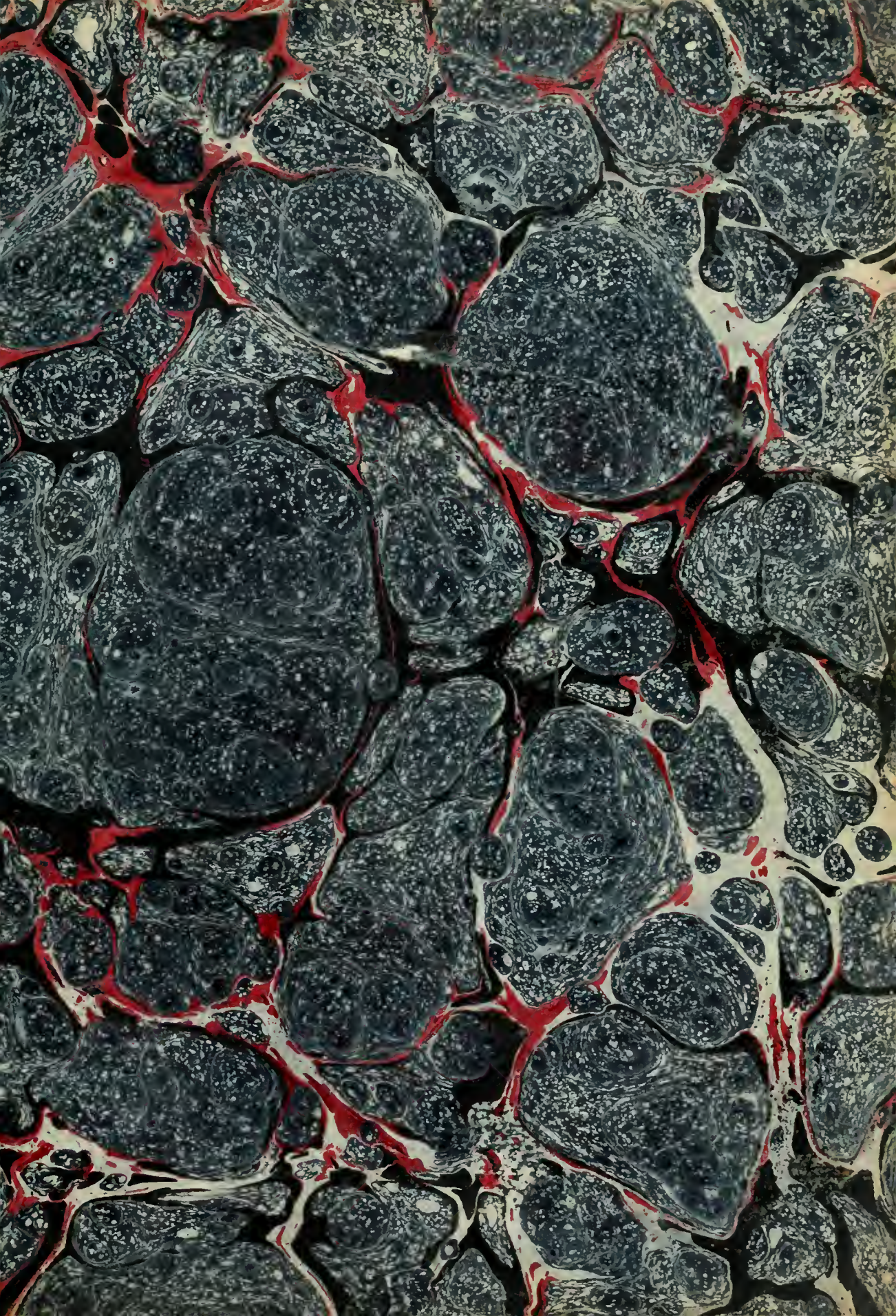
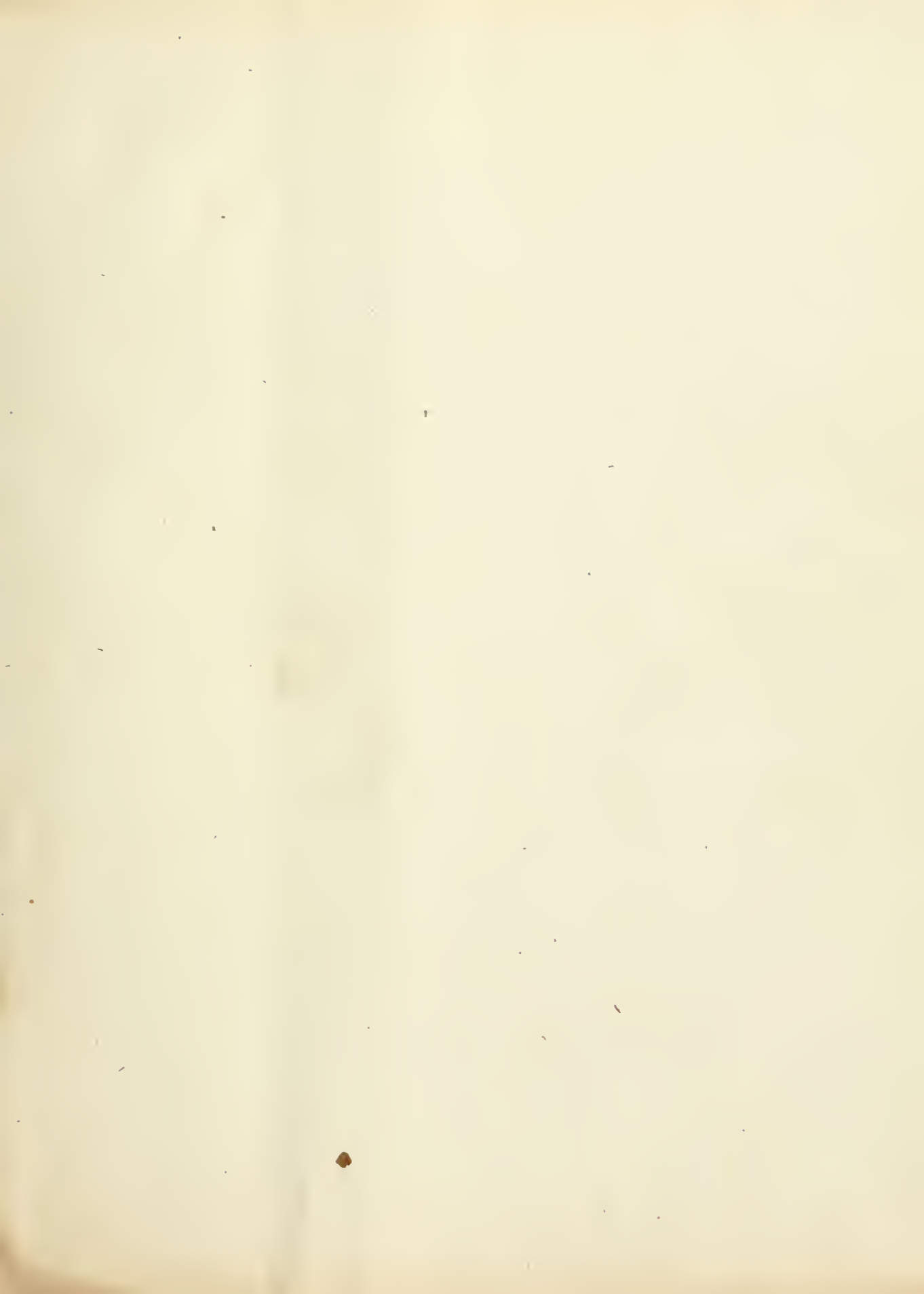




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1874

THE
IMPERIAL ENCYCLOPÆDIA;
OR,
DICTIONARY

OF THE
Geo^r **Sciences and Arts;** *Sal.* —
COMPREHENDING ALSO THE WHOLE CIRCLE OF
MISCELLANEOUS LITERATURE.

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ALL THE SCIENCES ARE DIGESTED IN A SYSTEMATIC FORM,
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AND
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WORKS, HEROES, LAWYERS, AND STATESMEN,

WITH EVERY OTHER TOPIC OF INFORMATION ESSENTIAL TO A WORK OF THIS NATURE.

BY THE
REV. W. M. JOHNSON, A. M.

CURATE OF HENBURY, AND CHAPLAIN TO THE RIGHT HONOURABLE LORD HUTCHINSON;

AND

THOMAS EXLEY, A. M.

TEACHER OF THE MATHEMATICS, BRISTOL.

ARES debemus imitari, quæ ut vagantur et flores ad mel faciendum idoneos carpunt; deinde quicquid attulere, disponunt, ac per favos digerunt; ita debemus quæcumque ex diversâ lectione congressimus separare; melius enim distincta servantur; deinde, ad debitam facultatem ingenii, in unum saporem varia illa libamenta confundere; ut etiam si apparuerit unde sumptum est, aliud tamen esse, quàm unde sumptum est, appareat.

SENECA.

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—
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IMPERIAL ENCYCLOPÆDIA.

HISTORY.

HISTORY may, in general, be defined an account of the most remarkable events which have occurred in the world, arranged in the true order in which they actually happened, together with the causes from which they originated, and the different effects they produced, as far as could be discovered. The word history (*ἱστορία*) literally denotes a search for curious things, or a desire of knowing, or even a rehearsal of things we have seen; being formed from the verb *ἵστω*, which properly signifies to know a thing by having seen it. But the idea is now much more extensive, and is applied to the knowledge of things taken from the report of others. It is derived from the verb *ἵστω*, I know; and hence among the ancients, several of their great men were called *polyhistores*, i. e. persons of various and general knowledge. The word history is, however, sometimes used to signify a description of things, as well as an account of facts. Thus Theophrastus calls his work on the nature and properties of plants, an history of plants; and we have a treatise of Aristotle, entitled an History of Animals; and to this day the description of plants, animals, and minerals, are called by the general name of Natural History. But the term history is chiefly used to denote an account of the principal transactions of mankind from the beginning of the world. This subject is generally divided into two parts, viz. civil and ecclesiastical. The first contains the history of mankind in their various relations to one another, and their behaviour, for their own emolument, or that of others, in common life; the second considers them as acting, or pretending to act, in obedience to what they believe to be the will of the Supreme Being. Civil history, therefore, includes an account of all the different states that have existed in the world, and likewise of those men who in different ages of the world have most eminently distinguished themselves, either for their good or evil actions. This last part of civil history, however, forms a distinct branch usually stiled Biography. History is justly esteemed a very considerable branch of polite literature. Few accomplishments are more valued than an accurate knowledge of the histories of different nations; and scarce any literary production is more regarded than a well written history of any nation: although the truth of Dr. Goldsmith's remark in his History of England, must be acknowledged with respect to those of all nations; viz. that "history is generally little more than the register of human contention and calamity."

FOUNDATION AND CREDIBILITY OF HISTORY.

As to the grounds on which the credibility of an history is founded; they are derived partly from the events related, and partly from the evidence and character of such as relate them; whence

arises an internal and external credibility. The interior credibility consists not only in the possibility of the event reported, but likewise in its probability; which last consists in this, that the circumstances in which an event is reported to have happened be conformable or suitable thereto, or that there be some foundation for it in the connection of the circumstances, and that in parallel cases the same had frequently happened. Hence it is easy to conceive, that many events may appear improbable, nay incredible, to some, through mere ignorance, or by separating them from their circumstances. This is the case with the frequent charges of incredibility brought against those numerous armies we read of in ancient history, from confounding the regular armies of the moderns, with the tumultuous ones of the ancients; which were a kind of militia composed of all or the greater part of the fighting men of a country. Under the external grounds of credibility are comprehended the genuineness of the original testimony, and the capacity and integrity of those who relate it: the evidence alleged must not only be ascribed to its true authors, but these must appear to be persons so circumstanced and inclined as to relate the truth, so as to add to it nothing false, nor omit any thing of consequence to the event reported. The first of these, or the genuineness of the original testimony, affects not only books and tracts, but public records and monuments of past events, statues, inscriptions, columns, edifices, &c. And to detect the fraudulent practices of former times in forging evidences of this kind, requires great knowledge in the history not only of human societies, but of the opinions, sciences, languages, and customs, of different times. And hence appears the necessity of great penetration, and capacity in an historian: but above all, of great integrity and sincerity in relating the truth. In trying the credibility of an event by the number of evidences brought in support of it, we ought to weigh: 1. How many historians, and other known sources, are really extant of any particular event. 2. The actual diversity of their testimonies. 3. Their agreement and contradiction; and whether they cannot be reconciled. 4. The exterior and interior credibility of the contradicting narrations. From what has been said, we may draw the following inferences: 1. That there is a real and demonstrable certainty of events, which ought not to be doubted or contested: and, indeed, scepticism in historical matters most commonly, if not always, proceeds from ignorance of the real nature of that certainty and its criterion, or from a consciousness of the indispensable necessity of unwearied diligence, of farther helps, and deeper reflection in examining and proving, than the conveniency of many will allow. 2. That the demonstrability of a fact, the credibility of an historian who reports, and the evidences of his whole work, ought never to be confounded

confounded or mistaken for one and the same thing: for an historian may be well worth credit, though he be not infallible, and even though he has actually committed errors in some of his reports. 3. The demonstrability of events has different degrees and limits, as reaching only so far as the records preserved will permit: and hence appears the necessity of well distinguishing such events, the reality or falsity of which can be proved, from events that are at best uncertain and doubtful. 4. That the credibility of events may gain new strength is evident: since many facts cannot be known, till after the death of such as were either the actors or persons concerned in them: besides it frequently happens, that records and vouchers of transactions, long since past, are afterwards discovered, which till then were either unknown, or could not be confidently published by those who knew them, for want of such witnesses and proofs. 5. The credit of history can never decay by age, as some have erroneously asserted; since facts, once established upon good evidence, must ever remain so, while the vouchers of such evidence are preserved: nay an account which formerly was uncertain, or even considered as improbable and false, may be vindicated and proved by late discoveries of historical writings and records.

USEFULNESS OF HISTORY.

That great advantage may be reaped from the study of history, will appear from the following considerations: 1. It proves an agreeable amusement and relaxation: for though the mind is not wholly inactive in the study of history; yet, being a lighter and more entertaining employment, the faculties of the mind, when fatigued and almost exhausted with more intense employment, find actual repose, and are recruited and restored to vigour. 2. But beside the pleasure of studying history, it lays a foundation not only for general prudence, but for that particular kind, which the circumstances and situation of each man require. To become acquainted with the characters of men, the marks, sources, and effects, of their passions and prejudices, the power and changes of their customs, and the like, is an essential and necessary step to prudence: and all this knowledge is considerably improved by history, which teaches us to make other men's experience our own, to profit by it, and to learn wisdom from their misfortunes. 3. History is of eminent use in promoting virtue, partly by a copious and pleasant instruction in a right and virtuous conduct in general, and partly by examples that insensibly lead us to the practice of several virtues in particular. 4. Every other science receives great benefit from history. Philosophy, and practical mathematics, have recourse to history, or to nature, through the medium of history, for most of their objects; and in many parts of these sciences, the whole force of the demonstration is founded on experiments; which would make but an indifferent figure, if the assistance of other men's experiments by the means of history were excluded: and the same holds of divinity, law, medicine, &c.

METHOD OF STUDYING HISTORY.

Persons who read history merely for amusement, or, having in view some particular branch of learning, attend only to certain branches of history, are not confined to that order and connection, which is absolutely requisite for obtaining a proper knowledge of history; the most regular, as well as successful way of studying which, is, to begin with an epitome of universal history, and afterwards apply to the history of particular nations and commonwealths: for the study of particular histories presupposes, or, to speak more properly, is only extending the knowledge of particular parts of universal history. In the study of history, we must consider, that all the revolutions which have happened in the world have been owing to two causes. 1. The connections between the different states existing together in the world at the same time, or their different situations with regard to one another; and, 2. The different characters of the people who in all ages constituted these states, their different geniuses and dispositions, &c. by which they were either prompted to undertake such and such actions of themselves, or were easily induced to it by others. The person who would study history, therefore, ought first to make himself acquainted with the state of the world in general in all different ages; what nations inhabited the different parts of it; what their extent of territory was; at what particular time they

arose, and when they declined. He should next inform himself of the various events which have happened to each particular nation; and thus he will discover many of the causes of those revolutions, which before he only knew as facts. Thus, for instance, a person may know the Roman history from the time of Romulus, without knowing why the city of Rome happened to be built at that time. This cannot be understood without a particular knowledge of the former state of Italy, and even of Greece and Asia; seeing the origin of the Romans is commonly traced as high as Aeneas, one of the heroes of Troy. But when all this is done, which indeed requires no small labour, the historian has yet to study the genius and dispositions of the different nations, the characters of those who were the principal directors of their affairs, whether kings, ministers, generals, or priests: and when this is accomplished, he will discover the causes of those transactions in the different nations, which have given rise to the great revolutions above mentioned: after which, he may assume the character of one who is well versed in history. In order to assist the memory it may be very useful in the study of history to divide the time in which the events happened into distinct periods to be considered apart. Thus civil history may be very properly divided into the following periods, at each of which a great revolution took place, either with regard to the whole world, or a very considerable part of it: viz. 1. The creation of man. 2. The flood. 3. The commencement of profane history, *i. e.* when, leaving the fabulous relations of heroes, demi-gods, &c. to the poets, men began to relate facts with some regard to truth and credibility. 4. The conquest of Babylon by Cyrus, and the destruction of the Babylonian empire. 5. The reign of Alexander the Great, and the overthrow of the Persian empire. 6. The destruction of Carthage by the Romans, when the latter had no longer any rival capable of opposing their design of universal empire. 7. The reign of Trajan, when the Roman empire was brought to its utmost extent. 8. The division of the empire under Constantine. 9. The destruction of the western empire by Odoacer, and the settlement of the different nations of Europe. 10. The rise of Mohammed and the conquests of the Saracens and Turks. 11. The crusades, and all the space intervening between that time and the American War. 12. The commencement of the American war, to the present time. With regard to the number of years which have elapsed since the creation of the world, there have been many disputes. The compilers of the Universal History determine it to have taken place in the year 4305 B. C. so that, according to them, the world is now in the 6115th year of its age. Others think it was created only 4004 years B. C. so that it is not yet 5815 years old. Be this as it will, however, the whole account of the creation rests on the truth of the Mosaic history; and which we must of necessity accept, because we can find no other, which does not either abound with the grossest absurdities, or lead us into absolute darkness. The Chinese and Egyptian pretensions to antiquity are so absurd and ridiculous, that the bare reading of them must be a sufficient confutation of them to every reasonable person. Some historians and philosophers are inclined to discredit the Mosaic accounts, from the appearances of volcanoes, and other natural phenomena; but their objections are by no means sufficient to invalidate the authority of the sacred writings; not to mention that every one of their own systems is liable to insuperable objections. It is therefore reasonable for every person to accept of the Mosaic account of the creation as truth: but an historian is under an absolute necessity of doing it, because, without it, he is quite destitute of any standard or scale by which he might reduce the chronology of different nations to any agreement; and, in short, without receiving this account as true, it would be in a manner impossible at this day to write a general history of the world. Ecclesiastical history may be considered under the same periods, or it may be arranged in a different order, as 1. From the creation to the flood. 2. From the flood to the call of Abraham. 3. From the call of Abraham to the departure of the Hebrews from Egypt. 4. From this event to the building of the temple. 5. From the first temple to the second. 6. From the second temple to the birth of Christ. 7. From the birth of Christ to the erection of the pope's supremacy. 8. From the erection of the pope's supremacy to his assumption of universal empire. 9. From this period to the reformation. 10. From the reformation to the present time. It cannot be expected that we should here present the reader with the civil and

and ecclesiastical history of those periods; our limits will not admit of it: we shall therefore consider it sufficient to mention the principal historians whose works may be consulted. Obvious advantages will attend the use of a good compendium of general history, previous to the study of any particular portion. The earliest epitome was the *Chronicon Carionis*, printed at Wittenberg, 1532; but the most celebrated are, Turselin's, Bossuet's, and Baron Holberg's; the last of these was translated into English by Mr. Gregory Sharpe. Of chronological tables the best and most completely useful are Blair's: and of the charts of history, Dr. Priestley's. These shew at once the reference which the history of one country bears to that of another. Sacred history as contained in the books of the old and new Testament, may properly be said to stand alone: it is not only the most certain, but exhibits the continuation of the true religion uninterrupted from the creation of the world, and therefore ought to form the groundwork of our study. The oldest history extant, next to the historical books of the Old Testament is that of Herodotus, who flourished about four hundred and fifty years before the Christian era, a little after the invasion of Greece by Xerxes. His history comprises probably every thing he had an opportunity of learning concerning the history of the Lydians, Ionians, Lycians, Egyptians, Persians, Greeks, and Macedonians: computing from the earliest of his accounts to the latest, his history may be reckoned to commence about 713 years before Christ, and to reach to about 479 before Christ; a period of about 234 years. Next to Herodotus, Thucydides is to be read; whose history reaches to the twenty-first year of the Peloponnesian war, the history of which is completed in the first and second books of Xenophon's *History of Greece*. After this, the student may proceed to the expedition of Cyrus, and the return of the Greeks: and then go back to the remaining books of Xenophon's history. The fifteenth and sixteenth books of Diodorus Siculus contain the histories of Greece and Persia from the battle of Mantinea to the beginning of the reign of Alexander the Great, in the year 336 before Christ. For the history of Alexander; Arrian, Quintus Curtius, and the tenth and eleventh books of Justin, must be referred to. The eighteenth, nineteenth, and twentieth, books of Diodorus Siculus, contain the history of Greece from the year 323 before Christ, to the year 301: the thirteenth, fourteenth, and fifteenth, books of Justin will complete the period; and those which follow to the twenty-ninth inclusive, carry on the history to about the year 195 B. C. Lastly, in the regular order of history read the thirteenth book of Justin, and all that follow to the two last, which completes the history of Greece till it mixes with that of the Romans. The lives of illustrious men by Plutarch and Cornelius Nepos, form an excellent supplement to the regular historians. Of the above works, which contain not only the history of Greece, but that of all the nations of the world known to the historians, Justin, Quintus Curtius, and Cornelius Nepos, only, are in Latin; the rest are in Greek. The following course of Roman history comprehends all that is to be learnt now of the subsequent ancient history of all other nations. The writer who treats of the early part of the Roman history, in the fullest and most satisfactory manner, is Dionysius of Halicarnassus, a rhetorician as well as an historian: the remains of his works which originally brought the history of Rome to the beginning of the first Punic war, end at this time with the year 341 before Christ, the time when the consuls resumed the chief authority in the republic after the dissolution of the decemvirate: so that to complete the period we must go to the three first books of Livy, whose history to the tenth book inclusive, brings that of Rome to the year 451, of the building of the city, or 292 before Christ. To supply the chasm between the tenth and twentieth books of Livy, read Polybius, the seventeenth, eighteenth, twenty-second, and twenty-third, books of Justin, and Appian's *Punic and Illyrian wars*; and afterwards the remainder of Livy from the twenty-first book to the end, which brings the history to 166 years before Christ. Sallust's *History of the War of Jugurtha*, and the *Catilinarian Conspiracy*, are the next books to be proceeded to: they are all which remain to us of his works. The *Commentaries of Caesar*, and Cicero's *Epistles to Atticus*, are the next works to be consulted, followed by the remains of Dio Cassius, and the *Compendium of Velleius Paterculus*. Suetonius's *lives of the Cæsars*, and the works of Tacitus, close the list of Roman historians of the greatest eminence. Those who are called the writers of the brassen

or iron age deserve a slighter mention. The principal of these are, Niphilini, and Herodian. The *Historiæ Augustæ Scriptores*, Zozimus, Ammianus Marcellinus, Paulus Deaconus, and Procopius; the last four, however, may be omitted; and Nicetas Acomnatus and Nicephorus Gregoras, followed by Joannes Cantacuzenus, substituted in their room. Laonicus Chalcondiles brings up the conclusion of the Eastern Empire, in the year 1453, when Constantinople was taken by Mohammed II. To enumerate all the modern compilations of ancient history which may be serviceable to those who cannot make their searches in the original authors would be endless. That of Rollin must not be passed over. The most complete body of history, however, ancient and modern, is the *Universal*: which has reference to the original writers for almost every paragraph of information. Gillies and Mitford have written *Histories of Greece*, and Hooke is by far the most preferable among the compilers of the Roman history. Having been thus particular on the subject of ancient history, we shall go on to the enumeration of those sources from which the last materials are derived for English history; and then proceeding to the other countries of modern Europe, make a slight mention of the best historians of each. The earliest accounts of Britain are to be found among the Romans; and principally in the works of Julius Cæsar, Dio Cassius, and Tacitus. Livy and Fabius Rusticus were others who wrote expressly on its history; but their works have perished in the general wreck of ancient literature. The most ancient of our native historians, now extant, says Bishop Nicholson, is Gildas, a monk of Bangor, who lived about the middle of the sixth century; a sorrowful spectator of the miseries and almost utter ruin of his countrymen, by a people under whose banners they hoped for peace. The title of his work was, "*De Excidio Britannia*." The next historian of note was Nennius, who is often confounded with Gildas: his work, which has gone by different names, was printed by Gale under that of "*Historia Britonum*." If we except a supplement to these writers, in the laws of Hoel Dha, we have nothing more of early British history. Geoffrey of Monmouth's work, which was written at a subsequent period, is nothing more than a romance. For the history of the Saxon times we have better materials, the oldest of which, perhaps, that are now preserved, are in the *Saxon Chronicle*, printed from several manuscripts by Bishop Gibson. Next to this Bede's *Ecclesiastical History* may be placed, and the *Life of Alfred* by Asser of St. David's. Only two Danish historians, says Bishop Nicholson, are necessary to the English antiquary's Library; Saxo Grammaticus and Sweno Agonis. The first English historian after the Norman Conquest, was Ingulph, Abbot of Crozland, whose history extends from the year 626 to 1089. That portion of Marianus Scotus's history which relates to Britain never has been printed. Florence of Worcester's who died 1119 is more full. Eadmer's work, published by Mr. Selden, contains the history of the two Williams and Henry the First, from 1066 to 1122, and is a work of very good authority. William of Malmesbury was the next historian, whose book "*De Gestis Rebus Anglorum*," is one of the most faithful of our numerous annals: it begins with the first arrival of the Saxons, and is continued to the death of Stephen. The other historians of the twelfth century were, Simeon Dunelmensis, Henry of Huntingdon, and William de Neuberg. Gervase of Canterbury's history, of which a fragment only is left, is the earliest of the thirteenth century: his chief contemporary was Hoveden, who seems to have been chaplain to King Henry the Second. Ralph de Diceto, Walter of Coventry, and Matthew Paris, were others. There were likewise a few meaner historians, whose names it is not necessary to repeat. The principal writers of the fourteenth century were, Wilkes, Trivet, John Brompton, Higden, John of Tinnmouth, Matthew of Westminster, and Knighton: the last but one of whom is often called *Flerilegus*. The first and principal writer of the fifteenth century was Froissart, whose work has been so carefully translated by Mr. Johnes. It affords the best history of the English nation during the reigns of Edward the Third and Richard the Second. Thomas de Walsingham is the next writer of credit, succeeded by John Harding, Caxton, and Rouse. Fabian's *Chronicle* is the first work of consequence in the sixteenth century, and is said to have given great offence to Wolsey. Polydore Virgil's history is not believed to have been so faithful; though greater merit is attributed to the works of Hall and Hollinshed. The industrious

Stowe was the first writer among the historians of the seventeenth century: the next of eminence was Daniel Speed, Sir Richard Baker, Sandford, Brady, Echard, and Tyrrel, are others, whose names only it is quite sufficient to enumerate. In the last century, Bishop Burnet, Carte, Kennet, Tindal, Hume, Smollett, Macaulay, and Henry, are historians too well known to need either comment or commendation here. In regard to the writers of particular histories of the kings with whom they were cotemporary, it may be sufficient to enumerate the following: William the Conqueror's life was written by William of Poitiers; King Stephen's memoirs, by Richard Prior of Hexham, printed among the decemscriptores; Richard the First's Expedition into the Holy Land, was celebrated by Joseph of Exeter, or Iscanus; the Life of Edward the Second by Sir Thomas de la More; Henry the Fifth's by some one under the name of Titus Livius: and that of Edward the Fifth, with a part of the History of Richard the Third, by Sir Thomas More; Henry the Eighth's reign, by Lord Herbert of Cherbury; and Elizabeth's by Camden. Those of a later period, perhaps, are hardly entitled to so much credit for impartiality. The historians of other particular countries may be mentioned in a briefer manner; enumerating such only as a reader may refer to when inquiring into facts. In regard to France, after mentioning the *Chroniques de St. Denis*, the *Annales Francorum*, with the works of Monstrelet, Mezeray, Daniel and Garnier, and Hérault's Abridgement, we need only mention two of the most comprehensive bodies of French history, "Duchesne's *Historia Francorum Scriptores*;" and "Bouquet's *Recueil des Historiens des Gaules et de la France*," in thirteen volumes folio. For the general history of Italy, Guicciardini's work is undoubtedly the best, not only for its accuracy, but its style; though Bruni's and Capriata's works are much esteemed for their veracity. To those who make a deep search, the "*Rerum Italianarum Scriptores*," by Muratori, will be useful. For the separate states of Italy, Giannoni's History of Naples, Machiavel's *Historia Florentina*, and the "*Historia Veneziani*." For Switzerland, the "*Helvetic Confederacy*" by Mr. Planta, may be referred to: for Holland, Le Clerc's "*Provinces Unies*," 1728. Among the writers of German history, the "*Germani Scriptores*" of Pistorius, Urstilius, Freher, and Reuber, may be mentioned; the writers on ancient

Germany by Schard; the *Scriptores Rerum Brunsvicensium*; and Mascon's history of the Germans. The most valuable history of Spain is Mariana's, first published in 1592; the best edition of which, continued to a late period, was published at Valencia, 1783. Beside this, Curita's "*Annales de Arragon*" may be consulted with the "*Annales de Catteluna*." The earliest materials for Portuguese history are to be found among the *Scriptores Rerum Hispaniarum*. The first historian whom Meusel mentions is Laimund de Ortega; but one of the most valuable and industrious was Bernard de Erito, who published the two first parts of the "*Monarchia Lusitanica*," in 1597 and 1609; which was continued as far as an eighth part, in 1729. Others are, Meneze's *Historia de Portugal*, printed at Lisbon in two volumes, folio, 1679 and 1698; La Clede's *Histoire de Portugal*, Par. 1735; and the elaborate history of Gebauer, in German, Leipsig, 1759. On Sweden, Crusius's "*Annales Suevicæ*," 1596, and Pottinger's "*De Rebus Suevicis*," 1686, will be found works of considerable consequence. On Norway, Forfæus's "*Historia Rerum Norvegicarum*." On Denmark, Cragius's "*Annales Danicæ*;" Mallet's "*Histoire de Dannemarc*," and Langebek's "*Scriptores Rerum Danicarum*;" and of Russia, "*Rerum Muscoviticarum Scriptores*," 1600, folio, and Levesque's "*Histoire de Russie*," 1800. Those who would gain a more particular knowledge of the characters which the principal of these historians bear, may consult the works of Wheare and Rawlinson on History. There are, however, some particular histories, which are so excellently written, that no person of a liberal education should neglect becoming acquainted with them. Under this character we may comprehend all the works of Tacitus, which now remain to us: in his writings every phrase is a maxim; the narrative goes on with rapidity; while all his characters are drawn with a more profound knowledge of human nature than those of any historian who went before him; his very brevity is pregnant. Thuanus's History of his own Times is a work almost equal to any production of the classic ages. Guicciardini's History of Italy: Davila's of the Civil Wars of France; Bentivoglio's of those of the Netherlands; and Giannoni's History of Naples, deserve a similar character, as well as Hume's history of our own country. And Rapin's History of England will be justly esteemed a treasure by all lovers of truth.

HITCH, in the sea-language, is to catch hold of any thing with a hook or rope, and by this means to hold it fast: thus when a boat is to be hoisted in, the sailors say, "hitch the tackles into the ring-bolts of the boat;" and when they are about to weigh anchor, "Hitch the fish-hook to the fluke of the anchor."

HITCHIN, or **HITCHING**, a large and populous town of Hertfordshire, near Hitchwood, twenty-five miles N. N. W. of Hertford, and thirty-four N. W. of London.

HITHE, a town of Kent; seventy miles from London. It is one of the Cinque Ports. From hence to Boulogne is reckoned the shortest passage to France. Lon. 1. 17. E. Lat. 51. 6. N.

HITSACKER, a town of Lunenburg Zell, on an island in Jetze; twenty-nine miles E. of Lunenburg, and fifty-six N. E. of Zell.

HITTITES, the descendants of Heth, the second son of Canaan. Gen. x. 15.

HIVE. See **APIS**, and **BEE**.

HIVITES, a people descended from Canaan, who dwelt at first in the country afterwards possessed by the Caphtorims, or Philistines. There were also Hivites in the centre of the promised land, for the Shechemites and the Gibeonites were Hivites. Gen. xxxiv. 2. Josh. xi. 19. There were also some beyond Jordan, at the foot of mount Hermon. Josh. xi. 3. Bochart says, that Cadmus, who carried a colony of Phœnicians into Greece, was an Hivite.

HOAI-KING, a town of China, in the province of Honan, fifteen miles S. S. W. of Peking.

HOAI-NGAN-FOU, a city of China, in the province of Kiang-nan, inclosed by a triple wall.

HOANG-HO. See **YELLOW RIVER**.

HOANG-T-CHEOU, a city of China, of the first rank, in the province of Hou-Quang, on the Yang-Tse, 585 miles S. of Peking.

HOARHOUND. See **MARRUBIUM**.

HOARSENESS, is a diminution or temporary loss of the voice, sometimes attended with a preternatural asperity or roughness of utterance. The parts affected are the trachea and larynx. It is occasioned by a slight inflammation of the mucous membrane covering those parts; and is relieved by mucilaginous liquors; warm diluting drinks, such as bran-tea, linseed-tea, &c.; assisted by opiates and sudorific medicines taken at bed-time.

HOATCHIT, a country of Chinese Tartary, governed by a Mogul Prince. It is seated N. of Peking.

HOBAL, in mythology, an idol of the ancient Arabs, the worship of which at Mecca was destroyed by Mohammed.

HOBBS, THOMAS, a famous writer, born at Malmesbury, in 1588, was the son of a clergyman. He completed his studies at Oxford, and was afterwards governor to the earl of Devonshire's eldest son; whom he attended in his travels through France and Italy. He translated Thucydides into English; and published his translations in 1628, to shew his countrymen, from Athenian history, the disorders and confusions of a democratical government. In 1626, his patron, the earl of Devonshire, died; and in 1628 his son also died: which loss affected Mr. Hobbes to such a degree, that he willingly accepted an offer of going abroad with the son of Sir Gervase Clifton; whom he accordingly accompanied into France, where he staid some time. While he continued there he was solicited to return to England, and to resume his concern for the hopes of that family to whom he had attached himself so early, and to which he owed so many and so great obligations. In 1631 the countess dowager of Devonshire desired to put the

young

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[illegible]

HISTORICAL CHART.

Representing at one View the rise & progress of the Principal States & Empires of the known World.

	GERMAN-BRITISH ISLANDS Scotl. Br. England	GAUL	ITALY	SPAIN (including Portugal)	GREECE	ASIA (properly so called)	AFRICA (properly so called)
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young earl under his care, who was then about the age of thirteen. This was very suitable to Mr. Hobbes's inclination, who discharged that trust with great fidelity. In 1634 he republished his translation of Thucydides, and prefixed to it a dedication to that young nobleman, in which he gives a long character of his father, and represents in the strongest terms the obligations he was under to that illustrious family. The same year he accompanied his noble pupil to Paris, where he applied his vacant hours to the study of natural philosophy; especially to the perfect understanding of mechanism, and the causes of animal motion. He had frequent conversations upon these subjects with father Marin Mersenne; a man deservedly famous, and who kept up a correspondence with almost all the learned in Europe. From Paris he attended his pupil into Italy, where at Pisa he became known to that great astronomer Galilei, who communicated to him his notions very freely; and after having seen all that was remarkable in that country, he returned with the earl of Devonshire into England. Afterwards, foreseeing the civil wars, he went to seek a retreat at Paris; where, by the good offices of F. Mersenne, he became known to the famous Des Cartes, and afterward held a correspondence with him upon several mathematical subjects, as appears from his letters published in Des Cartes's works. In 1642, Mr. Hobbes printed a few copies of his famous book, *De Cive* which raised him many adversaries, on account of its dangerous principles. Among many illustrious persons who, upon shipwreck of the royal cause, retired to France for safety, was Sir Charles Cavendish, brother to the duke of Newcastle; and this gentleman, being skilled in every branch of the mathematics, proved a constant friend and patron to Mr. Hobbes; who, by engaging, in 1645, in a controversy about squaring the circle, became so famous, that, in 1647, he was recommended to instruct Charles, prince of Wales, afterwards king Charles II. in mathematics; an office which he discharged much to his satisfaction. In 1650, was published at London, a small treatise of Mr. Hobbes's, entitled, *Human Nature*; and another, *De Corpore Politico*, or, *Of the Elements of the Law*. All this time he had been digesting his religious, political, and moral principles, into a complete system, called the *Leviathan*, which was printed at London in 1650 and 1651. After this he returned to England, and passed the summer commonly at the earl of Devonshire's seat, and some of his winters in town, where he had for his intimate friends some of the greatest men of the age. In 1660, upon the restoration, he came up to London, where he obtained from the king an annual pension of 100*l*. But, in 1666, his *Leviathan*, and his treatise *De Cive*, were censured by parliament, which alarmed him very much, as did also the bringing in of a bill into the house of commons to punish atheism and profaneness. When this storm was blown over, he procured a beautiful edition of his pieces in Latin, to be published in 4to. in 1668, by John Bleau. He died in 1679, aged 92. His character and manners are thus described by Dr. White Kennet, in his *Memoirs of the Cavendish Family*. "The earl of Devonshire (says he) for his whole life entertained Mr. Hobbes in his family, as his old tutor, rather than as his friend or confidant. He let him live under his roof in ease and plenty, and in his own way, without making use of him in any public, or so much as domestic, affairs. He would often express an abhorrence of some of his principles in policy and religion; and both he and his lady would frequently put off the mention of his name, and say, 'He was a humorist, and nobody could account for him.' His professed rule of health was to dedicate the morning to his exercise, and the afternoon to his studies. And therefore at his first rising, he walked out, and climbed any hill within his reach; or if the weather was not dry, he fatigued himself within doors by some exercise or other, to be in a sweat: recommending that practice upon this opinion, that an old man had more moisture than heat, and therefore by such motion heat was to be acquired and moisture expelled. He used to say, that it was lawful to make use of ill instruments to do ourselves good: 'If I were cast (says he) into a deep pit, and the devil should put down his cloven foot, I would take hold of it to be drawn out by it.' He could not endure to be left in an empty house. Whenever the earl removed he would go along with him, even to his last stage, from Chatsworth to Hardwick. When he was in a very weak condition, he dared not to be left behind, but made his way upon a feather-bed in a coach, though he survived the journey but a

few days. He could not bear any discourse of death, and seemed to cast off all thoughts of it: he delighted to reckon upon longer life. The winter before he died he made a warm coat, which he said must last him three years, and then he would have such another. In his last sickness his frequent questions were, Whether his disease was curable? and when intimations were given that he might have ease, but no remedy, he used this expression, "I shall be glad to find a hole to creep out of the world at;" which are reported to have been his last sensible words; and his lying some days following in a silent stupefaction, did seem owing to his mind more than his body." The Rev. Mr. Granger observes, that Hobbes's style is incomparably better than that of any other writer in the reign of Charles I. and was for its uncommon strength and purity scarcely equalled in the succeeding reign. "He has in translation (says he) done Thucydides as much justice as he has done injury to Homer; but he looked upon himself as born for much greater things than treading in the steps of his predecessors. He was for striking out new paths in science, government, and religion; and for removing the land-marks of former ages. His ethics have a strong tendency to corrupt our morals, and his politics to destroy that liberty which is the birthright of every human creature. He is commonly represented as a sceptic in religion, and dogmatist in philosophy; but he was a dogmatist in both. The main principles of his *Leviathan* are as little founded in moral or evangelical truths, as the rules he has laid down for squaring the circle are in mathematical demonstration. His book on human nature is esteemed the best of his works."

HOBLERS, or **HOBLIERS**, [*hoblerii*, Lat.] in ancient English customs, were men who, by their tenure, were obliged to maintain a light horse or hobby, for the certifying any invasion towards the sea-side. The name was also used for certain Irish knights, who used to serve as light-horsemen upon hobbies.

HOBSEES or **GOFFREES**, a kind of Abyssinian slaves very frequent in Hindostan. They are highly valued for their courage, fidelity, and shrewdness; in which they do so far exceed, as often to be raised to posts of great honour, and made governors of places under the title of siddes.

HOCHSTADT, or **HOCHSTETT**, a town of Germany, in Suabia, 22 miles N.E. of Ulm.

HOCKHOCKING, a river of the United States, in the north-western territory, which runs into the Ohio, 18 miles S.W. of Marietta.

HODMAN, a term formerly used for a young scholar admitted from Westminster school to be student in Christ church in Oxford.

HOE, or **HOW**, a well-known implement of husbandry, designed for eradicating weeds from gardens, fields, &c. This tool is of great utility, and ought to be more frequently employed in stirring the unoccupied corners and spots of land during the more vacant seasons of the year, by which operation the soil will be considerably improved. See **HUSBANDRY**.

HOETICHEOU, the most southern city of the province of Kiangnan, in China, and one of the richest of the empire.

HOFF, a town of Franconia, 46 miles N.E. of Bamberg.

HOFFMAN, **MAURICE**, M.D. was born of a good family, at Furstenwalde, in Brandenburg, Sept. 20, 1621; and was driven early from his native country by war and pestilence. In 1637 he was sent to study in the college of Cöln. Famine and the plague drove him from thence to Köpnik, where he buried his father; and in 1638 he went to Altorf, to his maternal uncle, who was a professor of physic. Here he finished his studies in classical learning and philosophy, and then applied with the utmost ardour to physic. In 1641 he went to the university of Padua, which then abounded with men very learned in all sciences. Anatomy and botany were the great objects of his pursuit; and he became very deeply skilled in both. In 1648 he was made professor extraordinary in anatomy and chirurgery; in 1649, professor of physic, and soon after member of the college of physicians; in 1653, professor of botany, and director of the physic-garden. He died in 1698. His works are: 1. *Aldorfi Delicia Hortenses*; 2. *Appendix ad Catalogum Plantarum hortensium*; 3. *Delicia silvestres*; 4. *Florilegium Aldorfinum*.

HOFFMAN, **JOHN MAURICE**, son of the doctor, by his first wife, was born at Altorf in 1653, and sent to school at Herszprugk, whence he returned to Altorf at sixteen, and studied philosophy

and physic. In 1674, he was admitted M. D. In 1677, he was made professor extraordinary in physic, and in 1681, professor in ordinary. In process of time his fame was spread so far and wide that he was sought after by persons of the first rank. Upon the death of his father, in 1698, he succeeded him in his places of botanic professor and director of the physic-garden. He was elected also rector of the university of Altorf, a post which he had occupied in 1686. He lost his great friend and patron, the marquis of Anspach, in 1703; but found the same kindness from his successor, William Frederic, who pressed him so earnestly to reside nearer, and made him likewise such advantageous offers, that, in 1713, he removed from Altorf to Anspach, where he died in 1727. He published a great number of works, which are highly esteemed; among these were a continuation of his father's work, entitled, *Delicia Hortensis Altdorfinae, Acta Laboratorii Chemici Altdorfini*; and *De Differentiis Alimentorum*, 4to.

HOG, in zoology. See *Ovis* and *Sus*.

HOG, on board of a ship, is a sort of flat scrubbing-broom formed by inclosing a number of short twigs of birch or such wood between two pieces of plank fastened together, on cutting off the ends of the twigs. It is made use of to scrape the filth from the ship's bottom under water, particularly in the act of boot-topping.

HOGARTH, WILLIAM, a celebrated painter, was born at London in 1698, and bound apprentice to an engraver of arms on silver-plate. About 1720 he set up for himself, and his first employment was to engrave coats of arms and shop-bills. He next undertook to execute plates for booksellers, the chief of which are the prints to *Hudibras*. His first performance as a painter was a representation of Wanstead assembly, the portraits being taken from life. In 1730 he married a daughter of Sir John Thornhill, and shortly after embellished the gardens of Vauxhall with some excellent paintings, for which the proprietor complimented him with a perpetual ticket of admission. In 1733 appeared his *Harlot's Progress*, prints which stamped his reputation, and were followed by other moral histories, admirably executed. Soon after the treaty of Aix-la-Chapelle he went to France, and while at Calais began to sketch a drawing of the gate of the town, for which he was taken up, but was soon released. This circumstance he ridiculed in an excellent caricature. In 1753 he published his *Analysis of Beauty*, in 4to. Hogarth was very vain, and thought himself the first painter of the age. He was also remarkably absent, of which the following is an instance: On setting up his carriage he paid a visit to the lord mayor, and having protracted his stay till a heavy shower came on, he was let out by a different door from that by which he entered, and, unmindful of his carriage, he set off on foot, and got home dripping wet. When Mrs. Hogarth had asked him where he had left the carriage, he said that he had forgot it. He died in 1762, and was buried in the church-yard of Chiswick—*Watkins*.

HOGSHEAD, a measure of capacity containing sixty-three gallons.

HOGUE, a town and cape of France, on the N. W. point of the department of the Channel and late province of Normandy; near which Admiral Rook burnt the French admiral's ship, called the *Rising Sun*, with twelve more large men of war, the day after the victory obtained by Admiral Russel near Cherbourg, in May 1692. Lon. 1. 45. W. Lat. 49. 56. N.

HOHENZOLLERN, a principality of Germany, in Suabia, divided into two branches, Hohenzollern Hechingen, and Hohenzollern Sigmaringen.

HOHNSTEIN, a county of Germany, in Thuringia, anciently possessed by the descendants of Charlemagne.

HOLST, in sea-language, denotes the perpendicular height of a flag or ensign, as opposed to the fly, which signifies its breadth from the staff to the outer edge.

HOISTING, the operation of drawing up any body by the assistance of one or more tackles. Hoisting is never applied to the act of pulling up any body by the help of a single block, except in the exercise of extending the sails by drawing them upwards along the masts or stays, to which it is invariably applied.

HOCKE-DAY, HOCK-DAY, or HOCK-TUESDAY, in ancient English customs (dies Martis, quem quindenam pasche vocant), the second Tuesday after Easter week; a solemn festival celebrated for many ages in England in memory of the great

slaughter of the Danes, in 1002. This is still kept up in some counties; and the women bear the principal sway in it, stopping all passengers with ropes and chains, and exacting some small matter from them to make merry with.

HOKIEN, or HOKIENFOU, a city of China, in the province of Pe-tcheli, eighty-seven miles S. of Peking.

HOLCUS, INDIAN MILLER, or CORN: a genus of the monœcia order, and polygamia class of plants; natural order, Gramina. Hermaphrodite, calyx glume, one or two-flowered; corolla glume, awned; stamina three; styles two; seed one; male, calyx glume, two-valved; corolla none; stamina three. There are fifteen species.

H. SORGHUM, or GUINEA-CORN, is the most remarkable of the foreign species. The stalks are large, compact, and tall eight feet high. In Senegal the fields are entirely covered with it. The negroes, who call it guarnot, cover the ears when ripe with its own leaves to shelter it from the sparrows. The grain made into bread is esteemed very wholesome. With this the slaves in the West Indies are generally fed, each being allowed from a pint to a quart every day. See Plate LXV.

HOLD, the whole interior cavity, or belly of a ship, or all that part of her inside, which is comprehended between the floor and the lower deck throughout her whole length. This capacious apartment usually contains the ballast, provisions, and stores, of a ship of war, and the principal part of the cargo in a merchantman. The disposition of these articles with regard to each other, naturally falls under consideration in the article *STOWAGE*; it suffices in this place to say, that the places where the ballast, water, provisions, and liquors, are stowed, are known by the general name of the hold. The several store-rooms are separated from each other by bulk-heads, and are denominated according to the articles which they contain, the sail-room, the bread-room, the fish-room, the spirit-room, &c.

HOLDERNESS, a peninsula in the east riding of Yorkshire, forming a promontory between the German ocean on the E. and the Humber on the S.

HOLDSWORTHY, a town in Devonshire, 43 miles E. N. E. of Exeter.

HOLINESS, anciently a title given to all bishops. The Greek emperors also were addressed under the title of Holiness, as being anointed with holy oil at their coronation. Du Cange also informs us that some of the kings of England have had the same attribute; and that the orientals have frequently refused it to the pope.

HOLLAND, a province of Europe, the principal of the Dutch States, commonly called the Seven United Provinces, and now stiled Batavia. Holland is a peninsula, bounded on the N. and W. by the German Ocean, on the E. by the Zuyder Zee and the late state of Utrecht, and on the S. by the Meuse and the late province of Dutch Brabant. It was divided into North and South Holland. The length of the whole, including the Texel and the other islands of the Meuse, is about 90 miles; the breadth is various, from 15 to 48. It contains 90 walled towns, besides many others. The soil is so soft and marshy, that but for the constant care in forming ditches and canals, it would be hardly capable of cultivation; some part of it lies even lower than the sea, from which it is secured by dykes. The meadow-grounds are rich, and feed great numbers of milch-cows; the making of butter and cheese being a principal occupation. These meadows are generally under water during the winter, and the water would remain there at all times, if the inhabitants had not found means to discharge them, by mills invented for this purpose, into the ditches and canals. The Hollanders are affable, industrious, laborious, absorbed in trade, excellent sailors, moderate politicians, and lovers of liberty. A free exercise of religion is allowed to all persuasions, but Calvinism is the most prevailing. This country was anciently inhabited by the Batavians, who derived their origin from the Catti, a people of Germany. Having been obliged to abandon their country on account of civil wars, they came to establish themselves in an island, formed by the waters of the Rhine and Walhal or Leck, and named their country Batavia, or Betuwe, from Batton, the son of their king.

HOLLAND, a district of England in Lincolnshire, in the S. E. part of the county. In nature, as well as in name, it resembles the Batavian state above described. It consists entirely of fens

HOLLAND



and marshes; some in a state of nature, but others cut by numberless drains and canals, and crossed by raised causeways. The lower or S. division is the most watery, and is preserved from constant inundations by nothing but vast banks, raised on the sea-coast and rivers. The air is unwholesome, and the water is generally so brackish as to be unfit for internal purposes; on which account the inhabitants are obliged to make reservoirs of rain-water. In summer, vast swarms of insects fill the air, and prove a great nuisance. Here industry has produced comfort and opulence, by forming excellent pasture-lands out of the swamps and bogs, and even making them capable of producing large crops of corn. The fens too, in their native state, are not without their utility; and afford various objects of curiosity to the naturalist.

HOLLAND, in commerce, a fine and close kind of linen, so called from its being first manufactured in Holland. See LINEN.

HOLLAND, PHILEMON, M. D. commonly called the Translator General of his age, was educated in the university of Cambridge. He was long a schoolmaster at Coventry, where he also practised physic. He translated Livy, Pliny's Natural History, Plutarch's Morals, Suetonius, Ammianus Marcellinus, Xenophon's Cyropædia, and Camden's Britannia, into English; and the geographical part of Speed's Theatre of Great Britain into Latin. The Britannia, to which he made many useful editions, was the most valuable of his works. It is surprising, that a man of two professions could find time to translate so much; but it appears from the date of the Cyropædia, that he continued to translate till he was 80 years of age. He died in 1636, aged 85. He made the following epigram upon writing a large folio with a single pen:

With one sole pen I wrote this book,
Made of a grey goose quill;
A pen it was when it I took,
And a pen I leave it still.

HOLLAND, New, the largest island in the world, reaching from 10° to 44° lat. S. and between 110° and 154° lon. E. of London; so named from having been chiefly explored by Dutch navigators. Some have disputed whether the title of island can be properly applied to a country of such vast extent, or whether it ought not rather to be denominated a continent; while others insist, that though the word island does indeed signify a tract of land surrounded by sea, yet, in the usual acceptation, it means only a land of moderate extent thus surrounded. Were it otherwise, we might call the whole world an island, as it is every where surrounded by the sea; and in fact, Dionysius Periegetes applies this term to it, with the addition of the word immense, to distinguish it from other islands. The best rule for determining whether a country ought to have the name of island or continent, is to consider whether it has the advantages of an insular situation, or not. The first and principal of these is the being capable of an union under one government, and thence deriving a security from all external attacks excepting those by sea; but in countries of great extent, this is not only difficult, but impossible. If we consider, therefore, that New Holland extends about 1000 miles every way, we shall find that its claim to be called a continent is undoubted; its length from E. to W. being about 2400 English miles, and 2300 from N. to S. The climate of this continent appears not to be disagreeable. The heat is never excessive in summer, nor is the cold intolerable in winter. Storms of thunder and lightning are frequent. The eastern part of this vast tract was totally unknown till Captain Cook made his voyages; and by fully exploring that part of the coast, gave his country an undoubted title to it; which accordingly has since been taken possession of under the name of New South Wales. The inhabitants of New Holland are by all accounts represented as the most miserable and savage race of mortals, perhaps, existing on the face of the earth. They go entirely naked; and though pleased at first with some ornaments which were given them, they soon threw them away as useless. It does not appear, however, that they are insensible of the benefits of clothing, or of some of the conveniences which their new neighbours are in possession of. Some of them, whom the colonists partly clothed, seemed to be pleased with the comfortable warmth they derived from it; and they all express a great desire for the iron-tools which they see their neighbours make use of. Their colour, in the opinion of Captain Cook, is rather a deep chocolate than a full black; but the filth with which their skins are covered,

prevents the true colour of them from appearing. At some of their interviews with the colonists, several droll instances happened of their mistaking the negroes among the colonists for their own countrymen. Notwithstanding their disregard for European finery, they are fond of adorning, or rather deforming, their bodies with scars; so that some of them cut the most hideous figure that can be imagined. The scars themselves have an uncommon appearance. Sometimes the flesh is raised several inches from the skin, and appears as if filled with wind; and all these seem to be reckoned marks of honour among them. Some of them perforate the cartilage of the nose and thrust a large bone through it, an hideous kind of ornament humorously called by the sailors their sprit-sail yard. Among the insects of this country are several sorts of large spiders and scolopendras, but the most remarkable insects seen by Captain Cook were the green ants. These little animals form their habitations, by bending down the leaves of trees, and glueing the ends of them together so as to form a purse. Though these leaves are as broad as a man's head, they perform this feat by main strength, thousands of them holding down the leaves, while multitudes of others apply the glutinous matter. Capt. Cook's people ascertained that this was the case, by sometimes disturbing them. The quadrupeds of New Holland hitherto discovered are principally of the Oposum kind, of which the most remarkable is the Kangaroo. See DIDELPHIS. There is also a species of dogs very different from those known in Europe. They are extremely fierce, and never can be brought to the same degree of familiarity with those of Europe. Some of them have been brought to England, but still retain their usual ferocity. There are many beautiful birds of various kinds; among which the principal are the ostrich, or cassowary, which often grows to the height of seven feet or more; and the black swans, which the ancients despaired of finding; whence their adage, for any thing very rare; "Rara avis in terris, nigroque similima cygno." Several kinds of serpents have also been met with. There are likewise many curious fishes; though the finny tribe seems not to be so plentiful on the coast as to give any considerable assistance in the way of provisions for the colony. This country has become an object of considerable consequence by the establishment of a British colony in it; where the criminals condemned to be transported are sent to pass their time of servitude. A variety of flowering shrubs, almost all entirely new to Europeans, and of exquisite fragrance, abound in those places which are free from trees; and among these, a tall shrub, bearing an elegant flower, which smells like English may, is peculiarly delightful, and perfumes the air to a great distance. The trees, as Capt. Tench and others relate, are of so bad a grain, that they can scarcely be used for any purpose. But this Mr. Stockdale ascribes to their being used in an unseasoned state. These trees, however, yield vast quantities of a peculiar kind of gum, which is used as a cure for the dysentery.

HOLLOA, in the sea-language, an exclamation of answer, to any person who calls to another to ask some question, or to give a particular order. Thus, if the master intends to give any order to the people in the main-top, he previously calls, Main-top, hoay! to which they answer, Holloa! to shew that they hear him, and are ready. It is also the first answer in hailing a ship at a distance.

HOLLOW, in architecture, a concave moulding, about a quarter of a circle, by some called a casement, by others an abacus.

HOLLOW TOWER, in fortification, is a rounding made of the remainder of two brisures, to join the curtain to the crillon, where the small shot are played, that they may not be so much exposed to the view of the enemy.

HOLLOW ROOT. See APOXA.

HOLLY, in botany. See ILEX.

HOLLYHOCK. See ALCEA.

HOLocausts, [from *holos* whole, and *kaio*, I consume with fire,] burnt sacrifices of which the whole was consumed by fire. They are often mentioned by the heathens as well as Jews; particularly by Xenophon, Cyropæ. lib. viii. p. 464, ed. Hutchins, 1738, who speaks of sacrificing holocausts of oxen to Jupiter, and of horses to the sun: and they appear to have been in use long before the institution of the other Jewish sacrifices by the law of Moses: see Job i. 5. xlii. 8. and Gen. viii. 20. xxii. 13. On this account, the Jews, who would not allow the Gentiles to offer on their altar any other sacrifices peculiarly enjoined by the law of

Moses.

Moses, admitted them by the Jewish priests to offer holocausts; because these were a sort of sacrifices prior to the law, and common to all nations.

HOLOGRAPH, or **HOLOGRAPHUM**, [of $\alpha\lambda\lambda$, all, and $\gamma\rho\alpha\phi\eta$, I write,] in the civil law, is chiefly used of a testament written wholly in the testator's own hand. The Romans did not approve of holographic testaments; and, though Valentinian authorized them, they are not used where the civil law is in full force.

HOLOMETRER, [$\mu\epsilon\tau\rho\epsilon\tau\rho\eta$ and $\mu\epsilon\tau\rho\epsilon\tau\rho\eta$,] a mathematical instrument that serves universally for taking all measures, both on the earth and in the heavens.

HOLORACEÆ, in botany, the name of the twelfth order in Linnaeus's "Fragments of a Natural Method," consisting of pot-herbs, or plants useful for the table, and entering into the economy of domestic affairs.

HOLOSTEUM, in botany, a genus of the triandria trigynia class and order. Natural order, Caryophyllæ. Calyx five-leaved; petals five; capsule one-celled, subcylindrical, opening at top. There are five species.

HOLOTHURIA, a genus of the vermes mollusca class and order. Body detached, cylindrical, thick, naked, and open at the extremity; mouth surrounded by fleshy branched tentacula or feelers. These are all inhabitants of the sea, and expand or contract themselves at pleasure; the anterior aperture serves them both as a mouth and vent, and from the hinder one they reject waters which had been previously drawn in; the tentacula are retractile. There are twenty-three species.

H. PENTACTES, the FIVE-ROWED, **HOLOTHURIA**, has the mouth encompassed with tentacula, the body bearing tentacula five different ways. The animal is of a red colour, nearly oval, or somewhat cylindrical, and is observed to assume various shapes. The mouth is set round with ten rays mostly at the points; the body longitudinally dotted in five places with clay-coloured hollow warts, situated two together. It inhabits the sea of Norway, and is also found near Penzance. See Plate LXVII.

H. PHYSALIS, the BLADDER-SHATED **HOLOTHURIA**. The body of this species is oval, approaching to triangular, of a glossy transparency; the back sharp-edged, of a dark green colour, whence run out a number of sinews; anteriorly the body is of a reddish hue. The trunk spiral, reddish towards the thicker end. It inhabits the seas. The word holothuria is used by Pliny and Aristotle; but Mr. Pennant supposes they both intended, under this name, to describe those marine bodies now denominated zoophyta. Aristotle, however, seems to have admitted that they possessed animal life, a circumstance that has in modern times been completely ascertained.

H. TREMULA, or **QUIVERING HOLOTHURIA**, is of a cylindric form about an inch in diameter; it can extend to more than a foot in length, or contract its body into a ball. See Plate LXVII.

HOLSTEIN, a late duchy of Germany, bounded by the German ocean on the W.; the Baltic, or the gulph of Lubeck on the E.; the duchy of Mecklenburg on the S. E.; that of Bremen, with the Elbe, on the S. W.; and Laueburg, with the territory of Hamburg, on the S. Its greatest length is about 80 miles and breadth 60. A great part of this country consists of rich marshes where cattle are bred in vast numbers, and great quantities of excellent butter and cheese made of their milk. The arable land is very fruitful in wheat, barley, pease, beans, and rape seed. In the barren and healthy parts of the country, large flocks of sheep are grazed. The woods abound with game and wild fowl; and the sea and rivers with fish. Holstein is also noted for beautiful horses. The ponds and lakes are drained once in three or four years, and the carp, lampreys, pikes, and perches, found in them, are sold; then sowed for several years after with oats, or used for pasture; and after that laid under water again, and fish bred in them. There are hardly any hills. The principal rivers are the Eyder, Stor, and Trave. The duchy contains about 30 towns.

HOLT, whether at the beginning or ending of the name of any place, signifies that it is or hath been woody, from the Saxon *holl*, a wood; or sometimes possibly from the Saxon *hol*, i. e. hollow, especially when the name ends in tun or dun. Gibson.

HOLT, a town of Germany, in the late duchy of Cleves, now in the department of the Roer. It is 27 miles S. E. of Cleves.

HOLYHEAD, a town, cape, and parish, of Wales, on the isle of Anglesea, in the Irish channel, where people usually embark for

Dublin, there being regular packet-boats which sail for that city every Monday, Wednesday, and Friday. It has a very convenient harbour for the northern trade, when stopt by contrary winds. It is situated near the extremity of the isle, and is joined to the N. W. part of it by a stone-bridge of one arch. It has a market on Saturday. Under the mountains that overhang the town is a large cavern in the rock, supported by natural pillars, called the Parliament-house, accessible only by boats, and the tide runs into it. The chief commodities are butter, cheese, bacon, wild fowl, lobsters, crabs, oysters, razor-fish, shrimps, herrings, cod-fish, whittings, pollacks, cole-fish, tenches, turbot, soles, flounders, rays, and other fish. It lies 24 miles and a half N. W. of Caernarvon, 60 E. of Dublin, and 276 N. W. of London. Lon. 4. 22. W. Lat. 53. 19. N.

HOLY ISLAND, a small island on the coast of England 10 miles S. E. of Berwick, in Northumberland.

HOLY-ROOD DAY, a festival observed by the Roman Catholics, in memory of the exaltation of our Saviour's cross.

HOLY-THURSDAY. The day on which the ascension of our Saviour is commemorated, ten days before Whitsuntide.

HOLY-WEEK. The week before Easter, in which the passion of our Redeemer is commemorated.

HOLYWOOD, JOHN, or JOANNES DE SACROBOSCO. See SACROBOSCO.

HOLZAPSEL, a county of Germany, on the banks of the Lahn, between the late electorate of Treves and Nassau Dietz.

HOLZAPSEL, the capital of the above county, 4 miles N. E. of Nassau.

HOMALIUM, in botany, a genus of the polyandria trigynia class and order. Calyx six or seven-parted, corolla six or seven-petaled; stamens twenty-one, in three bodies; pericarpium one-celled, many-seeded. There are two species.

HOMBERG, WILLIAM, a celebrated physician, chemist, and philosopher, born in Batavia, in the East Indies, in 1652. His father was a Saxon gentleman, who, afterwards settling at Amsterdam, William there prosecuted his studies; and thence removed to Jena, and to Leipsic, where he studied the law. In 1642 he was made advocate at Magdeburg, where he studied experimental philosophy. Some time after he travelled into Italy; and studied medicine, anatomy, and botany, at Padua. He afterwards studied at Bologna; and at Rome learned optics, painting, sculpture, and music. He at length travelled into France, England, and Holland; obtained the degree of M. D. at Wittemberg; travelled into Germany and the North; visited the mines of Saxony, Bohemia, Hungary, and Sweden; and returned to France, where he acquired the esteem of the learned. M. Colbert being informed of his merit, made him such advantageous offers, as induced him to fix his residence at Paris. M. Homberg, who was already well known for his phosphorus, for a pneumatic machine of his own invention more perfect than that of Guericke, for his microscopes, for his discoveries in chemistry, and for the great number and variety of his curious observations, was received into the academy of sciences in 1691, and had the laboratory of that academy, of which he was one of its principal ornaments. The duke of Orleans, afterwards regent, made him his chemist, gave him a pension, and the most superb laboratory that was ever in the possession of a chemist, and in 1704 made him his first physician. He had abjured the Protestant religion in 1682, and died in 1715. There are many learned and curious pieces of his writing, in the Memoirs of the Academy of Sciences, and in several journals. He had begun to give the elements of chemistry in them, and the rest were found among his papers fit for printing.

HOMBURG, a town of Germany, in the late duchy of Deux Ponts, now annexed to France, and included in the department of Sarre and Moselle. It is 4 miles N. N. W. of Deux Ponts, and 36 W. N. W. of Landau. Lon. 7. 32. E. Lat. 49. 16. N.

HOME, HENRY, Lord Kames, an eminent Scottish lawyer, and author of many useful and ingenious works on various subjects, was descended of an ancient family, and born in 1696, in Berwickshire. In early youth, he was lively, and eager in the acquisition of knowledge. He never attended a public school; but was instructed in the ancient and modern languages, as well as in several branches of mathematics, and the arts necessarily connected

connected with that science, by Mr. Wingate, a man of considerable parts and learning, who spent many years as private tutor to Mr. Home. He applied with great diligence to the study of the civil and municipal law of his country, and early acquainted himself with the forms and practical business of the courts. Whoever peruses the law-papers composed by Mr. Home when a young man, will perceive an uncommon elegance of style, besides great ingenuity of reasoning, and a thorough knowledge of the law and constitution of his country. These qualifications, together with the strength and vivacity of his natural abilities, soon raised him to be an ornament to the Scottish bar; and, on the 2d of February 1752, he was advanced to the bench as one of the judges of the court of session, under the title of Lord Kames. His principal works are, *Essays upon several Subjects concerning British Antiquities*, 1764; *Essays on the Principles of Morality and Natural Religion*, 8vo.; *Historical Law*, 8vo.; *The Principles of Equity*, folio; *Elements of Criticism*, 3 vols. 8vo.; *The Gentleman Farmer*, 8vo.; *Loose Hints upon Education*, 8vo.; *The History of Man*, 4 vols. 8vo. He died in 1792.

HOMER, the father of Greek poetry, was born on the banks of the river Meles, whence his mother called him Melesigenes. He was a natural child, but his mother afterwards married one Phenius, a citizen of Smyrna, who adopted the child as his son. His birth, however, is involved in so much obscurity that all this may be fable, for the ancients are not agreed as to the period in which he flourished; and seven cities disputed the honour of having given him birth, which are enumerated in the following distich:

Smyrna, Rhodes, Colophon, Salamis, Chios, Argos, Athenæ;
Orbis de patria certat, Homere, tua.

He is said to have kept a school at Smyrna, and that he afterwards accompanied Mentes, a master of a ship, in several voyages, and by him was left at Ithaca, where he gathered many particulars respecting Ulysses, which laid the foundation of the *Odyssey*. At length Mentes returned and took him on board again, but at Colophon he had the misfortune of losing his sight. He then became a strolling bard, and obtained the name of Homer, which signifies a blind man. It is further added, that being at Phocæa, a school-master, named Thestorides, offered to maintain him, provided he would suffer him to transcribe his verses, which he agreed to from necessity. The school-master then went to Chios, where he acquired great wealth by Homer's poems, while the poet himself could scarcely get bread by reciting them. Homer on this proceeded to Chios, and Thestorides, hearing of his arrival, fled before him. Here the poet opened a school of poetry, married, and had two daughters. He died about 907 years B. C. The only genuine works of his extant, are the *Iliad* and *Odyssey*. The *Batrachomyomachia*, or *Battle of the Frogs and Mice*, has been disputed, but many good critics deem it to be his. The Hymns which go under his name are questionable. Many other pieces are ascribed to him; viz. epigrams, the *Partiges*, the *Cecropes*, and the *Destruction of Oechalia*, of which only the names are remaining. Nothing can excel the clearness and majesty of Homer's style; the sublimity of his thoughts; the strength and sweetness of his verses. All his images are striking; his descriptions just and exact; the passions so well expressed, and nature so justly and finely painted, that he gives to every thing motion, life, and action. But he more particularly excels in invention, and in the different characters of his heroes, which are so varied, that they affect us in an inexpressible manner. In a word, the more he is read by a person of good taste, the more he is admired. Nor are his works to be esteemed merely as entertaining poems, or as the monuments of a sublime and varied genius. He was in general so accurate with respect to costume, that he seldom mentioned persons or things that we may not conclude to have been known during the time of which he writes; and it was Mr. Pope's opinion, that his account of people, princes, and countries, was purely historical, founded on the real transactions of those times, and by far the most valuable piece of history and geography left us concerning the state of Greece in that early period. His geographical divisions of that country were thought so exact, that we are told of many controversies concerning the boundaries of Grecian cities, which have been decided upon the authority of his poems. The best editions of Homer are, that of Barnes, Cam-

bridge, 2 vols. 4to. 1711; Clarke's, 4 vols.; that of Glasgow, 2 vols. folio, 1738; that of Oxford, 5 vols. 8vo. 1780; and what is called the Grenville edition, recently published from the same press. It is needless to enter into his character as a poet, as he was beyond a doubt the most exalted and universal genius the world has seen.

HOMER, OMER, CHOMER, or CORUS. See MEASURE and OMER.

HOMICIDE, in law, signifies in general the taking away of any person's life by another person. It is of three kinds; justifiable, excusable, and felonious.

I. HOMICIDE, EXCUSABLE, is of two sorts; either per infortunium, by misadventure; or se defendendo, upon a principle of self-preservation.

i. HOMICIDE PER INFORTUNIUM, or BY MISADVENTURE, is where a man, doing a lawful act, without any intention of hurt, unfortunately kills another: as where a man is at work with a hatchet, and the head thereof flies off and kills a stander-by; or, where a person, qualified to keep a gun, is shooting at a mark, and undesignedly kills a man: for the act is lawful, and the effect is merely accidental. So where a parent is moderately correcting his child, a master his apprentice or scholar, or an officer punishing a criminal, and happens to occasion his death, it is only misadventure; for the act of correction was lawful: but if he exceeds the bounds of moderation, either in the manner, the instrument, or the quantity of punishment, and death ensues, it is manslaughter at least, and in some cases (according to the circumstances) murder; for the act of immoderate correction is unlawful. To whip another's horse, whereby he runs over a child and kills him, is held to be accidental in the rider, for he has done nothing unlawful; but manslaughter in the person who whipped him, for the act was a trespass, and at best a piece of idleness, of inevitably dangerous consequence. And in general, if death ensues in consequence of an idle, dangerous, and unlawful sport, as shooting or casting stones in a town, or the barbarous diversion of cock-throwing; in these and similar cases, the slayer is guilty of manslaughter, and not misadventure only; for these are unlawful acts.

ii. HOMICIDE SE DEFENDENDO, or IN SELF-DEFENCE, upon a sudden affray, is also excusable rather than justifiable, by the English law. This species of self-defence must be distinguished from that just now mentioned, as calculated to hinder the perpetration of a capital crime; which is not only a matter of excuse, but of justification. But the self-defence which we are now speaking of, is that whereby a man may protect himself from an assault, or the like, in the course of a sudden brawl or quarrel, by killing him who assaults him. And this is what the law expresses by the word chance-medley, or (as some rather choose to write it) chand-medley; the former of which in its etymology signifies a casual affray, the latter an affray in the heat of blood or passion; both of them of pretty much the same import; but the former is in common speech too often erroneously applied to any manner of homicide by misadventure; whereas it appears by stat. 24 Hen. VIII. c. 5, and our ancient books, that it is properly applied to such killing as happens in self-defence upon a sudden rencontre. The right of natural defence does not imply a right of attacking; for, instead of attacking one another for injuries past or impending, men need only have recourse to the proper tribunals of justice. They cannot therefore legally exercise this right of preventative defence, but in sudden and violent cases; when certain and immediate suffering would be the consequence of waiting for the assistance of the law. Wherefore, to excuse homicide by the plea of self-defence, it must appear that the slayer had no other possible means of escaping from his assailant. In some cases this species of homicide (upon chance-medley in self-defence) differs but little from manslaughter, which also happens frequently upon chance-medley in the proper legal sense of the word. But the true criterion between them seems to be this: when both parties are actually combating at the time when the mortal stroke is given, the slayer is then guilty of manslaughter; but if the slayer hath not begun to fight, or (having begun) endeavours to decline any farther struggle, and afterwards being closely pressed by his antagonist, kills him to avoid his own destruction, this is homicide excusable by self-defence. For which reason the law requires, that the person, who kills another in his own defence, should have retreated as far as he conveniently or safely can, to avoid the vio-

lence of the assault before he turns upon his assailant; and that not fictitiously, or in order to watch his opportunity, but from a real and affectionate regard for preserving the life of his brother. And though it may be cowardice, in time of war between two independent nations, to flee from an enemy; yet, between two fellow-subjects, the law countenances no such point of honour: because the king and his courts are the vindices injuriarum, and will give to the party wronged all the satisfaction he deserves. In this the civil law also agrees, or perhaps goes rather farther; "*qui cum aliter tueri se non possunt, damni culpam dederint, innoxii sunt.*" The party assaulted must therefore flee as far as he conveniently can, either by reason of some wall, ditch, or other impediment; or as far as the fierceness of the assault will permit him; for it may be so fierce as not to allow him to yield a step, with manifest danger of his life, or enormous bodily harm; and then in his defence he may kill his assailant instantly. And, as the manner of the defence, so is also the time to be considered: for if the person assaulted does not fall upon the aggressor till the affray is over, or when he is running away, this is revenge and not defence. Neither, under the colour of self-defence, will the law permit a man to screen himself from the guilt of deliberate murder: for if two persons, A and B, agree to fight a duel, and A gives the first onset, and B retreats as far as he safely can, and then kills A, this is murder; because of the previous malice and concerted design. But if A upon a sudden quarrel assaults B first, and, upon B's returning the assault, A really and bona fide flies; and, being driven to the wall, turns again upon B and kills him; this may be *se defendendo*, according to some; though others have thought this opinion too favourable: inasmuch as the necessity, to which he is at last reduced, originally arose from his own fault. Under this excuse of self-defence, the principal civil and natural relations are comprehended: therefore, master and servant, parent and child, husband and wife, killing an assailant in the necessary defence of each other respectively, are excused; the act of the relation assisting being construed the same as the act of the party himself. There is one species of homicide *se defendendo*, where the party slain is equally innocent as he who occasions his death; and yet this homicide is also excusable from the great universal principle of self-preservation, which prompts every man to save his own life preferably to that of another, where one of them must inevitably perish. As, among others, in that case mentioned by Lord Bacon, where two persons, being shipwrecked, and getting on the same plank, but finding it not able to save them both, one of them thrusts the other from it, whereby he is drowned. He who thus preserves his own life, at the expence of another man's, is excusable through unavoidable necessity, and the principle of self-defence; since their both remaining on the same weak plank is a mutual, though innocent, attempt upon, and endangering of, each other's life. Let us next take a view of the circumstances wherein those two species of homicide, by misadventure and self-defence, agree; and those are in their blame and punishment. For the law sets so high a value upon the life of a man, that it always intends some misbehaviour in the person who takes it away, unless by the command or express permission of the law. In the case of misadventure, it presumes negligence, or at least a want of sufficient caution in him who was so unfortunate as to commit it; who therefore is not altogether faultless. And as to the necessity which excuses a man who kills another *se defendendo*, Lord Bacon entitles it *necessitas culpabilis*, and thereby distinguishes it from the former necessity of killing a thief or a malefactor. For the law intends that the quarrel or assault arose from some unknown wrong, or some provocation, either in word or deed: and since in quarrels both parties may be, and usually are, in some fault, and it scarce can be tried who was originally in the wrong: the law will not hold the survivor entirely guiltless. But it is clear, in the other case, that where I kill a thief who breaks into my house, the original default can never be upon my side. The law besides may have a farther view, to make the crime of homicide more odious, and to caution men how they venture to kill another upon their own private judgement; by ordaining, that he who slays his neighbour, without an express warrant from the law so to do, shall in no case be absolutely free from guilt. Nor is the law of England singular in this respect. Even the slaughter of enemies required a solemn purgation among the Jews; which implies, that the death of a man, however it happens, will leave

some stain behind it. And the Mosaical law appointed certain cities of refuge for him "who killed his neighbour unawares; as if a man goeth into the wood with his neighbour to hew wood, and his hand fetcheth a stroke with the ax to cut down a tree, and the head slippeth from the helve, and lighteth upon his neighbour that he die, he shall flee into one of those cities and live." But it seems he was not held wholly blameless, any more than in the English law; since the avenger of blood might slay him before he reached his asylum, or if he afterwards stirred out of it till the death of the high priest. In the imperial law likewise casual homicide was excused by the indulgence of the emperor signed with his own sign-manual *adnotatione principis*; otherwise, the death of a man, however committed, was in some degree punishable. Among the Greeks, homicide by misfortune was expiated by voluntary banishment for a year. In Saxony a fine is paid to the kindred of the slain; which also, among the western Goths, was little inferior to that of voluntary homicide; and in France, (under the old government,) no person was absolved in cases of this nature, without a largess to the poor, and the charge of certain masses for the soul of the party killed. The penalty inflicted by the English law is said by Sir Edward Coke to have been anciently no less than death; which, however, is with reason denied by later and more accurate writers. It seems rather to have consisted in a forfeiture, some say of all the goods and chattels, others of only a part of them, by way of fine or *weregild*: which was probably disposed of, as in France, in pious uses, according to the humane superstition of the times for the benefit of his soul who was thus suddenly sent to his account with all his imperfections on his head. But that reason having long ceased, and the penalty (especially if a total forfeiture) growing more severe than was intended, in proportion as personal property has become more considerable, the delinquent has now, and has had, as early as the English records will reach, a pardon and writ of restitution of his goods as a matter of course and right, only paying for suing out the same. And, indeed, to prevent this expence, in cases where the death has notoriously happened by misadventure or in self-defence, the judges usually permit (if not direct) a general verdict of acquittal.

II. HOMICIDE, FELONIOUS, is an act of a very different nature from the former, being the killing of a human creature, of any age or sex, without justification or excuse. This is either manslaughter or murder. Manslaughter is homicide against the life of another, either with or without malice; that which is without malice is called manslaughter, or sometimes chance-medley, by which is understood such killing as happens either on a sudden quarrel, or in the commission of an unlawful act, without any deliberate intention of doing any mischief at all. 3 Inst. 56. Hence it follows, that there can be no accessories to this offence before the fact, because it must be done without premeditation; but there may be accessories after the fact. Id. The only difference between murder and manslaughter, is, that murder is upon malice aforethought, and manslaughter upon a sudden occasion, as if two meet together, and striving for the wall the one kills the other, this is manslaughter and felony. And so it is if they had, on that sudden occasion, gone into the field and fought, and the one had killed the other, this had been but manslaughter and no murder, because all that followed was but a continuance of the first sudden occasion, and the blood was never cooled till the blow was given. 3 Inst. 55. Murder is the highest crime against the law of nature that a man is capable of committing. Murder is when a man of sound memory, and at the age of discretion, unlawfully kills another person under the king's peace with malice aforethought, either expressed by the party, or implied by the law, so as the party wounded or hurt die of the wound or hurt within a year and a day. 3 Inst. 47. And the whole day on which the hurt was done, shall be reckoned the first. 1 Haw. 79. By malice expressed, is meant a deliberate intention of doing any bodily harm to another, whereunto by law a person is not authorized. And the evidences of such malice must arise from external circumstances discovering that inward intention; as lying in wait, menacings antecedent, former grudges, deliberate compassings, and the like, which are various, according to the variety of circumstances. 1 H. H. 451. Malice implied, is where a person voluntarily kills another, without any provocation; for in this case the law presumes it to be malicious, and that he is a public enemy of mankind.

mankind. 1 H. H. 455. In general any formed design of doing mischief may be called malice; and therefore not such killing only as proceeds from premeditated hatred or revenge against the person killed, but also in many other cases, such as is accompanied with circumstances which shew the heart to be perversely wicked, is judged to be of malice prepense, or aforethought, and consequently murder. 2 Haw. 80. If a man kills another, it shall be intended *prima facie* that he did it maliciously, unless he makes the contrary appear, by shewing that he did it on a sudden provocation or the like. 1 Haw. 82. When the law makes use of the term malice aforethought, as descriptive of the crime of murder, it must not be understood in that narrow restrained sense, to which the modern use of the word malice is apt to lead one, a principle of malevolence to particulars; for the law by the term malice, in this instance, means, that the fact has been attended with such circumstances, as are the ordinary symptoms of a wicked heart, regardless of social duty, and fatally bent upon mischief. Fost. 256. The law so far abhors all duelling in cold blood, that not only the principal who actually kills the other, but also his seconds are guilty of murder, whether they fought or not; and it is holden that the seconds of the person killed are also equally guilty, in respect to that countenance which they give to their principals in the execution of their purpose, by accompanying them therein, and being ready to bear a part with them. 1 Haw. 82. Also it seems agreed, that no breach of a man's word or promise, no trespass either to land or goods, no affront by bare words or gestures, however false or malicious it may be, and aggravated with the most provoking circumstances, will excuse him from being guilty of murder who is so far transported thereby, as immediately to attack the person who offends, in such a manner as manifestly endangers his life, without giving him time to put himself upon his guard, if he kills him in pursuance of such assault, whether the person slain did at all fight in his defence or not. Id.

III. HOMICIDE, JUSTIFIABLE, is of different kinds. i. Such as is owing to some unavoidable necessity, without any will, intention, or desire, and without any inadvertence or negligence, in the party killing, and therefore without any shadow of blame; as, for instance, by virtue of such an office as obliges one, in the execution of public justice, to put a malefactor to death, who hath forfeited his life by the laws and verdict of his country. This is an act of necessity, and even of civil duty: and therefore not only justifiable, but commendable, where the law requires it. But the law must require it, otherwise it is not justifiable: therefore wantonly to kill the greatest of malefactors, a felon, or a traitor, attainted or outlawed, deliberately, uncompelled, and extrajudicially, is murder. And farther, if judgement of death be given by a judge not authorized by lawful commission, and execution is done accordingly, the judge is guilty of murder. Also such judgement, when legal, must be executed by the proper officer, or his appointed deputy; for no one else is required by law to do it, which requisition it is that justifies the homicide. If another person doth it of his own head, it is held to be murder: even though it be the judge himself. It must farther be executed, *servato juris ordine*; it must pursue the sentence of the court. If an officer beheads one who is adjudged to be hanged, or vice versa, it is murder: for he is merely ministerial, and therefore only justified when he acts under the authority and compulsion of the law. But, if a sheriff changes one kind of punishment for another, he then acts by his own authority, which extends not to the commission of homicide: and besides, this licence might occasion a very gross abuse of his power. The king indeed may remit part of a sentence, as in the case of treason, all but the beheading: but this is no change, no introduction of a new punishment; and in the case of felony, where the judgement is to be hanged, the king (it has been said) cannot legally order even a peer to be beheaded. Again: in some cases homicide is justifiable, rather by the permission, than by the absolute command, of the law: either for the advancement of public justice, which without such indemnification would never be carried on with proper vigour; or, in such instances where it is committed for the prevention of some atrocious crime, which cannot otherwise be avoided. ii. Homicides, committed for the advancement of public justice, are, 1. Where an officer, in the execution of his office, either in a civil or criminal case, kills a person that assaults and resists him. 2. If an officer, or any private person, attempts to take a man charged with

felony, and is resisted; and, in the endeavour to take him, kills him. 3. In case of a riot or rebellious assembly, the officers endeavouring to disperse the mob are justifiable in killing them, both at common law and by the riot-act, 1 Geo. I. c. 5. 4. Where the prisoners in a gaol, or going to a gaol, assault the gaoler or officer, and he in his defence kills any of them, it is justifiable, for the sake of preventing an escape. 5. If trespassers in forests, parks, chases, or warrens, will not surrender themselves to the keepers, they may be slain; by virtue of the statute 21 Edward I. stat. 2, de malefactoribus in pacis, and 3 & 4 W. & M. c. 10. But, in all these cases, there must be an apparent necessity on the officer's side; viz. that the party could not be arrested or apprehended, the riot could not be suppressed, the prisoners could not be kept in hold, the deer-stealers could not but escape, unless such homicide were committed: otherwise without such absolute necessity, it is not justifiable. iii. In the next place, such homicide as is committed for the prevention of any forcible and atrocious crime, is justifiable by the law of nature: and also by the law of England, as it stood so early as the time of Bracton, and as it is since declared by stat. 24 H. VIII. c. 5. If any person attempts a robbery or murder of another, or attempts to break open a house in the night-time (which extends also to an attempt to burn it), and shall be killed in such attempt, the slayer shall be acquitted and discharged. This reaches not to any crime unaccompanied with force, as picking of pockets; or to the breaking open of any house in the day-time, unless it carries with an attempt of robbery also. So the Jewish law, which punished no theft with death, makes homicide only justifiable in case of nocturnal house-breaking: "If a thief be found breaking up, and he be smitten that he die, no blood shall be shed for him; but if the sun be risen upon him, there shall be blood shed for him, for he should have made full restitution." At Athens, if any theft was committed during the night, it was lawful to kill the criminal, if taken in the fact; and, by the Roman law of the XII tables, a thief might be slain by night with impunity; or even by day, if he armed himself with any dangerous weapon: which amounts very nearly to the same as is permitted by our constitution. The Roman law also justifies homicide, when committed in defence of the chastity either of one's self or relation; and so also according to Selden, stood the law in the Jewish republic. The English law likewise justifies a woman killing one who attempts to ravish her: and so too the husband or father may be justified in killing a man, who attempts a rape upon his wife or daughter; but not if he takes them in adultery by consent; for the one is forcible and felonious, but not the other. And there is no doubt but the forcibly attempting a crime, of a still more detestable nature, may be equally resisted by the death of the unnatural aggressor. For the one uniform principle that runs through our own, and all other laws, seems to be this: that where a crime, in itself capital, is endeavoured to be committed by force, it is lawful to repel that force by the death of the party attempting. But we must not carry this doctrine to the same length that Mr. Locke does; who holds, "that all manner of force without right upon a man's person, puts him in a state of war with the aggressor; and, of consequence, that being in such a state of war, he may lawfully kill him that puts him under this unnatural restraint." However just this conclusion may be in a state of uncivilized nature, yet the law of England, like that of every other well regulated community, is too tender of the public peace, too careful of the life of the subject, to adopt so contentious a system; nor will it suffer with impunity any crime to be prevented by death, unless the same, if committed, would also be punished by death. In these instances of justifiable homicide, it may be observed, that the slayer is in no kind of fault whatsoever, not even in the minutest degree: and is therefore to be totally acquitted and discharged, with commendation rather than blame. But that is not quite the case in excusable homicide, the very name whereof imports some fault, some error, or omission; so trivial, however, that the law excuses it from the guilt of felony, though in strictness it judges it deserving of some little degree of punishment.

HOMILY, [from *homilia*, an assembly,] a sermon upon some point of religion, delivered in a plain manner, so as to be easily understood by the people. The Greek homily, says M. Fleury, signifies a familiar discourse, like the Latin sermo; and discourses delivered in the church were so named, to intimate, that they were not harangues or matters of ostentation and flourish, like those of

profane orators, but familiar and useful discourses, as of a master to his disciples, or a father to his children.

HOMINE REPLEGANDO, a writ for the bailing of a man out of prison, when he is confined without commandment of the king or his judges, or for any cause that is repleviable. But this writ is now seldom used; a writ of habeas corpus being sued out on the necessary occasions.

HOMIOC, a name given by mariners to a billock or small eminence of land, resembling the figure of a cone, and appearing on the sea-coast of any country.

HOMO, MAN, is ranked by Linnaeus under the class mammalia and order primates, or Chiefs; and characterised by having four parallel fore-teeth both in the upper and lower jaw, and two mammae on the breast. The only species is the

HOMO SAPIENS, or **SAPIENT MAN**, so named as being endowed with wisdom far superior to, or rather exclusive of, all other animals. See **MAN**. In the early editions of Linnaeus, the *Trogodytes* was added as a second species, but is now with much more propriety arranged under the genus *Simia*. See **SIMIA**. Mankind, though originally sprung from one pair, vary much from difference of climate, education and habits. Hence the following varieties are enumerated by Linnaeus; viz. wild men, Americans, Europeans, Asiatics, Africans, and Monsters.

1. **HOMINES AFRICI, AFRICANS**. "Of black complexion, phlegmatic temperament, and relaxed fibre." The hair is black and frizzly; the skin soft and silky; the nose flat; the lips are thick; and the female has long lax breasts. They are of crafty, indolent, and careless dispositions, and governed in their actions by caprice. Anoint the skin with grease.

2. **HOMINES AMERICANI, AMERICANS**. "Of copper-coloured complexion, choleric constitution, and remarkably erect." Their hair is black, lank, and coarse; their nostrils are wide; their features harsh, and the chin is scantily supplied with beard. Are obstinate in their tempers, free and satisfied with their condition; and are regulated in all their proceedings by traditional customs. Paint their skins with red streaks.

3. **HOMINES ASIATICI, ASIATICS**. "Of sooty complexion, melancholy temperament, and rigid fibre." Their hair is strong, black, and lank; the eyes are dark brown. They are of grave, haughty, and covetous manners; and are governed by opinions. Dress in loose garments.

4. **HOMINES EUROPEI, EUROPEANS**. "Of fair complexion, sanguine temperament, and brawny form." The hair is flowing, and of various shades of brown; the eyes are mostly blue. They are of gentle manners, acute in judgement, of quick invention, and governed by fixed laws. Dress in close vestments.

5. **HOMINES FERI, WILD MEN**. "Walk on all fours, are dumb, and covered with hair." 1. A youth found in Lithuania, in 1761, resembling a bear. 2. A youth found in Hesse, in 1544, resembling a wolf. 3. A youth in Ireland resembling a sheep. Tulp. Obs. iv. 9. 4. A youth in Bamberg resembling an ox. Camerarius. 5. A wild youth found in 1724, in Hanover. 6. Wild boys found in 1719 in the Pyrenees. 7. A wild girl found in 1717, in Overysel. 8. A wild girl found in 1731 in Champagne. 9. A wild lad found near Leyden. Boerhaave. These instances of wild men and their similitudes, (Mr. Kerr justly observes,) are partly to be attributed to imposture, and in part to exaggeration: most probably idiots who had strayed from their friends, and who resembled the above animals only imitating their voices."

6. **HOMINES MONSTROSI, MONSTERS**. Of these there are several varieties: the first and second of which, in the following list, are occasioned by peculiarity of climate, while the rest are produced by artificial management. 1. *Alpini*: the inhabitants of the northern mountains; they are small in stature, active, and timid in their dispositions. 2. *Patagonici*: the Patagonians of South America; of vast size, and indolent in their manners. 3. *Monorchides*: the Hottentots; having one testicle extirpated. 4. *Imberbes*: most of the American nations; who eradicate their beards and the hair from every part of the body except the scalp. 5. *Macrocephali*: the Chinese; who have their heads artificially forced into a conical form. 6. *Plagioccephali*: the Canadian Indians; who have the fore-part of their heads flattened when young by compression. See **MAN**.

HOMODROMUS VECTIS, or **LEVER**, in mechanics, is

a lever in which the weight and power are both on the same side of the fulcrum, as in the lever of the second and third kind; being so called, because here the weight and power move both in the same direction, whereas in the heterodromus they move in opposite directions.

HOMOGENEAL, or **HOMOGENEOUS**, [from *ὁμογ*; like, and *γεν*; kind,] a term applied to various subjects, to denote that they consist of parts of the same nature and kind; in contradistinction to **HETEROGENEOUS**, which see.

HOMOGENEOUS LIGHT, that whose rays are all of one colour and degree of refrangibility, without any mixture of others. See the article **COLOUR**.

HOMOGENEOUS SURDS, those which have the same radical character, or signs, as $2\sqrt{a}$, and $2\sqrt{b}$.

HOMOLOGATION, [from *ὁμολογία*, consent,] in the civil law, the act of confirming or rendering a thing more valid and solemn, by publication, repetition, or recognition thereof.

HOMOLOGOUS, [*ὁμολογος*,] in geometry, is applied to the corresponding sides and angles of similar figures, as being proportioned to each other. Thus, in two similar triangles ABC, DEF, (Plate XCV. fig. 12,) the sides AB and DE, BC and EF, and AC and DF, are homologous. And these triangles are to each other as the squares of their homologous sides. See **GEOMETRY**.

HOMOLOGOUS THINGS, in logic, those which agree in name, but are of different natures.

HOMONYMOUS, [*ὁμωνυμος*,] an appellation given to words which have two different significations, being the same with equivocal terms.

HOMOTONOUS, [*ὁμοτονος*,] equable: said of such distempers as keep a constant tenour of rise, state, and declension.

HONAN, a province of China, bounded on the N. by that of Petcheli and Chansi, on the W. by Chansi, on the S. by Hou-quang, and on the E. by Chantong. Every thing that can contribute to render a country delightful is found united in this province; the Chinese therefore call it Tong ho, or the middle flower: it is situated almost in the centre of China.

HONAN, a city of the above province, situated amidst mountains, and between three rivers, 360 miles S. W. of Pekin.

HONDA BAY, 1. A bay on the N. coast of Cuba. 2. A bay on the E. coast of Honduras, N. of Cape Gracias a Dios.

HONDURAS, a large province of North America, bounded on the N. by the Bay, on the E. by the Mosquito Shore, on the S. by Nicaragua, and on the W. by Chiapa and Guatemala. It is comprehended in the government of New Spain, although this province, and the peninsula of Yucatan, on the other side of the Bay of Honduras, can hardly be said to have formed a part of the ancient Mexican empire. Honduras and Yucatan do not, like the other territories of Spain in the New World, derive their value either from the fertility of their soil, or the richness of their mines; but they produce, in greater abundance than any part of America, the logwood-tree, which is become an article in commerce of great value.

HONDURAS BAY, a bay on the coast of Honduras, lying W. of the Caribbean Sea, between Cape Catoche, and Cape Honduras.

HONEY, [*honig*, Sax. *honig*, Dutch; *honey*, *honig*, Germ.] a sweet, fragrant, vegetable juice, collected by the bees from the flowers of various plants, and deposited in the cells of the comb. It has a white or yellowish colour, a soft and grained consistence, a saccharine and aromatic smell. By distillation it affords an acid phlegm and an oil, and its coal is light and spongy like that of the mucilage of plants. Nitric acid extracts from it oxalic acid precisely as it does from sugar; it is very soluble in water, with which it forms a syrup, and like sugar passes to the vinous fermentation, and yields a pleasant liquor called mead. Mr. Cavezzali has proved lately that honey is composed of sugar, mucilage, and an acid. The sugar may be separated by melting the honey, adding carbonate of lime in powder as long as any effervescence appears, and straining the solution while hot. The liquid thus treated gradually deposits crystals of sugar when allowed to remain in a glass-vessel. The honey produced by young bees, and which flows spontaneously, is purer than that expressed from the comb; whence it is called virgin-honey: the best sort is of a thick consistence, and of a whitish colour, inclining to yellow; it possesses an agreeable smell, and a pleasant taste. As an article of food, when

when immoderately used, honey is pernicious to weak stomachs; it ought, therefore, to be avoided by persons liable to eruptions of the skin, or in whom there is a redundancy of bile. This vegetable essence contains an acid, similar to that of sugar, but is more spirituous: hence it readily ferments, occasions flatulency, and in some habits produces gripes and looseness. As a medicine, however, it is a very useful aperient and expectorant, especially when it has been previously boiled; in which state it may be used with safety and advantage by asthmatic patients; for it tends to dissolve viscid humours, and to promote the expectoration of tough phlegm. Notwithstanding these salubrious properties of honey, it is apt to produce effects very detrimental to those plethoric, bilious, febrile, or cachectic, patients, who trust to it as a remedy in coughs, arising from, or connected with, pulmonary complaints. If a pound of honey be dissolved in three or four quarts of water, and exposed to a temperature between the seventieth and eightieth degrees of Fahrenheit's thermometer, it will in a short time become a very agreeable acid liquor, which possesses an aromatic flavour and strength superior to that of the best vinegar made of white wine. As the latter is frequently adulterated, and incomparably more expensive than the substitute we have proposed, this appears to deserve every attention in domestic æconomy. See ARIS, and BEE.

HONEY-COMB, a waxen structure, full of cells, framed by the bees, to deposit their honey and eggs in. See BEE and WAX. The construction of the honey-comb seems one of the most surprising parts of the works of insects, and the materials of which it is composed, which, though evidently collected from the flowers of plants, yet do not, that we know of, exist in them in that form, has given great cause of speculation to the curious. The regular structure of the comb is also equally wonderful. When the several cells in it are examined, it should seem that the nicest rules of geometry had been consulted for its composition, and all the advantages that could be wished, or desired, in a thing of that kind, are evidently found in it. Each cell consists of six plane sides, which are all trapeziums, but equal to each other: the bottom of the cell is contrived with three rhombuses HKDI, DEFI, and FGHI, Plate LXXXV. fig. 6, so disposed as to constitute a solid angle at I, under the three equal angles DIH, DIF, and HIF, each of which is double the maximum angle of $54^{\circ} 44' = DIK = DKI$. Hence it comes to pass, that a less quantity of surface is sufficient to contain a given quantity of honey, than if the bottom had been flat, in the proportion of 4658 to 5550, as has been found by calculation; that is, nearly a fifth of the whole, so far as the figure in the end of the cells extends, in each; which fifth part of wax and labour saved, amounts to a vast deal in the whole comb. And if these admirable insects knew their advantage, they could not more nicely observe the rules of modern geometry. Hence we may observe, that though the rules of discovering the maxima and minima of quantities by fluxions, is a part of knowledge which the mathematicians have but lately acquired, and which they esteem the sublimity of human science, yet this very thing was imparted to these insects at the creation. The method of making two sorts of cells in each comb, is also admirably contrived to save the expence of wax, since, had they been made single, every comb must have had its peculiar base, and every set of cells their bottom of wax, whereas one bottom now serves for two cells; and there is but one plate of wax in the centre of a double comb. This structure occasions a very great sparing of the wax, or matter of the comb: but besides this there is another great advantage resulting from this structure, which is, that the angles arising from the fore-mentioned combination of the bases, greatly strengthen the whole work. The sides of the cells are all much thinner than the finest paper, and yet they are so strengthened by their disposition, that they are able to resist all the motions of the bee within them, as they are frequently obliged to be. The effect of their thrusting their bodies into the cells, would be the bursting of those cells at the top, were not this well guarded against. But to prevent this, the creatures extend a cord, or roll of wax, round the verge of every cell, in such a manner that it is scarce possible they should split in that particular part. This cord or roll is at least three times as thick as the sides of the cell, and is even much thicker and stronger at the angles of the cells, than elsewhere, so that the aperture of each cell is not regularly hexagonal, though its inner cavity be perfectly so. See fig. 7. The several combs are all

placed parallel to one another, fig. 8, and there is such a space left between them, that the bees can easily pass: and often they place a part of the comb in a contrary direction to the rest, so that while the others are placed horizontally, these stand perpendicularly. The cells which have served, or are to serve, for the habitation of the worms of the common, and of the male bees, are often made also at other times the receptacles of honey; but though these are indifferently made to serve either use, there are others destined only to receive honey. The celerity with which a swarm of bees received into a hive, where they find themselves lodged to their minds, bring their works of the combs to perfection, is amazing. There are vast numbers at work all at once; and that they may not incommode one another, they do not work upon the first comb till it is finished, but when the foundation of that is laid, they go to work upon another, so that there are often the beginnings of three or four stories made at once, and so many swarms allotted to the carrying on the work of each. It would be a desirable thing to see the bees at work, in making these elegant and regular fabrics; but it is scarce possible to see any thing of this kind distinctly, even with the advantage of glass-hives; for, as Mr. Reaumur observes, no bee ever works singly upon this occasion, but wherever the fabric is erecting, there are numbers together trying to assist each other, and their motions are so swift, and so hid by their standing before one another, that very little is to be seen of them. New bees are every moment going to the place, and old ones going away; and very frequently those which arrive late are dispatched away immediately after they arrive: there are only some very short moments in which the glass of the hives can give a view of the creatures regularly employed at their work; for the moment one sees a bee at work in building, that moment we see one either fly off, or else another get before her, so as to hinder the view: however, it is plain that the bee uses her teeth, in modelling and fashioning the wax.

HONEY-COMB, in gunnery, is a flaw in the metal of a piece of ordnance, when it is ill cast and spongy.

HONEY-DEW, *SUFFUSIO MELLITA*, a sweet substance found on the leaves of oak, hazle-nut, hops, and other plants; and which has been erroneously supposed to fall from the sky. According to Dr. Darwin, the honey-dew is a saccharine juice that exudes from trees, in consequence of the retrograde motions of the cutaneous lymphatic vessels connected with the umbilical, or with the common sap-vessels of plants; instead of being carried forward to increase the growth of the present leaf-buds, or to accumulate nutriment for the buds, which are in an embryon state. This exudation is consequently very injurious to the trees which are subject to it; especially from its great sweetness, which attracts immense numbers of bees and ants: no method of preventing it has hitherto been discovered.

HONEY-FLOWER. See MELIANTHUS.

HONEY-SUCKLE. See LONICERA.

HONFLEUR, a considerable sea-port of France, in the department of Calvados and late province of Normandy, 110 miles N. W. of Paris. Lon. $0^{\circ} 14'$ E. Lat. $49^{\circ} 25'$ N.

HONITON, a borough of Devonshire, on the Otter, sixteen miles and a half E. of Exeter, and 156 W. S. W. of London.

HONORARY, [*honorarius*, Lat.] a term often applied to persons who bear some title, or office, merely for the name's sake, without performing any of its functions, or receiving any advantage from it; such as honorary counsellors, honorary fellows, &c. Honorary is also used for a lawyer's fee, or a salary given to public professors in any art or science.

HONORIACI, in antiquity, an order of soldiery in the eastern empire, who introduced the Goths, Vandals, Alani, Suevi, &c. into Spain.

HONOUR, [*honor*, Lat.] a mark of esteem or submission, expressed by words, actions, and exterior behaviour, by which we make known the respect we entertain for a person on account of his dignity or merit. The word is used in general for the esteem due to virtue, glory, and reputation. It is also used for virtue and probity themselves, and for an exactness in performing whatever we have promised; and in this last sense we use the term a man of honour. But honour is more particularly applied to two kinds of virtue; bravery in men, and chastity in women. Virtue and Honour were deified among the ancient Greeks and Romans, and had a joint temple consecrated to them at Rome: but afterwards

wards each of them had separate temples, which were so placed, that no one could enter the temple of Honour without passing through that of Virtue; by which the Romans were continually put in mind, that virtue is the only direct path to true glory.

HONOUR, in the beau monde, has a meaning materially different from the above, and which it is easier to illustrate than define. It is, however, subject to a system of rules, called the laws of honour, constructed by people of fashion, calculated to facilitate their intercourse with one another, and for no other purpose. Consequently nothing, however vicious, is considered as inconsistent with honour, but what tends to incommode its intercourse. Hence, as Mr. Paley states the matter, profaneness, neglect of public worship or private devotion, cruelty to servants, rigorous treatment of tenants or other dependants, want of charity to the poor, injuries done to tradesmen by insolvency or delay of payment, with numberless examples of the same kind, are accounted no breaches of honour; because a man is not a less agreeable companion for these vices, nor the worse to deal with in those concerns which are usually transacted between one gentleman and another. Again, the law of honour being constituted by men occupied in the pursuit of pleasure, and for the mutual convenience of such men, will be found, as might be expected from the character and design of the law-makers, to be, in most instances, favourable to the licentious indulgence of the natural passions. Thus it allows of fornication, adultery, drunkenness, prodigality, duelling, and revenge, in the extreme; and lays no stress upon the opposite virtues.

HONOUR, or RANK. The degrees of honour observed in Britain may be comprehended under nobles majores and nobiles minores. Those included under the first rank are, archbishops, dukes, marquises, earls, viscounts, barons, and bishops; which are all distinguished by the respective ornaments of their escutcheons; and those of the last are baronets, knights, esquires, and gentlemen. Some authors will have baronets to be last under the first rank, because their honour is hereditary, and by patent, like that of the nobility.

HONOUR is particularly applied in the English customs to the more noble kind of seignories or lordships, whereof other inferior lordships or manors hold or depend. As a manor consists of several tenements, services, customs, &c. so an honor contains divers manors, knights fees, &c. It was also formerly called *beneficium*, or royal fee, being always held of the king in capite.

HONOUR, EXTRAORDINARY INSTANCES OF. The Spanish historians relate a memorable instance of honour and regard to truth. A Spanish cavalier in a sudden quarrel slew a Moorish gentleman, and fled. His pursuers soon lost sight of him, for he had unperceived leaped over a garden-wall. The owner, a Moor, happening to be in his garden, was addressed by the Spaniard on his knees, who acquainted him with his case, and implored concealment. "Eat this," said the Moor (giving him half a peach), "you now know that you may confide in my protection." He then locked him up in his garden telling him as soon as it was night he would provide for his escape to a place of greater safety. The Moor then went into his house, where he had but just seated himself, when a great crowd, with loud lamentations, came to his gate, bringing the corpse of his son, who had just been killed by a Spaniard. When the first shock of surprise was a little over, he learned from the description given, that the fatal deed was done by the very person then in his power. He mentioned this to no one; but, as soon as it was dark, retired to his garden, as if to grieve alone, giving orders that none should follow him. Then accosting the Spaniard, he said, "Christian, the person you have killed is my son, his body is now in my house. You ought to suffer; but you have eaten with me, and I have given you my faith, which must not be broken. He then led the astonished Spaniard to his stables, mounted him on one of his fleetest horses, and said, "fly far while the night can cover you; you will be safe in the morning. You are indeed guilty of my son's blood: but God is just and good: and I thank him I am innocent of yours, and that my faith given is preserved." This point of honour is most religiously observed by the Arabs and Saracens, from whom it was adopted by the Moors of Africa, and by them was brought into Spain. The following instance of Spanish honour may still be in the memory of many living, and deserves to be handed down to the latest posterity. In 1746, when Britain was at war with Spain,

the Elizabeth of London, Captain William Edwards, coming through the Gulph from Jamaica, richly laden, met with a most violent storm, in which the ship sprung a leak, that obliged them to run into the Havannah, a Spanish port, to save their lives. The captain went on shore, and directly waited on the governor, told the occasion of his putting in, and that he surrendered the ship as a prize, and himself and his men as prisoners of war, only requesting good quarter. "No, Sir," replied the Spanish governor, "if we had taken you in fair war at sea, or approaching our coast with hostile intentions, your ship would then have been a prize, and your people prisoners; but when, distressed by a tempest, you come into our ports for the safety of your lives, we, the enemies, being men, are bound as such by the laws of humanity to afford relief to distressed men who ask it of us. We cannot, even against our enemies, take advantage of an act of God. You have leave, therefore, to unload your ship, if that be necessary, and to stop the leak; you may refit her here, and traffic so far as shall be necessary to pay the charges; you may then depart, and I will give you a pass to be in force till you are beyond Bermuda: if after that you are taken, you will then be a lawful prize: but now you are only a stranger, and have a stranger's right to safety and protection." The ship accordingly departed, and arrived safe in London.

HONOUR, MAIDS OF, are young ladies in the queen's household, whose office is to attend the queen when she goes abroad, &c.

HONOUR-POINT, in heraldry, is that next above the centre of the escutcheon, dividing the upper part into two equal portions.

HONOUR, COURTS OF. There is a court of honour of Earl Marshal of England, &c. which determines disputes concerning precedence and points of honour.

HONOURS, MILITARY. All armies salute crowned heads in the most respectful manner, colours and standards dropping, and officers saluting. Different ranks of officers are saluted in a different mode.

HONOURS OF WAR, in a siege, is, when a governor, having made a long and vigorous defence, is at last obliged to surrender the place to the enemy for want of men and provisions, and makes it one of his principal articles to march out with the honours of war; that is, with shouldered arms, drums beating, colours flying, and all their baggage, &c.

HOOD, ROBERT, or ROBIN, a famous outlaw and deer-stealer, who chiefly harboured in Sherwood Forest in Nottinghamshire. He was a man of family, which by his pedigree appears to have had some title to the earldom of Huntingdon; and played his pranks about the end of the twelfth century. He was famous for archery, and for his treatment of all travellers who came in his way; levying contributions on the rich, and relieving the poor. Falling sick at last, and requiring to be blooded, he is said to have been betrayed, and bled to death. He died in 1247; and was buried at Kirkstall in Yorkshire, then a Benedictine monastery, where his gravestone is still shewn.

HOOD, in falconry, a piece of leather to cover the head of the hawk.

HOOD'S ISLAND, one of the Marquesas Islands, in the South Sea, discovered in April 1774, by Captain Cook. Lon. 138. 52. W. Lat. 9. 26. S.

HOOF, UNGULA, the horny substance that covers the feet of divers animals, as oxen, horses, sheep, &c. See **HORN**.

HOOGLY, the western arm of the Ganges, formed by the union of its two westernmost branches, the Cossimbuzar and Yellingly. It is the port of Calcutta, and the only branch of the Ganges that is commonly navigated by ships.

HOOGLY, an ancient city of Hindoostan in Bengal. It is seated on the Hoogly, twenty-six miles N. of Calcutta. Lon. 88. 28. E. Lat. 32. 30. N.

HOOGSTRATTEN, a town of Batavia, in the department of Dommel and Scheldt, and late province of Dutch Brabant, 10 miles S. of Breda.

HOOKS OF A SHIP, all those forked timbers which are placed directly upon the keel, as well in her run as in her rake. Can-hooks are those which being made fast to the end of a rope with a noose (like that which brewers used to sling or carry their barrels on), are made use of for slings. Foot-hooks are the same with futtocks. Loof-hooks are a tackle for two hooks; one to hitch into a cringle of the main or fore-sail, in the bolt-rope at the

leech.

leech of the sail by the clew; and the other is to hitch into a strap, which is spliced into the chess-tree. Their use is to pull down the sail, and succour the tackles in a large sail and stiff gale, that all the stress may not bear upon the tack. It is also used when the tack is to be seized more secure, and to take off or put on a bonnet or drabber.

HOOKE, among the Arabs and other nations of the East, is a pipe of a singular and complicated construction, through which tobacco is smoked. Out of a small vessel of a bell or globular form, and nearly full of water, issue two tubes, one perpendicularly, on which is placed the tobacco; the other obliquely from the side of the vessel, and to that the person who smokes applies his mouth; the smoke by this means being drawn through water, is cooled in its passage, and rendered more grateful: one takes a whiff, draws up a large quantity of smoke, puffs it out of his nose and mouth in an immense cloud, and passes the hookah to his neighbour; and thus it goes round the whole circle. The hookah is known and used throughout the East; but in those parts of it where the refinements of life prevail greatly, every one has his own hookah; and it is frequently an implement of a very costly nature, being of silver, and set with precious stones: in the better kind, that part which is applied to the mouth is very long and pliant; and for that reason is termed the snake: people who use it in a luxurious manner fill the vessel through which the smoke is drawn with rose-water, and it thereby receives some of the fragrant quality of that fluid. See Plate LXXXV. fig. 10.

HOOKE, ROBERT, a very eminent English mathematician and philosopher, was the son of Mr. John Hooke, minister of Freshwater, in the Isle of Wight, where he was born in 1635. He very early discovered a genius for mechanics, by making curious toys with great art and dexterity. He was educated under Dr. Busby in Westminster school, where he acquired Greek and Latin, with Hebrew, and some other oriental languages, and made himself master of a great part of Euclid's Elements. About 1653 he went to Christ-church in Oxford, and in 1655 was introduced to the Philosophical Society there; who first employed him to assist Dr. Willis in his operations in chemistry, and afterwards recommended to the honourable Robert Boyle, whom he served several years in the same capacity. He was also instructed in astronomy about this time by Dr. Seth Ward, and henceforward distinguished himself by many mechanical inventions and improvements. He invented several astronomical instruments for making observations both at sea and land; and was particularly serviceable to Mr. Boyle in completing the invention of the air-pump. Sir John Cutler having founded a mechanic-school in 1664, he settled an annual stipend on Mr. Hooke for life, intrusting the president, council, and fellows, of the Royal Society, to direct him with respect to the number and subject of his lectures; and on the 11th Jan. 1664-5, he was elected by that society curator of experiments for life, with an additional salary. In 1666 he produced to the Royal Society a model for rebuilding the city of London, after the dreadful fire, with which the society was well pleased; and the lord mayor and aldermen preferred it to that of the city-surveyor, though it happened not to be carried into execution. The rebuilding of the city, according to the act of parliament, requiring an able person to set out the ground to the proprietors, Mr. Hooke was appointed one of the surveyors; in which employment he got most part of his estate, as appeared from a large iron chest of money found after his death, locked down with a key in it, and a date of the time, which shewed it to have been shut up above thirty years. Mr. Oldenburgh, secretary to the Royal Society, dying in 1667, Mr. Hooke was appointed to supply his place, and began to take minutes at the meeting in October, but did not publish the transactions. In the beginning of 1687, his brother's daughter, Mrs. Grace Hooke, who had lived with him several years, died, and he was so affected with grief at her death, that he hardly ever recovered it, but from that time became less active, more melancholy, and more cynical than ever. At the same time, a chancery-suit in which he was concerned with Sir John Cutler, on account of his salary for reading the Cutleian lectures, made him very uneasy, and increased his disorder. In 1691 he was created M. D. by archbishop Tillotson. In July, 1696, the chancery-suit with Sir John Cutler was determined in his favour, to his inexpressible satisfaction. His joy on that occasion was found in his diary thus expressed: D. O. M. S. H. L. G. I. S. S. A.

that is, Deo Optimo Maximo sit honor, laus, gloria, in secula seculorum, Amen. "I was born on this day of July, 1635, and God hath given me a new breath: may I never forget his mercies to me! while he gives me birth may I praise him!" As to his person, he was short of stature, very crooked, pale, lean, and of a meagre aspect, with dark brown hair, very long, and hanging over his face uncut and lank. His temper was penurious, melancholy, and mistrustful, but in his religious character he was exemplary. He always expressed a great veneration for the Deity; and seldom received any remarkable benefit in life, or made any considerable discovery in nature, without setting down his acknowledgment to God, as many places in his diary shew. He frequently studied the sacred writings in the original languages. He wrote, 1. *Lectiones Cutlerianae*. 2. *Micrographia*, or Descriptions of minute Bodies made by Magnifying Glasses. 3. *A Description of Helioscopes*. 4. *A Description of some Mechanical Improvements of Lamps and Water-Pipes*, &c. 5. *Philosophical Collections*. After his death were published, 6. *Posthumous work collected from his papers by Richard Waller, secretary to the Royal Society*. He also made a great number of discoveries and improvements in mathematics, the merits of which have been since claimed by others, particularly respecting the barometer; the double-barrelled air-pump; the engine for cutting clock and water-wheels; the chief phenomena of capillary attraction; the method of supplying the air to a diving-bell: the measurement of a degree of the meridian by a zenith-sector; the steam-engine; the quadrant by reflection; the marine barometer; the gauge for sounding unfathomable depth; the air being the sole source of heat in burning; the wheel-barometer; the universal joint; the manometer; the screw-divided quadrant; telescopic sights for astronomical instruments, &c. &c. And in 1684 he read a paper before the society, in which he affirms that some years before he had proposed a method of discoursing at distance, not by a sound but by sight. He then proceeds to describe a very complete telegraph, equal to those now in use: whence it appears that he had discovered this instrument before M. Amontons.

HOOKE, JOHN, alias VOWELL, was born Exeter, about 1524, the second son of Robert Hooker, who, in 1549, was mayor of that city. He travelled to Germany, where he kept exercises in law, and probably graduated. Thence he went to Strasburg, where he studied divinity under the famous Peter Martyr. He now returned to England, and soon after visited France, intending to proceed to Spain and Italy; but was prevented by a declaration of war. Returning, therefore, again to England, he fixed his residence in his native city, where, having married, he was in 1554 elected chamberlain, being the first person who held that office, and in 1571 represented his fellow-citizens in parliament. He died in 1601, and was buried in the cathedral at Exeter. He wrote, among other works, 1. *Order and Usage of keeping Parliaments in Ireland*. 2. *The Events of Comets or Blazing Stars*, made upon the Sight of the Comet Pagonia, which appeared in November and December 1577. 3. *An Addition to the Chronicles of Ireland*, from 1346 to 1568, in the second volume of Hollinshed's Chronicle. 4. *A Description of the City of Exeter*, and of the Sondrie Assaults given to the same; Hollinshed's Chronicle, vol. iii. 5. *A Book of Ensigns*. 6. *Translation of the History of the Conquest of Ireland*, from the Latin of Geraldus Cambrensis; in Hollinshed's Chronicle, vol. ii. 7. *Synopsis Chrographica*, or an Historical Record of the Province of Devon; never printed.

HOOKE, RICHARD, a learned divine, nephew to the preceding, born at Heavytree, near Exeter, in 1553. By his uncle he was first supported at the University of Oxford, with the addition of a small pension from Dr. Jewel, bishop of Salisbury, who in 1561 got him admitted one of the clerks of Corpus Christi college. In 1573 he was elected scholar. In 1577 he took the degree of M. A. and was admitted fellow. In July, 1579, he was appointed deputy-professor of the Hebrew language. In 1581 he took orders; and, being appointed to preach at St. Paul's Cross, he came to London, where he was unfortunately drawn into a marriage with Joan Churchman, the termagant daughter of his hostess. Having thus lost his fellowship, he continued in the utmost distress till 1584, when he was presented by John Cheney, Esq. to the rectory of Drayton-Beauchamp, in Buckinghamshire. In this retirement he was visited by Mr. Edwin Sandys, and Mr. George Croomer, his

his former pupils. They found him, with a Horace in his hand, tending some sheep in the common, his servant having been ordered home by his sweet Xantippe. They attended him to his house; but were soon deprived of his company by an order from his wife Joan, for him to come and rock the cradle. Mr. Sandy's representation to his father, of his tutor's situation, procured him the mastership of the Temple. In 1591 he obtained the rectory of Boscomb, in Wiltshire, together with a prebend in the church of Salisbury, of which he was also made sub-dean. In 1594 he was presented to the rectory of Bishopsbourne, in Kent, where he died in 1600. He was buried in his parish-church, and a monument erected to his memory by William Cooper, Esq. He was a meek, pious, and learned divine. He wrote, 1. *Ecclesiastic Politie*, in eight books, folio. 2. *A Discourse of Justification*, &c. with two sermons, Oxford, 1612, 4to. 3. Several other sermons printed with the *Ecclesiastical Politie*.

HOOKE, in naval architecture, a vessel much used by the Dutch, built like a pink, but rigged and masted like a hoy. Hookers will lie nearer a wind than vessels with cross-sails can do. They are from fifty to two hundred tons burthen, and with a few hands will sail to the East Indies.

HOOK-PINS, in architecture, are taper iron-pins, only with hook-leads, to pin the frame of a roof or floor together.

HOOLY ONORE, a town of Hindostan, in Mysore, at the conflux of the Tum and the Boodra, 56 miles N. W. of Seringapatam.

HOOPING-COUGH, a convulsive cough, so called from its noise; the chinchoy. See *MEDICINE*.

HOORINGOTA, a river of Hindostan, one of the mouths of the Ganges. It runs into the Bay of Bengal.

HOORN, a sea-port town of Batavia, in the department of the Texel, and late province of West Friesland, 11 miles from Alcmear, and 13 N. E. of Amsterdam. Lon. 4. 59. E. Lat. 52. 38. N.

HOORN, a late county of Liege, now in the department of the Lower Meuse.

HOORNBECK, JOHN, professor of divinity in the universities of Leyden and Utrecht, was born at Haerlem in 1617. He understood the Latin, Hebrew, Chaldaic, Syriac, Rabbinical, Dutch, German, English, French, and Italian languages, and published many works; among which are, 1. *A Relation of Socinianism*, 3 vols. 4to. 2. *A Treatise for the Conviction of the Jews*. 3. *Of the Conversion of the Heathens*. 4. *Institutiones Theologicae*, &c. Mr. Bayle represents him as a complete model of a good pastor and divinity professor.

HOP, in botany. See *HUMULUS*. This is an indigenous plant, growing in hedges, and flowering in June. Hops delight in a good rich loam, with a deep sub-soil or stratum of a loamy brick-earth, in a southern or western exposure; though they grow in almost any ground that is not wet. They are chiefly cultivated in the southern counties of England, and are propagated either by nursery-plants or by cuttings. These are set in hills, formed by digging holes in the spring, which are filled with fine mould, and the number of which varies from 800 to 1000, or 1200 per acre. One, two, or three plants are put in each hill; but, if hops are designed to be raised from cuttings, four or five of these, from three to four inches in length, are planted and covered one inch deep with fine mould. At the end of the first year, it becomes necessary to put poles into the hills, round which the bines reared from plants are wound: at the expiration of the second year, full-sized poles from 15 to 20 feet are set (though the hop-bines will run to the height of 50 feet), in the proportion of two poles to each hill, and a similar number of hop-plants are fastened loosely round each pole, by means of withered rushes. Hops begin to blow towards the middle of June, and about the end of August they are generally fit to be gathered. The most proper time of collecting them is, when the leaf rubs easily off the bine, when the hops have a strong scent, and the seed assumes a brownish colour. The culture of hops, though profitable when it succeeds, is very precarious: as soon as the plant appears above ground, it is attacked by an insect somewhat similar to the turnip-fly, which devours the young heads. Hop-gardens, situated on chalky soils, are peculiarly subject to its depredations; and the best remedy is to manure the soil highly with malt-culm, which adheres so strongly to the insects, as to prevent them from creep-

ing over the plant. In the months of June and July, the hops are liable to be blown by a species, of aphid, or fly, that poisons the leaf, by voiding its excrement; which is particularly injurious during hot, cloudy, and moist weather. This insect, however, does not endanger the growth of the plant, unless it be in a weak state, in consequence of the depredations committed on its root by the larva of the ottermoth, or *Phalana Humuli*, of Linnaeus. For the expulsion of these vermin, Dr. Withering recommends to cover hop-gardens with stones or flags; because, when hops grow wild in stony places, where the moth cannot penetrate to deposit its eggs, they are never affected with the honey-dew. There are two other distempers incident to hops, namely, the Fen and the Smitt, for which no effectual remedy has hitherto been discovered. Hops may, however, when gathered, be perfectly secured from the future depredations of insects, by putting a small quantity of brimstone in the fire, while they are drying in the kiln, by which means the vermin is not only destroyed, but the superfluous moisture is more speedily evaporated, and the hops acquire a brighter colour. The hop is a most valuable plant: in its wild state it is relished by cows, horses, goats, sheep, and swine. When cultivated, its young tops are eaten, early in the spring, as substitutes for asparagus, being wholesome and aperient; they are sold under the name of Hop-tops. The principal use of hops, however, is in brewing, for the preservation of malt-liquors, which are thus rendered more salubrious, and less liable to become sour. Hence vast quantities are consumed in Britain. See *BREWING*. A decoction of hops diluted with water, and given to cattle in very severe weather, is said to be of great service, and remarkably to improve their strength. In Sweden, the stalks of hops are successfully converted into strong cloth; for which purpose they are gathered in autumn, soaked in water during the winter; and in the succeeding spring, after being dried in stoves, they are dressed like flax. This object has been attempted in Britain, and from an experiment made, in consequence of the premium offered by the patriotic Society for the Encouragement of Arts, &c. it appears that hop-bines afford a material for spinning yarn, which may be woven into fine sacking, as well as coarse bags for hops. The bines are also employed for binding the sheaves of corn; and they have lately been converted into strong paper. From the leaves and flowery stalks of this plant, when dried, Dambourney dyed wool of a fine cinnamon brown, having previously dipped it in a diluted solution of bismuth. Berthollet remarks, that the expressed juice of hop-bines affords a very permanent red-brown colour. In medicine, decoctions and syrups of hop-flowers are said to be attended with much benefit in pestilential fevers: a pillow filled with them, and laid beneath the head, has been found to procure sleep to patients afflicted with delirious fevers. The heads and tendrils are likewise of considerable service in the scurvy, and other cutaneous affections. Hops are first mentioned in the English statute-book in the year 1552, viz. in the 5th and 6th Edw. VI. cap. 5, and by an act of parliament of the first year of King James I. anno 1603, cap. 18, it appears that hops were then produced in abundance in England. By several statutes, regulations are made for the curing &c. of hops, these regulations are under the inspection of the officers of the excise.

HOPE, in ethics, is the desire of some good, attended with a belief of the possibility, at least, of obtaining it, and enlivened with joy, greater or less, according to the greater or less probability of our possessing the object of our hope. Alexander, preparing for his Asiatic expedition, distributed his hereditary dominions among his friends; allotting to some villages, to others boroughs, to others cities; and being asked what he had reserved for himself, replied, Hope.

HOPE, GOOD, CAPE OF. See *GOOD HOPE*.

HOPE ISLANDS, two small islands on the N. E. coast of New Holland. Lat. 15. 41. S.

HOPEA, in botany, so named in honour of Dr. Hope, professor of botany at Edinburgh, a genus of the polyadelphia polyandria class and order. Calyx five-cleft, superior; corolla five-petaled; stamens many, connected in five bodies; style one; drupe with a three-celled nut. The only species, is *H. tinctoria*, a native of Carolina.

HOPLITE, or **HOPLITES**, [from ἔπλον armour,] in antiquity, were such of the candidates at the Olympic and other sacred games as ran races in armour.

HOPLITODROMOS,

HOPLITODROMOS, [from *ὅπλον*, armour, and *τρέμα*, I run,] in the ancient gymnastic sports, a term applied to such persons as went through those toilsome and robust exercises in complete armour; by which the exercise became much more violent, and the wearing of armour in the time of battle much more easy.

HOPLOMACHI, [*ὀπλομαχοί*, of *ὅπλον*, and *μαχόμεαι*, I fight,] in antiquity, a species of gladiators who fought in armour; either completely armed from head to foot, or only with a casque and cuirass.

HOPPER, [so called because it is always in agitation,] the box or open frame of wood into which the corn is put to be ground. It also signifies a basket for carrying seed. *Ainsworth*.

HOR, a mountain, or mountainous tract of Arabia Petraea, situated in that circuit which the Israelites took to the S. and S. E. of Edom in their way to the borders of Moab.

HORADNIC, a town of Red Russia.

HORE, *The Hours*, [*ὥραι*,] in ancient mythology, were esteemed goddesses, the daughters of Jupiter and Themis. The poets represent them as dressed in fine coloured or embroidered robes, and gliding on with a quick and easy motion.

HORÆA, in antiquity, solemn sacrifices, consisting of fruits, &c. offered in spring, summer, autumn, and winter; that heaven might grant mild and temperate weather. These, according to Meursius, were offered to the goddesses called *Horæ*.

HORARY CIRCLES, or **LINES**. See **DIALING**.

HORARY MOTION OF THE EARTH, the arch it describes in the space of an hour, which is $2^{\circ} 27' 50''$, 7 at a medium; though not always so, as the earth moves with different velocities, according to its greater or less distance from the sun. See **ASTRONOMY**.

HORATII, three Roman brothers, who, in the reign of Tullus Hostilius, fought against the three Curiatii, who belonged to the army of the Albans. The two armies being equal, three brothers on each side were chosen to decide the contest of superiority. Two of the Horatii were first killed; but the third, by his address, successively slew the three Curiatii, and by this victory rendered the city of Alba subject to the Romans. See **ROME**.

HORATIUS FLACCUS, *QUINTUS*, the most excellent of the Latin poets of the lyric and satirical kind, and the most judicious critic in the reign of Augustus, was the grandson of a freed man, and was born at Venusium 64 B. C. He embraced the party of Brutus and Cassius, but left his shield at the battle of Philippi. Some time after, he gave himself up entirely to the study of poetry. His talents soon made him known to Augustus and Mæcenas, who had a particular esteem for him, and loaded him with favours. Horace also contracted a strict friendship with Agrippa, Pollio, Virgil, and all the other great men of his time. He lived without ambition, and led a tranquil and agreeable life with his friends; but was subject to a defluxion in his eyes. He died at the age of 57. There are still extant his Odes, Epistles, Satires, and Art of Poetry; of which there have been a great number of editions. The best are those of the Louvre, in 1642, folio; of Paris, 1691, quarto; of Cambridge, 1699; that with Bentley's emendations, printed at Cambridge in 1711: Fowlis' immaculate edit. Glasgow, 1744: and the edition printed at St. Andrews, in 1796, under the care of the learned Dr. Hunter, who, in correcting it, compared the text with those of above 40 other copies; and in which no errors have yet been discovered.

HORDE, or **HORD**, is used for a wandering people, who have no settled habitation, but stroll about, dwelling in waggons or under tents, to be ready to shift as soon as the herbage, fruit, &c. of the province they are in, is eaten bare: such are several tribes of the Tartars, particularly those who inhabit beyond the Wolga, in Astracan and Bulgaria.

HORDEUM, *BARLEY*: in botany, a genus of the digynia order, and triandra class of plants; natural order, Gramina. Calyx lateral, two-valved, one-flowered, by threes, at each toothlet of the rachis. There are nine species.

HORDICALIA, or **HORDICIDIA**, in antiquity, a religious feast held among the Romans, wherein they sacrificed cattle big with young.

HOREB, or **OREB**, a mountain of Arabia Petraea, contiguous to and on the S. side of mount Sinai; the scene of many miraculous appearances.

HOREHOUND. See **MARRUBIUM**.

HORESTI, an ancient nation of North Britain, beyond Solway Frith, mentioned by Tacitus.

HORITES, an ancient people, who at first dwelt in the mountains of Seir beyond Jordan. (Gen. xiv. 6.) They had princes, and were powerful, even before Esau made a conquest of their country. (Id. xxxvi. 20—30.) The Horites, the descendants of Seir, and the Edomites, seem afterwards to have been confounded, and to have composed but one people. (Deut. ii. 2. xxxiii. 2. and Judg. v. 4.) They dwelt in Arabia Petraea, and Arabia Deserta, to the S. E. of the promised land. We find the Hebrew word *חורי* Chorim, which in the book of Genesis is translated Horites, used in an appellative sense in several other passages of scripture, and to signify nobles, or great and powerful men (1 Kings xxi. 8, 11. and Neh. ii. 16. iv. 14. v. 7. vi. 17. vii. 5. xii. 17. Eccl. x. 17. Isa. xxxiv. 12. Jer. xxvii. 29. xxxix. 6.); and it is very probable, that the Greeks derived from hence their *Herotes* in like manner as they derived *Anax*, a king, from the sons of *Anak*, the famous giant.

HORIZON, [*ὁρίζων*, Gr.] in geography and astronomy, is a great circle of the sphere, dividing the world into two parts or hemispheres; the one upper and visible, the other lower and hid. The word literally signifies bounding the sight; being formed of *ὁρίζω*, I bound. See **ASTRONOMY** and **GEOGRAPHY**.

HORIZON, **RATIONAL**, **TRUE**, or **ASTRONOMICAL**, also called simply and absolutely the horizon, is a great circle, whose plane passes through the centre of the earth, and whose poles are the zenith and nadir. It is divided into 32 equal parts called points of the compass.

HORIZON, **SENSIBLE**, **VISIBLE**, or **APPARENT**, is a less circle of the sphere, which divides the visible part of the sphere from the invisible. Its poles, too, are the zenith and nadir: and consequently the sensible horizon is parallel to the rational; and it is cut at right angles, and into two equal parts, by the verticals. The sensible horizon is divided into eastern and western.

i. **HORIZON**, **EASTERN**, or **ORTIVE**, is that part of the horizon wherein the heavenly bodies rise.

ii. **HORIZON**, **WESTERN**, or **OCCIDUAL**, is that wherein the stars set. The altitude, or elevation, of any point of the sphere, is an arch of a vertical circle intercepted between it and the sensible horizon.

HORIZON, **SENSIBLE**, or **PHYSICAL**, is also frequently used for a circle, which determines the segment of the surface of the earth, over which the eye can reach. In this sense we say, a spacious horizon, a narrow scanty horizon.

HORIZONTAL, is applied to any thing that relates to the horizon, or is taken in the horizon.

HORIZONTAL DIAL, is that drawn on a plane parallel to the horizon: having its gnomon, or style, elevated according to the altitude of the pole of the place it is designed for. Horizontal dials are, of all others, the most simple and easy. See **DIALING**.

HORIZONTAL LINE, in perspective, is a right line drawn through the centre of the picture, parallel to the horizon. See **PERSPECTIVE**.

HORIZONTAL PLANE, is that which is parallel to the horizon of the place, or nothing inclined thereto. The business of levelling is to find whether two points be in the horizontal plane; or how much the deviation is. See **LEVELLING**.

HORIZONTAL PLANE, in perspective, is a plane parallel to the horizon, passing through the eye, and cutting the picture at right angles.

HORIZONTAL RANGE, or **LEVEL RANGE**, of a piece of ordnance, is the line it describes, when directed parallel to the horizon or horizontal line. See **PROJECTILES**.

HORN, [*houn*, Gothic; *horn*, Saxon; *horn*, Dutch,] a hard substance growing on the heads of various animals, particularly on cloven-footed quadrupeds. The oil extracted from horn by repeated distillations, becomes extremely subtle and volatile; in which state it is called oil of Dippel, being the name of its inventor. The horns of stags yield the greatest proportion of rectified animal oil, as they contain a larger quantity of that species of earth which is found in bones, than those of any other animals. Horns form a considerable article in the arts and manufactures. Those of bullocks, when softened by heat, are converted into lanterns, combs, knives, inkhorns, &c. After the horn is roasted over a fire made of the stalks of furze, so as to render it sufficiently

sufficiently soft, it is slit on one side, and spread out between a pair of flat tongs, large enough to keep it expanded a second time over the fire, and reduce it to a flat state; it is then put into a press between iron-plates which are heated and greased. Here the horns are suffered to remain till they are gradually cooled; next they are soaked in water, till soft enough to be pared down to a proper thinness, with a large knife worked horizontally on a block. Thus, they acquire their transparency; and, after being immersed in urine, they are polished, by rubbing them with whiting and the coal of burnt willow.

HORN is also a musical instrument of the wind kind, chiefly used in hunting to animate the hunters and the dogs, and to call the latter together. The French horn is bent into a circle, and goes two or three times round, growing gradually bigger and wider towards the end, which in some horns is nine or ten inches over.

HORNS OF INSECTS, the slender oblong bodies projected from the heads of those animals, and otherwise called antennæ, or feelers. The horns of insects are extremely various; some being forked, others plumose or feathered, cylindrical, tapering, articulated, &c.

HORN ORE, in mineralogy, one of the species of silver ore; its most frequent colour is pearl-grey, of all degrees of intensity, from milk-white to lavender and violet-blue. It is sometimes of a green colour. It is found massive, disseminated in thick membranes, in roundish hollow balls, crystallized: specific gravity 4.8. It melts before the blow-pipe, and leaves a globule of silver. According to Klaproth, its constituents are

Silver.....	67.75
Muriatic acid.....	21.
Sulphuric acid.....	0.25
Oxide of iron.....	6.0
Alumina.....	1.75
Lime.....	0.25
	97.00
Losses	3.00
	100.00

It occurs in considerable abundance in the mines of South America, in some parts of France, and in Hungary. It takes a polish, and is soft, flexible, and ductile, and may be cut like horn; whence its name.

HORN-STONE, or HORN-STEEN, in mineralogy, a species of the flint genus, divided by Werner into three sub-species; the splintery, the conchoidal, and the wood-stone. The splintery horn-stone is generally grey: it is found in veins, in lime-stone, in several parts of Germany, and also in the Shetland islands. It appears to differ from quartz in containing a greater proportion of alumina; when it contains a very large quantity, it passes into jasper. It sometimes borders on chalcedony and flint. The best mill-stone, called French burr, is cellular-splinter hornstone. The woodstone commonly exhibits together several colours. Its shape is exactly conformable to its former woody shape, so that it occurs in the form of trunk, branches, and roots. It is found in sandy loam in Ireland and Germany, and takes a good polish.

HORNBACH, a town of Germany, in the late duchy of Deux Ponts, now included in the department of Savre and Moselle. It is five miles S. E. of Deux Ponts. Lon. 7. 36. E. Lat. 49. 10. N.

HORN-BEAM, in botany. See CARPINUS.

HORNBERG, an ancient town of Germany, in the late duchy of Wittenberg. It is 21 miles N. E. of Friburg.

HORN-BILL. See BUCEROS.

HORN-BLENDE, a species of the clay genus; it has four varieties or sub-species, viz. 1. Common. 2. Labrador. 3. Basaltic. 4. Hornblende slate.

HORNELENDE, COMMON, texture very conspicuously foliated; fracture conchoidal; fragments often rhomboidal; opaque; tough; specific gravity 2.922 to 3.41; colour black, blackish-green, olive-green, or leek-green. Before the blow-pipe it melts into a black glass.

HORN-BLENDE, BASALTIC. This stone is found commonly in basaltic rocks: hence the name basaltic, which was imposed by

Mr. Kirwan. It is crystallized either in rhomboidal prisms, or six or eight-sided prisms, terminated by three-sided pyramids. Its texture is foliated; fracture uneven; specific gravity 3.333; colour black, dark-green, or yellowish-green; streak white; transmits a reddish-yellow light. Before the blow-pipe it melts into a greyish-coloured enamel, with a tint of yellow. A specimen, seemingly of this stone, analysed by Bergman, contained

58 silica
27 alumina
9 iron
4 lime
1 magnesia
1 loss

100

HORNBY, a town of Lancashire. Lon. 2. 20. W. Lat. 54. 6 N.

HORN, CAPE, the most southern part of Tierra del Fuego, in South America, round which all ships now pass that sail into the South Sea. Lon. 67. 26. W. Lat. 55. 35. S.

HORNCASTLE, a town of Lincolnshire. It is 20 miles E. of Lincoln.

HORN-DISTEMPER, a disorder incident to horned cattle; it gradually wastes the internal substance of the horn, commonly called the pith, which is the spongy part of the bone, and the cells of which are filled with an oily matter. Thus, at length, the horn becomes hollow. From an account published by Dr. Tofts, in the first vol. of the Memoirs of the American Academy, it appears that this spongy bone is sometimes partially, and sometimes entirely, consumed. The horn is deprived of its natural heat, and on touching it, feels unusually cold. When this malady is suspected, other symptoms should be particularly attended to; such as dullness in the countenance; a sluggish motion; want of appetite; a desire to lie down; and, if attended with an inflammation of the brain, a giddiness, and frequent tossing of the head. Stiffness, as in the rheumatism, affects the limbs; the milk often fails in cows; the udder is hard, and there is in most cases a sudden wasting of the flesh. As soon as the distemper is discovered, an opening into the diseased horn should be immediately made; which may be done with a gimlet of a moderate size, in such a part of the horn as is most favourable for the discharge. It is recommended as most prudent to bore at first two or three inches above the head. If it is found hollow, and the gimlet passes through to the opposite side, and no blood discharges from the aperture, it may be best to bore still lower, and as near the head as it shall be judged that the hollowness extends. This opening is affirmed to be a necessary measure, and often gives immediate relief. Care must be taken to keep it clear, as it is apt to be clogged by a thin fluid that gradually oozes out and fills up the passage. Some saw off the horn; but, according to the best information, it does not succeed better than boring. From the cases Dr. Tutts has seen, he is led to conclude that injections are in general unnecessary; that, when the distemper is early discovered, no more is required than a proper opening into the horn, keeping it sufficiently clear for the admission of fresh air, the removal of the compression, and the discharge of floating matter. But when the distemper has communicated its effects to the brain, so as to produce a high degree of inflammation, it is doubted whether any method of cure will succeed.

HORNDON, a town of Essex, 19 miles E. of London.

HORNE, GEORGE, D. D. bishop of Norwich, was born at Otham in Kent, in 1730. He was educated at Maidstone, and took his degrees of B. A. and D. D. at Oxford. In 1753, he entered into orders, and was soon distinguished as an excellent preacher. In 1776, he was elected vice-chancellor, and in 1781, bishop of Norwich. Having early adopted the principles of Hutchinson, he displayed his abilities in defending them. He wrote, 1. An Impartial State of the Case between Sir Isaac Newton and Mr. Hutchinson: 2. The Theology and Philosophy in Cicero's *Somnium Scipionis* explained, 8vo.; 3. *Spicilegium Shuckfordianum*, or a Nosegay for the Critics: 8vo.; 4. A View of Mr. Kennicott's Method of Correcting the Hebrew Text: 8vo. 5. Considerations on the Life and Death of John the Baptist: 8vo. 1769. 6. A Commentary on the Psalms; 2 vols. 4to. 7. A Letter

ter to Adam Smith, LL. D. on the Life, Death, and Philosophy, of David Hume: 12mo. 8. Letters on Infidelity: 12mo. 9. A Letter to Dr. Priestley: 8vo. 10. Sermons, 5 vols: and several other works. He died at Bath in 1792; and was much esteemed for his learning and piety.

HORNNESS, a very ancient and considerable fraternity in London several centuries ago. In the reign of Edward II. they complained to parliament, that by foreigners buying up the horns in England, they were in danger of being ruined, and this business lost to the nation. For this reason was made the statute 6 Edw. IV. by which the sale of horns to foreigners (except such as the said horners refused) was prohibited; and the wardens were empowered to search all the markets in London and 24 miles round; to inspect Sturbridge and Ely fairs to prevent such practices, and to purchase horns at stated prices. But this law was repealed in the reign of James I. and thereupon the old evil revived. The horners again applied to parliament, and king Edward's statute was renewed (excepting as to the inspection of the fairs,) and still remains in force.

HORNET, in zoology. See *VISPA*.

HORN-FISH, or **GAR-FISH**. See *ESOX*.

HORNHEAD, a cape on the N. coast of Ireland, in Donegal. Lon. 7. 51. W. Lat. 55. 13. N.

HORNING, in Scots law, a writing issuing from the signet, in his majesty's name, at the instance of a creditor against his debtor, commanding him to pay or perform within a certain time, on pain of being declared rebel, and by a caption put in prison.

HORN-OWL. See *STRIX*.

HORNSPIPE, a common instrument of music in Wales, consisting of a wooden pipe, with holes at stated distances, and a horn at each end; the one to collect the wind blown into it by the mouth, and the other to carry off the sounds as modulated by the performer.

HORNSPIPE is also the name of an English air, probably derived from the above instrument. The measure is triple time, with six crotchets in a bar.

HORNSEA, a town of Yorkshire, 188 miles from London.

HORNSEY, a town of Middlesex. It is five miles N. of London.

HORN WORK, in fortification, an outwork composed of two demi-bastions joined by a curtain. See *FORTIFICATION*.

HOROGRAPHY, [*ὥρα* and *γραφία*,] an account of the hours.

HOROLOGE, or **HOROLOGY**, [*ὥρολογιον*, of *ὥρα*, an hour, and *λογος*, discourse,] a common name among the ancient writers for any instrument or machine for measuring the hours; (See *CHRONOMETER*).—Such are our clocks, watches, sun-dials, &c. See *CLOCK*, *CLEPSYDRA*, *DIAL*, and *WATCH*.

HOROLOGY, also denotes that part of science which explains the instruments for measuring time.

HOROMETRY, [*ὥρα* and *μετρίω*,] the art of measuring hours.

HOROPTER, in optics, a right line drawn through the points where the two optic axes meet, parallel to that joining the centres of the eyes.

HOROSCOPE, [from *ὥρα*, an hour, and *σκοπεῖν*, I consider,] in astrology, is the degree or point of the heavens rising above the eastern point of the horizon at any given time when a prediction is to be made.

HOROSCOPE is also used for a scheme or figure of the 12 houses or 12 signs of the zodiac, wherein is marked the disposition of the heavens for any given time. See *HOUSE*.

HOROSCOPY. See *DIVINATION*.

HORREA, in Roman antiquity, public magazines of corn and salt meat, out of which the soldiers were furnished on their march in the military roads of the empire.

HORROR, such an excess of fear as makes a person tremble. See *FEAR*, *FRIGHT*, and *TERROR*. In medicine, it denotes a shivering and shaking of the whole body, coming by fits. It is common at the beginning of all fevers, but is particularly remarkable in those of the intermittent kind.

HORROR OF A VACUUM, was an imaginary principle among the ancient philosophers, to which they ascribed the ascent of water in pumps, and other similar phenomena, which are now known to be occasioned by the weight of the air.

HORROX, **JEREMIAH**, an eminent English astronomer, born at Toxteth near Liverpool, in 1619, and educated at Emanuel col-

lege, Cambridge. He was the first who ever observed the transit of Venus over the sun's disk. He died, in 1642, to the great loss of that science and of the world, in the 23d year of his age, after he had just finished his "*Venus in Sole visa*;" which, with some other works, were published by Dr. Wallis, in 4to. in 1673.

HORNS DE SON FEE, an exception to avoid an action brought for rent issuing out of certain lands, by him that pretends to be the lord, or for some customs and services; for if the defendant can prove the land to be without the compass of his fee, the action fails.

HORSE, [*hors*, Saxon,] in zoology. See *EQUUS* and *FARRIERY*. The horse being an animal of extensive utility, the most proper and least extravagant manner of feeding and keeping him becomes an object of considerable importance. Hence, potatoes, carrots, furze, cabbages, &c. have been successfully tried as substitutes for oats, and the more expensive method of corn-feeding: where, however, grain is used, the most economical way will be to boil, and give it in a cool state to the animals, together with the liquor; by which simple means one-half may be saved. Carrots are particularly serviceable, as broken-winded horses, when fed on these roots, speedily recover. A considerable reduction may also be made, by cutting the hay into a kind of chaff, and mixing with it straw, or the broken ears of corn, which arise in dressing grain: and also by soiling horses with lucerne, tares, or clover, instead of turning them out to grass in the summer; for, if they be well littered, the dunghill will nearly repay the expence of their maintenance. See also the articles *FURZE* and *LINSEED*. The management of horses, after having performed the labour of the day, is a matter of equal moment with their feeding; and, as considerable expence has injudiciously been incurred, by erecting elegant stables, we propose the following practice to the consideration of the rural economist. It consists, simply, in forming a small yard provided with a shed that is open in the front, and furnished with racks, as well as a pump and cistern placed in one of the corners. A superstructure of this kind, if well littered, is in every respect preferable to a stable, and will preserve horses in better health, without requiring any other currying or dressing, than is usually given by farmers' servants. The utility and convenience of such a yard have been fully evinced by a patriotic nobleman, the earl of Darlington, who has followed this practice with great success for several years, and observed, that horses thus managed, not only are more healthy than in stables, but at the same time able to work well, even after the age of twenty years. We shall here subjoin a few characteristic marks, by which their general qualities may be ascertained, and some of the numerous frauds committed by grooms, jockies, &c. opportunely prevented. In old horses, the eye-pits are generally deep: this mark, however, is very uncertain, as it is also found on young animals descended from aged stallions. But the most certain criterion is that derived from the teeth, the number of which amounts to 40; namely, 24 grinders, or double teeth, four tushes, and twelve fore-teeth: these last are the surest guides for discovering the age of a horse. They appear about twelve days after the colt is foaled; are round, short, not very solid, and successively cast and replaced by others. When two years and a half old, the two middle fore-teeth in the upper jaw, and those in the lower jaw, are cast; in the course of another year, four others drop out, one on each side of the former. At the age of about four years and a half, the horse loses four others, and always next to those which have already fallen out and been replaced. These four foal-teeth are succeeded by four others, but do not grow so quickly as the eight first, and which are called corner-teeth. They replace the four last foal-teeth, and are the chief marks by which the age of a horse may be ascertained: they are the third, both above and below, counting from the middle of the jaw, being hollow, and having a black mark in their cavity. When the horse is four years and a half old, they are scarcely visible above the gum; and the cavity is very sensible; in the course of a year and a half, they begin to fill; and the mark continually diminishes and contracts, till the animal attains the age of seven or eight years, when the cavity is completely filled, and the black spots disappear. These teeth cease to afford any knowledge of a horse's age, after eight years, when it is ascertained by the tushes, which are the fore-teeth next to those last mentioned, and which, like the grinders, are not preceded by any other teeth. The two in the lower jaw usually begin to shoot at three years, and a half; those

those in the upper jaw at four; and both continue very sharp-pointed till the animal is six years of age. At ten years, the teeth in the upper jaw appear blunted, worn out, and long; the gum contracting in proportion to the increasing years; and the more exposed the teeth are, the greater is the age of the horse. From ten to thirteen, or fourteen, little can be perceived to determine the age; but at that time of life, the upper teeth seem blunted, the gum contracts, and these useful bones are left bare. In proportion, therefore, to the greater or less degree of these marks, the age of a horse may be determined; and likewise, though not perhaps with equal accuracy, by the bars in the animal's mouth, which decreases as he advances in years. On this occasion, it will not be useless to point out an odious practice, of which many ostlers and stable-keepers are guilty, especially towards the horses of strangers. When provisions are at an exorbitant price, these inhuman monsters have sometimes the cruelty to mix a few leaves of the bird-cherry (vol. i. p. 509), among the hay, or to rub the fatigued animal's teeth with tallow, or soap: in either case, it will obstinately refuse food, and not eat, till the hay is changed, or the teeth have been properly scoured with common salt. In a horse that is free from blemish, the legs and thighs are well shaped; the knees straight; the skin and shanks thin; the back-sinews strong and firm. The pastern-joints should be small and taper, and the hock lean, dry, and not puffed up with wind. With respect to the hoof itself, the coronet ought to be thick, without any tumor or swelling; the horn bright, and of a greyish colour. The fibres of a strong foot appear very distinctly, running in a direct line from the coronet to the toe, like the grain of wood. Such a foot, however, ought to be kept moist and pliable; as it is subject to fissures and cracks, by which the hoof is sometimes cleft through the whole length of the coronet. A narrow heel is likewise a great defect; and, if it do not exceed two fingers in breadth, it forms an imperfect foot. A high heel often causes a horse to trip and stumble; while a low one, with long yielding pasterns, is apt to be worn away on a long journey. On the other hand, a foot disproportionately large, renders the animal weak, and clumsy in its gait. The head of a horse ought to be small, and rather lean than fleshy; his ears should be erect, thin, sprightly, and pointed; the neck arched towards the middle, tapering gradually towards the head; the shoulders rather long; the withers thin, and enlarged by degrees as they extend downwards, yet so as to render his breast neither too gross nor too narrow. Such are the principal characters, by which the best form and proportion of that useful animal may be determined. Those of our readers who wish to obtain more extensive information relative to this interesting subject, may with advantage peruse "Ten Minute's Advice to every Gentleman going to purchase a Horse, &c." a small work, but which is replete with practical information.

HORSE-DEALERS. Every person exercising the trade or business of an horse-dealer, must take out a licence from the Stamp Office, for which he shall pay annually, if within London, Westminster, the bills of mortality, the parish of St. Pancras, or the borough of Southwark, twenty pounds; elsewhere ten pounds. Horse-dealers who shall, after January 1, 1796, carry on the said business without having obtained a licence under the act of 36 George III. c. 17, shall be liable to be assessed the duties on riding-horses, and shall deliver lists thereof as other persons.

HORSES. It shall be lawful for any person, native or foreigner, at any time to ship, lade, and transport, by way of merchandize, horses into any parts beyond the seas, in amity with his majesty, paying for each horse, mare, or gelding, 5s. and no more. No person convicted for feloniously stealing a horse, gelding, or mare, shall have the privilege of clergy. 1 Ed. VI. c. 12. And not only all accessories before such felony done, but also all accessories after such felony, shall be deprived and put from all benefit of their clergy, as the principal, by statute heretofore made, is or ought to be. If an horse be stolen out of the stable, or other curtilage of a dwelling-house, in the night-time, it falls under the denomination of burglary; if in the day-time, it falls under the denomination of larceny from the house; and in either case there is a reward of 40l. for convicting an offender, and the prosecutor is entitled to a certificate, which will exempt him from all parish and ward offices, in the parish and ward where the burglary, or larceny, is committed, and which may be once assigned over, and will give the same exemption to the assignee as

to the original proprietor. Great abuses having arisen, and many horses having been stolen, from the facility and safety of disposing of them to those who kept slaughter-houses for horses, some regulations and restrictions seemed absolutely necessary. It was no uncommon thing for horses of great value to be sold for the purpose of making food for dogs; the thief rather choosing to receive twenty shillings for a stolen horse, without fear or danger of detection, than venture to dispose of him publicly, though he might possibly have found a purchaser who would have given as many pounds for him. These considerations induced the legislature to pass the act of 26 Geo. III. c. 71, for regulating these slaughter-houses.

HORSES, KILLING OR MAIMING. Where any person shall, in the night-time, maliciously, unlawfully, and willingly, kill or destroy any horses, sheep, or other cattle, of any person, every such offence shall be adjudged felony, and the offender shall suffer as in the case of felony, 22 and 23 Car. II. c. 7. Offenders may be transported for seven years, either at the assizes, or at the sessions, by three justices of the peace; or one to be of the quorum. By the act of 9 Geo. I. c. 22, commonly denominated the black act, it is enacted, that if any person shall unlawfully and maliciously kill, maim, or wound, any cattle; every person so offending being thereof lawfully convicted, in any county of England, shall be adjudged guilty of felony, and shall suffer death, as in cases of felony, without benefit of clergy. But not to work corruption of blood, loss of dower, nor forfeiture of lands or goods. Prosecution upon this statute shall, or may, be commenced within three years from the time of the offence committed, but not after. If a horse, or other goods, be delivered to an inn-keeper, or his servants, he is bound to keep them safely, and restore them when his guest leaves the house. If a horse be delivered to an agisting farmer, for the purpose of depasturing in his meadows, he is answerable for the loss of the horse, if it be occasioned by the ordinary neglect of himself or his servants. If a man ride to an inn, where his horse has eat, the host may detain the horse till he be satisfied for the eating, and without making any demand. But a horse committed to an inn-keeper, can only be detained for his own meat, and not for that of his guest, or any other horse; for the chattels in such case, are only in the custody of the law for the debt which arises from the thing itself, and not for any other debt due from the same party. By the custom of London and Exeter, if a man commit a horse to an inn-keeper, if he eat out his price, the inn-keeper may take him as his own, upon the reasonable appraisement of four of his neighbours; which was it seems a custom, arising from the abundance of traffic with strangers, that could not be known so as to be charged with an action. But it hath been holden, though an inn-keeper in London, may, after long keeping, have the horse appraised and sell him, yet, when he has in such case had him appraised, he cannot justify the taking him to himself, at the price he was appraised at. And this cannot be done at any other place by the common law, unless there is some special custom.

HORSE is also used in carpentry, for a piece of wood jointed across two other perpendicular ones, to sustain the boards, planks, &c. which make bridges over small rivers; and on divers other occasions.

HORSE, in sea-language, is the name of a rope reaching from the middle of a yard to its extremity, or what is called the yard-arm, and depending about two or three feet under the yard, for the sailors to tread upon whilst they are loosing, reefing, or furling the sails, rigging out the studding-sail booms, &c.

HORSE is also a thick rope, extended in a perpendicular direction near the fore or aft side of a mast, for the purpose of hoisting or extending some sail upon it.

HORSE is also a cant name introduced into the management of lotteries, for the chance or benefit of a ticket or number for one or more days, upon condition, if it be drawn a prize within the time covenanted for, of returning to the seller an undrawn ticket.

HORSE is also used in the military language to express the cavalry; or the body of soldiers who serve on horseback. See CAVALRY.

HORSE-FEAN. See VICIA.

HORSE-CHESNUT. See *ÆSCULUS*, and *HIPPOCASTANUM*.

HORSE-HAIR WORMS. See *AMPHIBENA*.

HORSE-SHOE, in fortification, is a small work sometimes of a round and sometimes of an oval figure, inclosed with a parapet, sometimes raised in the moat or ditch, or in low grounds, and sometimes to cover a gate, or to serve as a lodgement for soldiers.

HORSE-SHOE-HEAD, a disease in infants, in which the sutures of the skull lie too open. This is commonly a sign of a weak constitution, and a short life. The nurses usually embrocate the parts affected with brandy or rum, to which some add the white of an egg, or palm-oil.

HORSE-LEECH. See **HIRUDO**.

HORSHAM, a town of Sussex, 38 miles from London.

HORTICULTURE. See **GARDENING**.

HORTUS SICCUS, a **DRY GARDEN**; an appellation given to a collection of specimens of plants, carefully dried and preserved. The value of such a collection is evident, as 1000 minutiae may be preserved in the well dried specimens of plants, which the most accurate engraver would overlook. We shall therefore give two methods of preparing and preserving a hortus siccus. 1. Flatten the plant, by passing a common smoothing iron over the papers between which it is placed; and dry it slowly in a sand-heat. For this purpose, the cold sand ought to be spread evenly, the smoothened plant laid gently on it, and sand sifted over so as to form a thick bed; the fire is then to be kindled, and the whole process carefully watched, till the plant is gradually and perfectly dried. Thus the colour of the tenderest herb may be preserved, and the most delicate flowers retain all their pristine beauty. 2. Another, and far more complete method, was suggested by the ingenious Mr. Whately; and bears a slight resemblance to that last specified. He directs those who intend to follow his plan, previously to procure—1. A strong oak box of the same size and shape as those employed for packing up tin-plates: 2. A quantity of fine sifted sand, sufficient to fill the box: 3. A considerable number of pieces of plant paper, from one to four inches square; and, 4. Some small flat leaden weights, and a few small bound books. He then directs the specimen of the plant intended for the herbal to be gathered, when dry and in full bloom, with all its parts as perfect as possible, and conveyed home in a tin-box, well secluded from the air. The plant is first to be cleared from the soil as well as the decayed leaves, and then laid on the inside of one of the leaves of a sheet of common cap-paper. The upper leaves and flowers are next to be covered, when expanded, by pieces of the prepared paper, and one or two of the leaden weights placed on them. The remainder of the plant is now to be treated in a similar manner. The weights ought next to be gently removed, and the other leaf of the sheet of paper folded over the opposite one, so as to contain the loose pieces of paper and plants between them. A book or two is now to be applied to the outside of the paper, till the intended number of plants is thus prepared; when a box is to be filled with sand to the depth of an inch, one of the plants put in, and covered with sand sufficient to prevent the form of the plant from varying. The other plants may then be placed in succession, and likewise covered with a layer of sand, one inch thick between each; after which the whole is to be gently pressed down in a greater or less degree, according to the tenderness or firmness of the plants. The box is next to be carefully placed before a fire, one side being occasionally a little raised, as may be most convenient; the sides being alternately presented to the fire two or three times in the day: or, the whole may be put into an oven gently heated. In the course of two or three days, the plants will be perfectly dry, when the sand ought to be taken out, and put into another box: the plants should likewise be removed to a sheet of writing paper. This method of preserving plants, Mr. Whately states to be preferable to every other, as both the flowers and leaves, if kept loosely within the paper, in a dry room, without being exposed to the air, will retain their beauty for several years. It will, however, be necessary to inspect them once in the course of a year, for the purpose of destroying any small insects, that may accidentally breed among the plants.

HORUS, a renowned deity of ancient Egypt. He was an emblem of the sun. Plutarch, in his treatise "De Iside et Osiride," says, "that virtue which presides over the sun, whilst he is moving through space, the Egyptians called Horus, and the Greeks Apollo." Job also calls Ur or Orus the sun—"If I gazed

upon the sun (Ur, Orus,) when he was shining, or on the moon (Jarecha) walking in brightness," &c. Ch. xxxi. ver. 26, 27, 28. The interpretation left by Hermapion of the hieroglyphics engraved on the obelisk of Heliopolis, (according to Ammianus Marcellinus), is in these remarkable words: "Horus is the supreme lord and author of time." These qualities were chiefly attributed to Osiris: that they may apply, therefore, to Horus, he must necessarily denote the star of the day in certain circumstances; and that is what is explained by the oracle of Apollo of Claros: "Learn that the first of the gods is Jao. He is called invisible in winter, Jupiter in the spring, the Sun in summer, and towards the end of autumn the tender Jao."

HOSANNA, in the Hebrew ceremonies, was a prayer rehearsed on the several days of the feast of tabernacles; thus called, because there was frequent repetition therein of the word הושיענו, i. e. save us, we pray. There are many of these hosannahs. The Jews call them hoschannoth; i. e. the hosannahs: and style them hosannah of the first day, hosanna of the second day, &c. according as they are rehearsed.

HOSANNA RABBA, or **GRAND HOSANNA**, is a name given to the feast of the tabernacles, which lasts eight days; because, during the course thereof, they are frequently calling for the assistance of God, the forgiveness of their sins, and his blessing on the new year; and to that purpose they make great use of the hoschannoth above mentioned. The Jews also apply the term hosanna rabba more peculiarly to the seventh day of this feast, because they more immediately on that day invoke the divine blessing, &c.

HOSPINIAN, **RODOLPHUS**, one of the greatest writers that Switzerland has given birth to. He was born in 1547, at Altorf, near Zurich; obtained the freedom of Zurich; was ordained in 1568, made provisor of the abbey-school in 1571, and soon after minister. He undertook a noble work of vast extent, viz. "A History of the Errors of Popery;" of which he published a considerable part. What he published on the Eucharist, and another work called "Concordia Discors," exceedingly exasperated the Lutherans. He did not reply to them; but wrote a work against the Jesuits, entitled "Historia Jesuitica," &c. These writings gained him fame and preferment. He died in 1626. An edition of his works was published at Geneva, 1681, in seven volumes folio.

HOSPITAL, **WILLIAM FRANCIS ANTONY, MARQUIS OF**, a celebrated mathematician, born in 1661. He was a geometrician almost from his infancy; for one day being at the duke of Rohan's, where some able mathematicians were speaking of a problem of Pascal's, which appeared to them extremely difficult, he ventured to say, that he believed he could solve it. They were amazed at such presumption in a boy, for he was then only fifteen; but in a few days he sent them the solution. He entered early into the army, and was a captain of horse; but being short-sighted, he soon quitted it. He contracted a friendship with Malbranche. In 1693, he was made an honorary member of the Academy of Sciences at Paris; and he published a work upon Sir Isaac Newton's calculations, entitled "L'Analyse des Infinimens Petits." Being the first in France who wrote upon this subject, he was regarded almost as a prodigy. He engaged afterwards in another work, in which he included "Les Sections Coniques, les Lieux Geometriques, la Construction des Equations, et Une Theorie des Courbes Mechaniques;" but a little before he finished it, he was seized with a fever, of which he died, Feb. 2, 1704, aged 43. It was published after his death.

HOSPITAL, [from the Latin, *hospes*, a host or stranger.] See **HOST**. In the first ages of the church, the bishop had the immediate charge of all the poor, both sound and diseased; also of the widows, orphans, strangers, &c. When the churches came to have fixed revenues, it was decreed, that at least one-fourth part thereof should go to the relief of the poor; and to provide for them the more commodiously, divers houses of charity were built, since denominated hospitals. They were governed wholly by the priests and deacons, under the inspection of the bishop. In course of time separate revenues were assigned for the hospitals; and many, from motives of piety and charity, gave lands and money for erecting hospitals. In Britain, hospitals are buildings properly endowed, or otherwise supported by charitable contributions, for the reception and support of the poor, aged, infirm, sick, or helpless,

less. A charitable foundation laid thus for the sustenance of the poor, is to continue for ever. Any person seized of an estate in fee, may, by deed inrolled in chancery, erect and found an hospital, and nominate such heads and governors therein as he shall think fit, and this shall be incorporated, and subject to the inspection and guidance of the heads and visitors which are nominated by the founder. There are few countries which abound with a greater number of these humane institutions than Britain; yet they are often calculated to generate disease rather than to cure it, on account of their crowded wards, or from their confined situation in populous cities, where the most pestilential vapours are in a manner condensed; and thus, in too many instances, the victims of poverty, age, infirmity, or sickness, eventually perish by mutual contagion. Much, we are convinced, has already been done towards remedying an evil of so serious a nature; but still more remains to be accomplished, before salutary changes produce the desired effect in this neglected department of medical police. We mention these few circumstances, in order to excite a greater degree of attention to this important object, in which the salubrity of the metropolis is particularly concerned. Those of our benevolent readers who wish to acquire further information, ought to read the Extracts from an Account of the Institution for the Cure and Prevention of Contagious Fevers in London, lately published; as well as Mr. Aikin's Thoughts on Hospitals: both pamphlets equally abound with interesting facts and observations.

HOSPITALLERS, an order of religious knights, who built an hospital at Jerusalem, wherein pilgrims were received. To these pope Clement V. transferred the effects and revenues of the Templars; whom, by a council held at Vienne, he suppressed for their many and great misdemeanours. These hospitalers were called Knights of St. John of Jerusalem; and are now called Knights of Malta.

HOSPITIUM, a term used by old writers either for an inn or monastery, built for the reception of strangers and travellers. See **INN** and **MONASTERY**.

HOSPODAR, a title borne by the princes of Walachia and Moldavia, who receive the investiture of their principalities from the grand signior.

HOST, is a term of mutual relation, applied both to a person who entertains another, and to the person thus lodged. It is formed of the Latin *hospes*, thus called, quasi *hostium* or *ostium* petens; for *ostium* was anciently written with an *h*. It was a custom among the ancients, when any stranger asked for lodging, for the master of the house, and the stranger, each of them to set a foot on their own side of the threshold, and swear they would neither of them do any harm to the other. It was this ceremony that raised so much horror against those who violated the law of hospitality on either side; as they were considered as perjured. Instead of *hospes*, the ancient Latins called it *hostis*: as Cicero informs us: though, in course of time, *hostis* came to signify an enemy; so much was the notion of hospitality altered.

HOST is also used by way of abbreviation for *hostia*, a victim or sacrifice offered to the Deity.

HOST, in the church of Rome, a name given to the elements used in the eucharist, or rather to the consecrated wafer; which they offer up every day a new host or sacrifice for the sins of mankind. They pay adoration to the host, upon the presumption that the elements are no longer bread and wine, but transubstantiated into the real body and blood of Christ. See **TRANSUBSTANTIATION**.

HOSTIA, or **HOST**, in antiquity, a victim offered in sacrifice to the Deity. The word is formed from *hostis*, an enemy; it being the custom to offer up a sacrifice before they joined battle, to render the gods propitious; or, after the battle was over, to give them thanks. Some derive the word from *hostio*, q. d. *ferio*, I strike. Isidore remarks, that the name *hostia* was given to those sacrifices which they offered before they marched to attack an enemy, (*antequam ad hostem pergerent*); in contradistinction from *victima*, which were properly those offered after the victory. *Hostia* also signified the lesser sorts of sacrifice, and *victima* the larger. However, we find these two words promiscuously used by ancient writers.

HOT-BEDS, in gardening, are made either with fresh horse-dung or tanner's bark, and covered with glasses, to protect them from the severity of the wind and weather. Where horse-dung is

employed, a trench should be dug, of a width and depth proportioned to the size of the frames intended to be used; and which, in dry ground, ought to be a foot, or a foot and a half, deep; but, if the soil be wet, it should not exceed six inches. The dung is then to be spread even and smooth on every part of the bed, laying the finer manure on the surface: if the bed be intended for planting out cucumbers, a hole should be made, about ten inches broad, and six inches deep, in the middle of the place destined for each light, and then filled up with good fresh earth. The bed is next to be covered, to the depth of four inches, with the earth taken out of the trench, and the frame fixed over it, to remain till the earth become warm, which commonly takes place in the course of three or four days after the bed is made; when the cucumbers may be planted. In case the hot-bed be designed for other plants, it will not be necessary to make holes in the dung; but after levelling the surface, good earth ought to be spread over it, to the depth of three or four inches; the frames and glasses being put on as before. In making such beds, the dung should be settled close with a fork; and if it be full of long litter, it must be trod down equally in every part. In the first week, or ten days, after the hot-bed is made, the glasses should be slightly covered during the night, and cautiously opened in the day-time, to give vent to the steam; but as soon as the heat abates, the covering should be increased by mats or straw; and, when the bed becomes cold, fresh dung should be applied to its sides. Hot-beds made with tanner's bark are preferable to those above described, especially for tender exotic plants and fruits; as they require a more equal warmth than can be produced by horse-dung. The method of making them is as follows; a trench is dug about three feet deep, if the ground be dry; but, if the soil be wet, it ought not to exceed the depth of a foot, and should be raised two feet above the ground. Their size must be in proportion to the frames intended to cover them; though they ought to extend at least ten or twelve feet in length, and six feet in width. The trench should be lined with bricks on each side, to the height of three feet, and filled in the spring with fresh tanners' bark, which should be previously thrown up into a round heap, in order to drain for three or four days. When the tan is laid on, it ought to be gently beaten down with a dung-fork; for if it be trodden in, it will be prevented from heating, as it settles too close. The frame and glasses are now to be fixed; and, in the course of ten days or a fortnight, the bed will grow hot, when pots or plants of seed may be plunged in it; care being taken that the bark be not compressed. These beds will preserve a proper temperature of heat for three or four months, which may be continued two or three months longer, by adding a load or two of fresh bark, as often as the warmth begins to decrease. Frames vary in size, according to the plants they are destined to cover. If designed for ananas or pine-apples, the back should be three feet high, the lower part fifteen inches: when the bed is intended for taller plants, the frame must be made proportionably higher; if for seeds only, it will not be necessary to employ frames more than fourteen inches in height at the back, and seven in the front. Thus the heat will be increased, and the growth of the plants considerably promoted.

HOthouse, a building erected for the purpose of raising such exotic plants, as from their extreme tenderness are unable to withstand the effects of a cold or variable climate. The construction of hothouses, in general, differs little from that of Greenhouses; because the design of both is to receive as much benefit as possible from the genial warmth of the sun, assisted by the heat artificially procured from subterraneous stoves and flues. See **STOVE**. We shall here present the reader with an analysis (from the 1st vol. of the second Series of Recreations in Agriculture, &c.) of the principle on which Dr. Anderson's improved hothouses are constructed, and for which he has lately obtained a patent. He first points out the defects in the present method of erecting hothouses; in consequence of which the heat of the sun is not employed with that advantage of which it is susceptible. In the prevailing mode of building these houses, the roof-glasses are, with very few exceptions, laid into the frames, by folding one frame over the other, and thus leaving an open space between each pane; through which the air has a free passage, while the front-panes are closely covered round with putty. This communication with the open air at the upper part of the house, is their

their chief imperfection; for the power of the morning-sun is thus lost for several hours; and, in the evening, when the warm air within begins to cool and to contract in bulk, the cold air from without rushes in through the top or roof-glasses, cools the whole house in the most expeditious manner, and thus counteracts the influence of the solar rays. To remedy these inconveniences, the patentee proposes the following plan of construction, for houses designed to force vines, or such plants as require a similar temperature. The house is to be built of the usual dimensions, but with a glass-roof perfectly flat; and, as it never requires to be opened, all the seams or junctures between each pane are to be carefully closed with lead and putty. Over this flat ceiling, another sloping roof is to be erected, and covered either with slate, or likewise with glass, which will better answer the purpose. The upper chamber, which will thus serve as a reservoir for the heated air, communicates with the common atmosphere only at its lower part, that is, immediately over the roof of the lower house; and there is a contrivance for another occasional communication with the latter, by means of a pipe or tube, that extends from the top of the upper chamber, almost to the ground below. By this construction, it is perceived, as soon as the sun expands the air in the lower house or chamber, a part of that air rises through the tube into the upper chamber; where it ascends to the top or roof, forcing out the cooler air contained in the upper chamber, which passes off through the openings left above the floor of this chamber, or in the roof of the lower room. During the whole of this heating process, the vines, which are trained along, beneath the glass-roof of the lower chamber, are surrounded with heated air. In the evening, when the influence of the sun is withdrawn, the warm air begins to cool, and consequently to contract its bulk; thus the external air rushes in, through the aperture immediately over the lower glass-roof, into the upper chamber. This cold air being heavier than that within the house, it cannot only enter as the latter recedes; the current through both chambers is now exactly reversed: and the lower room receives all the warm air from the reservoir or upper one, before the cold can reach it. Dr. Anderson is of opinion, that a few hours sun-shine will at any time be sufficient completely to heat the house in which vines are planted; and thus, without any artificial heat from fuel, a permanent warmth may be maintained, which is sufficient to ripen grapes, in favourable weather, as early as in the months of June, July, and August. He farther suggests that the upper chamber may be converted into an hothouse of inferior rank; and that it would be eminently calculated to serve as a substitute for a greenhouse or conservatory. Such is the outline of this very ingenious plan, and the inquisitive reader, who wishes to acquire more minute information on this subject, will probably resort to the volume already quoted, where it is amply treated, and illustrated with plates. Hothouses are liable to be infested with a variety of insects known under the different appellations of Cocco, Aphides, (lice,) &c. that harbour in the walls, and among the trellises, which fasten up vines, and other wall-fruit-trees, especially during the winter. In order to destroy these vermin, Mr. Speechley recommends the walls to be washed with common soap-suds, early in the spring, while they are in a torpid state. This liquor is to be poured out of a watering-pot from the top of the wall downwards; and ought, when used, to be considerably warmer than new milk: thus, if the suds be properly and plentifully applied, the wall will assume a pale red colour, and the insects be effectually destroyed.

HOTEL, a French term, anciently signifying a house or dwelling-place; afterward used for the palaces of the king, princes, and great lords. Since the abolition of monarchy and nobility, it has been chiefly applied to public buildings and hospitals.

HOTEL, in Britain, is used for a large inn, or elegant lodging-house ready furnished.

HOTTENTOTS, a people in the southern part of Africa, whose country surrounds the empire of Monomotapa, in the form of a horse-shoe, extending according to Magin, from the Negroest of Cabo as far as the Cape of Good Hope; and from thence northward to the river Magnica, or Rio de Sancto Spirito, including Mattatan a distinct kingdom. Many accounts have been published concerning the extreme nastiness and filthy customs of the Hottentots; but from the observations of later travellers it appears, that these have either been exaggerated, or that the Hottentots

have in some measure laid aside their former manners. Dr. Sparman describes them in much less disgusting terms, and M. Vaillant seems to have been charmed with their innocence and simplicity. According to the Doctor, these people are as tall as the generality of Europeans, though more slender in their persons, which he attributes to their scanty supply of food, and not accustoming themselves to hard labour. The characteristic of the nation, however, and which he thinks has not been observed by any one before, is, that they have small hands and feet in proportion to the other parts of their body. The distance between the eyes appears greater than in Europeans, by reason of the root of the nose being very low. The tip is pretty flat, and the iris of the eye has generally a dark-brown cast, sometimes approaching to black. Their skin is of a yellowish brown, something like that of an European who has the jaundice in a high degree; though this colour does not in the least appear in the whites of the eyes. The Hottentots besmear all their bodies copiously with fat mixed up with a little soot. "This (says Dr. Sparman) is never wiped off; on the contrary, I never saw them use any thing to clean their skins, excepting that when in greasing the wheels of their waggons, their hands were besmeared with tar and pitch, they used to get it off very easily with cow-dung, at the same time rubbing their arms into the bargain up to the shoulders with this cosmetic." The Hottentots perfume their bodies, by daubing them all over with the powder of an herb, the smell of which is at once rank and aromatic, approaching to that of the poppy mixed with spices.

HOTTONIA, **WATER-VIOLET**: a genus of the monogynia order, and pentandria class of plants; natural order, *Preciæ*. Corolla salver-shaped; stamina placed in the tube of the corolla; capsule unilocular. There are four species.

HOUAC, a French island, in the English channel, near the coast of Morbihan, eight miles in circumference, defended by a fort: seven miles N. E. of Belleisle.

HOVEN CATTLE, in husbandry, black cattle or sheep swollen by eating too voraciously of clover, or any other succulent food. The animal, when not quickly relieved, dies in half an hour. An extraordinary quantity of air being taken down with the clover, in its passage from the intestines upwards, forces the broad leaves of the clover before it, till they close up the passage at the entrance, and thus prevent the wind from returning. The common method of relief is to stab the beast into the paunch; but this is always dangerous, and often fatal. Mr. Richard Eager, of Graffham, near Guildford, received 50 guineas from the Society for the Encouragement of Arts, &c. for publishing the following method practised by him for curing hoven cattle;—"Let the farmer have always ready smooth knobs of wood, of different sizes, fixed to the end of a flexible cane, which for oxen should be at least six feet long, and for sheep three. When a beast is hoven, let one person take hold of him by the nostril and one horn, let another hold his tongue fast in one hand, putting the cane down his throat with the other. Be careful not to let the animal get the knob of the cane between his grinders; observe also to put the cane far enough down; the whole length will not injure. You will find the obstacle at the entrance of the paunch; push the cane hard, and when you perceive a smell to come from the paunch, and the animal's body to sink, the cure is performed."

HOVENIA, a genus of the class and order pentandria monogynia. The petals are five, convoluted; stigma trifid; capsule three-celled, three-valved. There is one species, a shrub of Japan.

HOUGH, in the manege, is the joint of the hind-leg of a beast which connects the thigh to the leg.

HOVERING. Ships of 50 tons, laden with customable or prohibited goods, hovering on the coasts of this kingdom, within the limits of any port (and not proceeding from foreign parts,) may be entered by officers of the customs, who are to take an account of the lading, and to demand and take a security from the master, by his bond to his majesty, in such sum of money as shall be treble the value of such foreign goods then on board; that such ship shall proceed, as soon as wind and weather and the condition of the ship will permit, on her voyage to foreign parts, and shall land the goods in some foreign port; the master refusing to enter into such bond or demand, or having given bond, shall not proceed on such voyage (unless otherwise suffered to make a longer stay by the collector, or other principal officer of such port where the vessel shall be, not exceeding twenty days.)

in either of the said cases, all the foreign goods on board, may be taken out by the customhouse-officers, by direction of the collector, and properly secured; and if they are customable, the duties shall be paid, and if prohibited, they shall be forfeited. The officers of the customs may prosecute the same, as also the ship, if liable to condemnation, 3 Geo. III. c. 21. Commanders of men of war, and customhouse-officers, may compel ships of fifty tons, or under, hovering within two leagues of shore, to come into port. 6 Geo. I. c. 21. If any ship or vessel shall be found at anchor, or hovering within eight leagues of the coast (except between the North Foreland and Beachy Head) unless by distress of weather, having on board foreign spirits, in any vessel or cask which shall not contain sixty gallons at least, or any wine in casks (provided such vessel have wine on board) shall not exceed sixty-tons burthen, or six pounds weight of tea, or twenty pounds weight of coffee, or any goods whatever liable to forfeiture upon importation, that such goods with the ship and furniture, shall be forfeited; spirits for the use of seamen, not exceeding two gallons per man, excepted, 42 Geo. III. c. 82.

HOULSWORTHY, a town of Devonshire, seated between two branches of the Tamar.

HOUNA, a cape of Scotland, on the coast of Caithness, two miles W. of Duncansbay Head.

HOUND. See CANIS, and BLOOD-HOUND.

HOUND'S-TONGUE. See CYNOGLOSSUM.

HOUND-TRFE. See CORNUS.

HOUNSLOW, a town of Middlesex, ten miles from London.

HOU-SQUANG, a province of China, in the centre of the empire; divided into two parts by the Yang-tse-kiang. The greater part of it is level, and watered by lakes, canals, and rivers; which render it so fertile that the Chinese call it the storehouse of the empire; and it is a saying among them, that "the abundance of Ki-ang-si could furnish all China with a breakfast; but the province of Hou-quang could maintain all its inhabitants."

HOURL, in chronology, is sometimes the twelfth part of a natural day. See DAY. The word *hora*, or *wa*, comes, according to some, from Horus, the Egyptian name of the sun, the father of the Hours. Others derive it from the Greek *ῥα*, to terminate, or distinguish. An hour, with us, is a measure of time, equal to a twenty-fourth part of the natural day, or the duration of the twenty-fourth part of the earth's diurnal rotation. It answers to 15° of the equator, not precisely, but near enough for common use. It is divided into sixty minutes; the minute into sixty seconds, &c. The division of the day is very ancient: as it is shewn by Kircher, Oedip. Ægypt. Tom. II. P. II. Class. VII. c. 2. The most ancient hour was the twelfth part of the day. Herodotus, lib. ii. says that the Greeks learnt from the Egyptians the method of dividing the day into twelve parts. The astronomers of Cathaya, &c. Bishop Beveridge observes, still retain this division. They call the hour *chag*; and to each *chag* give a peculiar name, taken from some animal: the first is called *zeth*, mouse; the second, *chiu*, bullock; the third, *zem*, leopard; the fourth, *mau*, hare; the fifth, *chin*, crocodile, &c. The division of the day into twenty-four hours, was not known to the Romans before the first Punic war. Till that time they only regulated their days by the rising and setting of the sun. They divided the twelve hours of the day and night into four watches, containing three hours each. See CHRONOLOGY.

HOURS, in mythology. See HORÆ.

HOURS, **HGRÆ**, in the Romish church, are certain prayers performed at stated times of the day; as matins, vespers, lauds, &c.

HOURL-GLASS, a kind of chronometer, which measures the time by the running of sand out of one glass into another. Hour-glasses are much used at sea for reckonings, &c. The best are those of which, instead of sand, have egg-shells dried in an oven, then beaten fine and sifted.

HOURIS, in Mohammedan theology, females promised to the faithful in paradise; formed for this purpose, with eternal beauty and undecaying charms.

HOUSE. See ARCHITECTURE. Among the Jews, Greeks, and Romans, houses were flat on the top for walking on, and had usually stairs on the outside, by which they might ascend and descend without coming into the house. Each house was so laid out, that it inclosed a quadrangular area or court; which being open to the sky, gave light to it. This was the place where com-

pany was received, and for that purpose it was strewed with mats or carpets for their better accommodation. It was paved with marble or other materials, according to the owner's ability, and provided with an umbrella of vellum to shelter them from the inclemency of the weather. This part of their houses, called by the Romans *impluvium*, or *cava adium*, was provided with channels to carry off the water into the common sewers. The level roof was covered with a strong plaster by way of terrace. Hither, especially amongst the Jews, it was customary to retire for meditation, private converse, devotion, (See Acts x. 9,) or the enjoyment of the evening-breezes. It is surprising that so few modern houses are built with this convenience.

HOUSE, in astrology, is the twelfth part of the heavens. The division of the heavens into house, is founded upon the pretended influence of the stars, when meeting in them, on all sublunary bodies. These influences are supposed to be good or bad; and to each of these houses particular virtues are assigned, on which astrologers prepare and form a judgement of their horoscopes. The horizon and meridian are two circles of the celestial houses, which divide the heavens into four equal parts, each containing three houses; six of which are above the horizon, and six below it; and six of these are called eastern, and six western, houses. A scheme or figure of the heavens is composed of twelve triangles, all called houses, in which is marked the stars, signs, and planets, so included in each of these circles. Every planet has likewise two particular houses, in which it is pretended that they exert their influence in the strongest manner: but the sun and moon have only one, the house of the former being Leo, and that of the latter Cancer. The houses in astrology have also names according to their qualities. The first is the house of life; this is the ascendant, which extends five degrees above the horizon, and the rest below it. The second is the house of riches: the third the house of brothers: the fourth, in the lowest part of the heavens, is the house of relations, and the angle of the earth: the fifth the house of children: the sixth the house of health: the seventh the house of marriage, and the angle of the west: the eighth the house of death: the ninth the house of piety: the tenth the house of offices: the eleventh the house of friends: and the twelfth the house of enemies. Such are the foolish schemes of astrology.

HOUSE. See COMMONS, LORDS, and PARLIAMENT.

HOUSEBREAKING is the breaking into, and robbing a house, in the day-time; the same crime being termed burglary when done by night: both are felony without benefit of clergy.

HOUSE-LEEK. See SEDUM, and SEMPERVIVUM.

HOUSED, in sea-language, the situation of the guns, upon the middle and lower gun-decks, when they are run in, and the breach being let down, the muzzle gas against the side above port. They are there secured.

HOUSING, or **HOUSEE**, is a cover laid over a saddle to save it from the weather, &c. The cavaliers anciently appeared with embroidered housings.

HOUSING, or **HOUSE-LINE**, in the sea-language, a small line, formed of three fine strands or twists of hemp, smaller than rope-yarn. It is chiefly used to seize blocks into their strops, to bind the corners of the sails, or to fasten the bottom of a sail to its bolt-rope, &c. See BOLT-ROPE.

HOUSING, among bricklayers, a brick which is warped, or cast crooked or hollow in burning.

HOUSSA, the capital of a flourishing and wealthy empire in the interior part of Africa, seated on the banks of the Niger. Its inhabitants are in such a high state of refinement and civilization, that the committee of the African Association can only account for it by supposing them to be the descendants of those ancient Carthaginians, who escaped from the massacre of their countrymen by the Romans. Their women are admitted freely into society. Their government is a limited monarchy, in which the negroes have a share; the rights of landed property are preserved by hereditary officers; their laws are severe, but kept in writing; their alphabetical characters are quite distinct from both the Hebrew and Arabic, and writing is in common use among them; their merchants are remarkable for probity; and their artists more skilled in some branches of manufactures, particularly in tempering of iron, than even the Europeans. Their files, for instance, are much superior to those of Britain and France. Their wheels used in the manufacture of pottery resemble those of the ancient Germans.

Houssa

Houssa, according to Major Rennel, in his last map of North Africa, lies in Lon. 4. 30. E. and Lat. 16. 20. N.

HOUSTONIA, in botany, a genus of the monogynia order, and tetrandria class of plants; natural order, Stellate. Corolla one-petaled, funnel-form; capsule superior, two-celled, two-seeded. There are two species, viz. *H. cœrulea*, with blue flowers; and *H. purpurea*, with purple flowers, natives of Virginia and Maryland.

HOUT BAY, a bay on the S. coast of Africa, N. N. W. of the Cape of Good Hope. Lon. 18. 19. E. Lat. 34. 5. S.

HOÛTCHEOU, a city of China, in the province of Tche-kiang.

HOÛTUYNIA, in botany, a genus of the monœcia monandria class and order. Natural order, Piperitæ. Calyx four-leaved; corolla none; stamens mixed with the pistils. There is only one species, viz. *H. cordata*, a native of Japan.

HOÛZOUANAS, a wandering nation of Africa, who inhabit the country between that of the Greater Nimiquas on the W. and Caffraria on the E.; situated, according to the map in Vaillant's Travels, between 16° and 29° Lon. E. It extends a great way N. from Lat. 23°; but how far is not known. When M. Vaillant was at the Cape, he was informed, that they formerly inhabited the country of Camdebo, the Snowy Mountains, and the district between them and Caffraria; and that they lived on peaceable and friendly terms with the European planters, till a set of lawless banditti, sent from Holland, subjected them to bondage, repaid their most laborious services with harsh treatment, and, when the Houzouanas fled to the mountains for refuge, pursued and massacred them like wild beasts: that on this they removed to the land which they now possess, but, enraged at their tyranny, swore in their own name, and that of their posterity, to be revenged of these European monsters. "And thus, (adds he,) if tradition says true, was a peaceful and industrious nation rendered warlike, vindictive, and ferocious;" and their hatred to the planters is perpetuated. Their courage and predatory habits render them the dread of all the surrounding tribes. Yet a Hottentot, who had lived many years among them, assured M. Vaillant, "that there are by no means murderers by profession; that they take up arms only to make just reprisals; that they live entirely by hunting; and that though they sometimes rob, when provisions fail, they never kill, except in self-defence, or in retaliation." On the whole, they appear, in many respects, to resemble the Arabs, being like them brave and addicted to rapine, but so unalterably faithful to their engagements, that they will defend to the last drop of their blood the traveller who purchases their service, and puts his confidence in them for protection. In M. Vaillant's opinion, "if it be at all practicable to travel from S. to N. through Africa, it can only be under the conduct of the Houzouanas;" and he thinks "that fifty men, of their brave temperate and indefatigable nation, would be sufficient to protect an enterprising European through that long and hazardous journey."

HOWARD, JOHN, Esq. a man of singular and transcendent humanity, was the son of a reputable upholsterer in St. Paul's Church-yard. He was born at Hackney, in 1726; and was put apprentice to M. N. Newnham, grocer, in Watling-street. His father died in 1742, leaving only this son and a daughter, to both of whom he bequeathed handsome fortunes; but by his will directed that his son should not be considered of age till he was twenty-five. His constitution being very weak, the remaining time of his apprenticeship was bought up, and he applied himself to the study of medicine and natural philosophy. Falling into a nervous fever, while he lodged with a widow lady, named Sarah Lardeau (a worthy woman, but an invalid), he was nursed with so much care and attention, that he resolved to marry her out of gratitude. In vain she expostulated with him upon the extravagance of such a proceeding, he being about twenty-eight, and she about fifty-one, years of age; but nothing could alter his resolution, and they were privately married about 1752. She was possessed of a small fortune, which he presented to her sister. During his residence at Newington, Mr. Howard, who was bred a dissenter, and stedfastly adhered all his life to that profession, gave 50*l.* to purchase the lease of a house near the meeting-house, and to appropriate it as a parsonage-house for the minister. His wife died Nov. 10, 1755, aged 54; and he was a sincere mourner for her death. About this time, he was elected F.R.S. In 1756 he ex-

perienced some of those evils which he afterwards made it his business to redress. He embarked that year in a Lisbon packet, to make the tour of Portugal; when the vessel was taken by a French privateer. "Before we reached Brest (says he, in his Treatise on Prisms, p. 11), I suffered the extremity of thirst, not having for above forty hours one drop of water, nor hardly a morsel of food. In the castle at Brest I lay six nights upon straw; and observing how cruelly my countrymen were used there and at Morlaix, whither I was carried next, during the two months I was at Carhaix upon parole, I corresponded with the English prisoners at Brest, Morlaix, and Dinan: at the last of those towns were several of our ship's crew, and my servant. I had sufficient evidence of their being treated with such barbarity, that many hundreds had perished, and that thirty-six were buried in a hole at Dinan in one day. When I came to England, still on parole, I made known to the commissioners of the sick and wounded seamen the sundry particulars, which gained their attention and thanks. Remonstrance was made to the French court: our sailors had redress; and those that were in the three prisons mentioned above were brought home in the first cartel ships. Perhaps (adds Mr. Howard) what I suffered on this occasion increased my sympathy with the unhappy people, whose case is the subject of this book." He afterwards made the tour of Italy; and at his return settled at Brokenhurst, a pleasant villa in the New Forest, near Lymington in Hampshire, having, April 25, 1758, married a daughter of Edward Leeds, Esq. of Croxton, Cambridgeshire, king's serjeant. This lady died in 1765, in child-bed, of her only child, a son, who unfortunately became lunatic. After her death Mr. Howard left Lymington, and purchased an estate at Cardington, near Bedford. "While he lived here in retirement (says Mr. Palmer, in his funeral sermon), his neat, but humble, mansion was ever hospitable to a few select friends; but was never the scene of luxurious banqueting. Though polite to all, he neither sought nor admitted the company of the profligate, however distinguished by rank or fortune. His charity had no bounds, except those of prudence; and was not more commendable for the extent of it, than for the manner in which it was exercised. He gave not his bounty to countenance vice and idleness, but to encourage virtue and industry. He was singularly useful in furnishing employment for the labouring poor of both sexes, when a scarcity of work rendered their situation most compassionate. Also, at other times, though never inattentive to the tale of woe, he was not easily imposed upon by it, but made himself acquainted with the case. He had indeed a general acquaintance with the cases and characters of the poor around him, and made it his business to visit the abodes of affliction. In circumstances of bodily disorder he often acted the part of a physician as well as a friend. But his kindness was not confined to the bodies of his fellow-creatures; it extended to their spiritual and immortal part. He used his advice, his admonitions, and influence, to discountenance immorality of all kinds, and to promote the knowledge and practice of religion. He provided for the instruction of poor children, by erecting and supporting schools. In short, he was a universal blessing to the village where he resided, in every part of which are to be seen the pleasing monuments of his munificence and taste. His liberality extended also to adjacent places; nor was it confined to persons of his own religious persuasion, but comprehended the necessitous and deserving of all parties; while he was particularly useful in serving the interest of the Christian society to which he belonged. What wonder if such a man were universally beloved? Was it possible he should have an enemy? One, however, he had (and I never heard of more), an idle and dissolute wretch, who, having been often reproved by him for his vices, formed the desperate resolution to murder him as he was going to public worship, which he almost always did on foot. But Providence remarkably interposed to preserve so valuable a life, by inclining him that morning to go on horseback a different road." But the sphere in which he hitherto moved was too narrow for his enlarged mind. Being appointed, in 1773, sheriff of Bedfordshire, this office brought the distress of prisoners more immediately under his notice. He personally visited the county-jail, where he observed such abuses, and such scenes of calamity, as he had before no conception of. He inspected the prisons in some neighbouring counties, and finding in them equal room for complaint, he determined to visit the principal prisons in England. The farther he proceeded, the

more shocking were the scenes he discovered, which induced him to exert himself to the utmost, for a general reform in those horrid places of confinement; considering it of the highest importance, not only to the wretched objects themselves, but to the community at large. Upon this subject he was examined in the house of commons, in March, 1774, when he had the honour of their thanks. This encouraged him to proceed. He visited all the prisons in the kingdom, together with the principal houses of correction. In 1775, he enlarged his circuit by going into Wales, Scotland, and Ireland, where he found the same need of reformation. One of his grand objects was, to put a stop to that shocking distemper, called the jail-fever, which raged so dreadfully in many of the prisons, as to render them to the last degree dangerous: a distemper by which more had been taken off than by the hands of the executioner; and which, in several instances, had been communicated from the prisoners into the courts of justice, and had proved fatal to the magistrates and judges, and to multitudes of persons who attended the trials, as well as to the families of discharged felons and debtors. Another end he proposed was, to procure the immediate release of prisoners, who, upon trial, were acquitted, but who often continued long to be unjustly detained for not being able to pay the accustomed fees: also to abolish many other absurd and cruel usages which had long prevailed. But the greatest object was to introduce a thorough reform of morals into our prisons: where he had found the most flagrant vices to prevail in such a degree, that they were become seminaries of wickedness and villany, and the most formidable nuisances to the community; in consequence of the promiscuous intercourse of prisoners of both sexes, and of all ages and descriptions; whereby the young and less experienced were initiated, by old and hardened sinners, into all the arts of villany, and the mysteries of iniquity; so that, instead of being reformed by their confinement (which should be the chief end of punishment), those that were discharged became more injurious to society than before. For the attainment of these great objects, Mr. Howard spared neither pains nor expence, and cheerfully exposed himself to much inconvenience and hazard; particularly from that malignant distemper, of which he saw many dying in the most loathsome dungeons, into which none, who were not obliged, besides himself, would venture. "I have been frequently (says Mr. Howard) asked what precautions I use to preserve myself from infection in the prisons and hospitals which I visit. I here answer, next to the free goodness and mercy of the Author of my being, temperance and cleanliness are my preservatives. Trusting in divine Providence, and believing myself in the way of my duty, I visit the most noxious cells; and while thus employed, I fear no evil. I never enter an hospital or prison before breakfast; and in an offensive room, I seldom draw my breath deeply." His laudable endeavours he had the pleasure to see, in some instances, crowned with success; particularly in regard to the healthiness of prisons, some of which were rebuilt under his inspection. Better provision was also made for the instruction of prisoners, by the introduction of bibles and other pious books into their cells, and a more constant attendance of clergymen. The gaolers likewise have, by act of parliament, been rendered incapable of selling strong liquors, which had been the source of much drunkenness and disorder. But for a minute detail of particulars the reader is referred to Mr. Howard's publications, which shew that much is yet wanting. With a view to a more general and happy regulation, and the reformation of criminals, he resolved to visit other countries; in hopes of collecting some information which might be useful in his own. For this purpose he travelled into France, Flanders, Holland, Germany, Switzerland, Prussia, and Austria, and visited Copenhagen, Stockholm, Petersburg, Warsaw, and some cities in Portugal and Spain. In all these expensive and hazardous journeys, he denied himself the usual gratifications of travellers, and declined the honours offered him by persons of the first distinction, applying himself solely to his grand object. To him the inspection of a jail, or hospital, was more grateful than all the entertainments of a palace. With what astonishment and gratitude he was received by their miserable inhabitants may easily be imagined, since while he made observations on their situation, he meditated their relief; and many distressed prisoners abroad, as well as at home, partook of his bounty, and some were liberated by it: for he considered all of every nation, and people, and tongue, as brethren. Nor was he sparing of his advice, or reproof, to persons of rank and

influence, whereby the miseries of their countrymen might be relieved. He courted the favour of none, nor feared the frowns of any; but, with a manly freedom, and a Christian fortitude, spoke his mind to crowned heads, particularly to the emperor Joseph II. in a manner to which they were not accustomed; which, however, in a person of such disinterested views procured him esteem, and in some instances proved effectual in relieving the miserable and oppressed. On his return, he published in 1777, "The State of the Prisons in England and Wales, with Preliminary Observations, and an Account of some Foreign Prisons," 4to. And, in 1778, he took a third journey through the Prussian and Austrian dominions, and the free cities of Germany and Italy. The observations made in this tour were published in 1780; with remarks respecting the management of prisoners of war, and the hulks on the Thames. In 1781 he again re-visited Holland, some cities in Germany, and the capitals of Denmark, Sweden, Russia, and Poland; and in 1783 some cities in Portugal and Spain, and returned through France, Flanders, and Holland. The substance of all these travels was afterwards thrown into one narrative, published in 1784. He also published a curious account of the Bastille, in 8vo.; that infamous French prison happily now no more. He next visited the lazarettos in France and Italy, to obtain information concerning the best methods to prevent the spreading of the plague. He then proceeded to Smyrna and Constantinople, where that most dreadful of human distempers prevailed, "pleasing himself with the idea of not only learning, but being able to communicate somewhat to the inhabitants of those distant regions." In the execution of this design, though he was so much exposed to danger, and actually caught the plague, "that merciful Providence (as he remarks) which had hitherto preserved him, was pleased to extend his protection to him in this journey also, and to bring him home once more in safety." In his return he re-visited the chief prisons and hospitals in the countries through which he passed, and afterwards went again to Scotland; and thence to Ireland, where he inspected the Protestant Charter Schools, in some of which he had observed shameful abuses, which he had reported to a committee of the Irish House of Commons. In this tour, he took a particular account of what he observed amiss in the conduct of this noble charity, with a view to a reform, and not without success. In the course of these journeys, various cities and communities paid him proper respect. At Dublin, he was created LL. D. by the university. At Glasgow and Liverpool he was enrolled among their honorary members. Upon his return, having again inspected the prisons in England, and the hulks on the Thames, to see what alterations had been made, he published the result of his last laborious investigations, in "An Account of the principal Lazarettos in Europe, with various Papers relative to the Plague, together with further Observations on some Foreign Prisons and Hospitals, and additional Remarks on the present State of those in Great Britain and Ireland," with a great number of curious plates. The work likewise contained Observations on Penitentiary Houses, for the Correction and Reformation of Criminals; of which he and Dr. Fothergill had been nominated by the king to be superintendants. He also published the Grand Duke of Tuscany's "New Code of Criminal Law, with an English Translation;" and of all his publications he gave a vast number of copies among his acquaintance. His laying open the horrors of despotism in France had nearly exposed him to suffer them; and had it not been for timely notice of our ambassador, he had ended his days in the Bastille. He concluded his Account of Lazarettos, with announcing his "intention again to quit his country, re-visit Russia, Turkey, &c. and extend his tour in the East. "I am not insensible (says he) of the dangers that must attend such a journey. Trusting, however, in the protection of that kind Providence which has hitherto preserved me, I calmly and cheerfully commit myself to the disposal of unerring wisdom. Should it please God to cut off my life in the prosecution of this design, let not my conduct be uncandidly imputed to rashness or enthusiasm, but to a serious deliberate conviction, that I am pursuing the path of duty; and to a sincere desire of being made an instrument of more extensive usefulness to my fellow-creatures than could be expected in the narrower circle of a retired life." Accordingly, he set out in summer 1789 on this hazardous enterprise; the principal object of which was to administer James's powder, a medicine in high repute in malignant fevers, under a strong persuasion that it would be equally efficaci-

ous in the plague. In this second tour, in the East, having spent some time at Cherson, a Russian settlement on the Dnieper, he caught, in visiting the Russian hospital, or as some say a young lady who was ill of it, a malignant fever, which carried him off on the twentieth of January, 1790, after an illness of about twelve days. He was buried, as he desired, in the garden of a villa, belonging to a French gentleman from whom he had received great civilities, by his faithful servant who had attended him in his former journeyings. While absent on his first tour to Turkey, &c. his character for active benevolence had so much attracted the public attention, that a subscription was set on foot to erect a statue to his honour, and in no long space above 1500*l.* was subscribed for that purpose. But in consequence of two letters from Mr. Howard himself to the subscribers, (inserted in the *Gent. Mag.* vol. lvii. p. 101,) the design was laid aside. It has, however, been resumed since his death: and surely of all the monuments ever erected by public gratitude to illustrious characters, none was ever erected in honour of worth so admirable as his—who devoted his time, his strength, his fortune, and finally sacrificed his life, in the pursuits of humanity: who (to adopt the expressive words of Burke) visited all Europe and the East, not to survey the sumptuousness of palaces, or the stateliness of temples; not to make accurate measurements of the remains of ancient grandeur, nor to form a scale of the curiosity of modern art; not to collect medals, or to collate MSS.; but to dive into the depth of dungeons; to plunge into the infection of hospitals; to survey the mansions of sorrow, and of pain; to take the gauge and dimensions of misery, depression, and contempt; to remember the forgotten; to attend to the neglected; to visit the forsaken; and to compare and collate the distresses of all men in all countries. His plan is original; and it is as full of genius as it is of humanity. It is a voyage of discovery, a circumnavigation of charity; and already the benefit of his labour is felt more or less in every country."

HOWDEN, a town in the East Riding of Yorkshire, sixteen miles S. E. of York, and twenty-three W. of Hull.

HOWDENSHERE, a small district of Yorkshire, so named from the above town which it surrounds, and watered by a conflux of several large rivers that fall into the Humber.

HOWE, RICHARD, EARL, a gallant admiral, was born in 1725, and entered the naval service at so early an age that at twenty he was appointed to the command of a sloop of war, in which he beat off two large French frigates, after a gallant action, for which he was made a post-captain. After a variety of active services he obtained the command of the Dunkirk of sixty guns, with which he captured a French sixty-four off Newfoundland. In 1757 he served under Admiral Hawke, and the year following was appointed commodore of a squadron, with which he destroyed a number of ships and magazines at St. Malo. In 1759 Prince Edward, afterwards Duke of York, was put under his care, and the commodore on the sixth of August took Cherbourg, and destroyed the bason. This was followed by the unfortunate affair of St. Cas, where he displayed his courage and humanity in saving the retreating soldiers at the hazard of his own life. The same year, at the death of his brother, he became Lord Howe, and soon afterwards had a great share in the victory over Comflans. When Admiral Hawke presented him, on this occasion, to the king, his majesty said, "your life, my lord, has been one continued series of services to your country." In 1763 he was appointed to the admiralty-board, where he remained till 1765, when he was made treasurer of the navy. In 1770 he was appointed commander-in-chief in the Mediterranean. In the American war he commanded the fleet on that coast. In 1782 he was sent to the relief of Gibraltar, which service he performed in sight of the French and Spanish fleets, but who slumped an action, though far superior in numbers. The year following he was made first lord of the admiralty, which office he soon afterwards resigned, but at the end of the year he was re-appointed, and continued in that station till 1788, when he was created an English earl. In 1793 he took the command of the channel-fleet, and June 1, 1794, he obtained a decisive victory over the French fleet. The same month he was visited on board his ship at Spithead by their majesties, when the king presented him with a magnificent sword, a gold chain, and medal. He also received the thanks of both houses, the freedom of London, and the applause of the nation. In 1795 he became general of the marines, and in 1797 was honoured with the garter. His lordship died in 1799, and was succeeded by his brother.

HOWE, CAPE, a promontory on the E. coast of New Holland. Lat. 37° 31' 15" S. Lon. from Greenwich, 145° 31' 07" W.

HOWE'S FORELAND, a cape on the coast of Kerguelen's Land. Lon. 69. 27. E. Lat. 48. 50. S.

HOWE'S ISLAND, or **LORD HOWE'S ISLAND**, a small island in the neighbourhood of New South Wales, discovered Feb. 17, 1788. Lon. 159. 4. E. Lat. 31. 36. S. Also, another island in the South Pacific Ocean. Lat. 16° 46' 30" S. Lon. 154° 6' 40" W. from Greenwich.

HOWITZ, or **HOWITZER**, a kind of mortar, mounted upon a field-carriage like a gun. The difference between a mortar and a howitz is, that the trunnions of the first are at the end, and at the middle in the last.

HOWTH, a promontory of Ireland, which forms the north entrance of the bay of Dublin. Lon. 6. 22. W. Lat. 53. 21. N.

HOY, a small vessel, chiefly used in coasting or carrying goods to or from a ship, in a road or bay, where the ordinary lighters cannot be managed with safety or convenience. It is difficult to describe, precisely, the marks of distinction between this vessel and some others of the same size, which are rigged in the same manner; because what is called a hoy in one place, is named a sloop or smack in another. It may be defined a small vessel, usually rigged as a sloop, and employed for carrying passengers and luggage from one place to another, on the sea-coast.

HOY, an island of Scotland, one of the larger Orkney isles.

HOYE, a town in Westphalia. Lon. 9. 0. E. Lat. 53. 5. N.

HRADISCH, a town of Moravia, thirty miles S. E. of Olmutz.

HUAHEINE, one of the **SOCIETY ISLANDS**, which see.

HUDDERSFIELD, a town of Yorkshire, in the West Riding, famous for its cloth-manufacture; twenty-five miles N. E. of Manchester, forty-two S. W. of York, and 189 N. W. of London.

HUDICKSWALL, a sea-port town of Sweden, in Helsingia. Lon. 18. 36. E. Lat. 61. 48. N.

HUDSON, a town of the United States, in Columbia county, in New York. Lon. 73. 40. W. Lat. 42. 20. N.

HUDSON'S BAY, a large bay of North America, lying between 51° and 69° of lat. N. discovered in 1610 by Henry Hudson, in his attempt to find a N. W. passage to the South seas.

HUDSON'S BAY COMPANY. See **COMPANY**.

HUDSON'S POINT, a cape of Antigua, on the S. W. coast. Lon. 61. 23. W. Lat. 17. 10. N.

HUDSON'S RIVER, a large river of the United States, which rises E. of Lake Ontario, and falls into the Atlantic Ocean, 10 miles S. of New York.

HUDSON'S STRAITS, the narrow Sea, between the Atlantic Ocean and Hudson's Bay, N. of Labrador.

HUDSONIA, in botany, a genus of the monogynia order, and dodecandria class of plants. No corolla; calyx five-leaved, tubular; stamina 15; capsule unilocular, trivalvular, trispermous. It has one species, a native of Virginia.

HUE AND CRY, in law, the pursuit of a person who has committed felony on the highway.—Of this custom, which is of British origin, the following deduction is given by Mr. Whitaker. "When it was requisite for the Britons to call out their warriors into the field, they used a method that was particularly marked by its expeditiousness and decisiveness, and remains partially among us to this moment. They raised a cry, which was immediately caught up by others, and in an instant transmitted from mouth to mouth through all the region. And, as the notice passed along, the warriors snatched their arms, and hurried away to the rendezvous. We have a remarkable description of the fact in Cæsar, and there see the alarm propagated in 16 or 17 hours through 160 miles in a line. In cases of felony, the party grieved, or any other, may resort to the constable of the vill; and, 1st, give him such reasonable assurance of the fact as the nature of the case will bear; 2. If he know the name of him that did it, he must tell the constable; 3. If he know it not, but can describe him, he must describe him, his person or his habit, or his house, or such circumstances as he knows, which may conduce to the discovery; 4. If the thing be done in the night, so that he knows none of these circumstances, he must mention the number of persons, or the way they took; 5. If none of all these can be discovered, as where a robbery, or burglary, or other felony, is committed in the night,

yet they are to acquaint the constable with the fact, and desire him to search his town for suspected persons, and to make hue and cry after such as may probably be suspected, as being persons vagrant in the same night; for many circumstances may happen to be useful for discovering a malefactor, which cannot at first be found out. For the levying of hue and cry, although it is a good course to have a justice's warrant, where time will permit, in order to prevent causeless hue and cry; yet it is not necessary, nor always convenient; for the felon may escape before the warrant be obtained. And upon hue and cry levied against any person, or where any hue and cry comes to a constable, whether the person be certain or uncertain, the constable may search suspected places within his vill, for the apprehending of the felon. And if the person, against whom the hue and cry is raised, be not found in the constabewick, then the constable, and also every officer to whom the hue and cry shall afterwards come, ought to give notice to every town round about him, and not to one next town only; and so from one constable to another until the offender be found, or till they come to the sea-side: and this was the law before the conquest. Hue and cry also is good, and must be pursued, though no person certain can be named or described.

HUEN, or **HUENA**, an island in the Baltic, 14 miles N. by E. of Copenhagen; famous for Tycho Brahe's observatory. Lon. 12. 42. E. Lat. 55. 55. N.

HUER, a name given to certain fountains in Iceland, of a most extraordinary nature; forming at times jets d'eau of scalding water 94 feet high and 30 in diameter, creating the most magnificent gerbes that can be imagined, especially when backed by the setting sun. They arise out of cylindrical tubes of unknown depths: near the surface they expand into apertures of a funnel-shape, and the mouths spread into a large extent of stalactitical matter, formed of successive scaly concentric undulations. The playing of these stupendous spouts is foretold by noises roaring like the cataract of Niagara. The cylinder begins to fill: it rises gradually to the surface, and gradually increases its height, smoking amazingly, and flinging up great stones. After attaining its greatest height it gradually sinks till it totally disappears. Boiling jets d'eau and boiling springs are frequent in most parts of the island. The most capital is that which is called Geyser or Geyser, in a plain rising into small hills, and in the midst of an amphitheatre, bounded by the most magnificent and various shaped icy mountains; among which the three-headed Hecla soars pre-eminent. See Plate LXXXV, fig. 9. These huers rise in the very sea, and form scalding fountains amidst the waves. Their distance from land is unknown; but the new volcanic isle, 12 miles off Reickenes, emitting fire and smoke, proves that the subterraneous fires and waters extend to that space; for those awful effects arise from the united fury of these two elements.

HUER, [*huer*, French, to cry,] one whose business is to call out to others.

HUESCA, an ancient town of Spain, in Arragon. Lon. O. 13. W. Lat. 42. 7. N.

HUESCAR, or **GUESCAR**, a town of Spain, 60 miles N. E. of Granada.

HUET, **PETER DANIEL**, a very learned French writer, born at Caen in Normandy, in 1630. Des Cartes's principles, and Bochart's sacred geography, led him to change his studies from the law to those of philosophy, mathematics, the languages, and antiquities. He contracted a very strict friendship with Bochart, and accompanied him to Sweden. Q. Christina would have engaged him in her service; but he, sensible of her inconstant temper, returned to France. All he brought with him was a copy of a M. S. of Origen, which he transcribed at Stockholm. He formed the plan of the commentaries in usum Delphini, and directed the execution. From motives of piety he entered into holy orders at the age of 46. Soon after this, he was presented to the abbey of Aunay; and in 1685 to the bishopric of Soissons, which he exchanged for that of Avranches. After ten years, he resigned, and was made abbot of Fontenay near Caen. A severe distemper weakened his body extremely, but not the vivacity of his genius: he wrote his own life in a very elegant style; and died in 1721, aged 91. He was a man of agreeable conversation, great probity, and immense erudition. His principal works are, 1. *De claris Interpretibus, et de optimo Genere interpretandi*: 2. *Origenis Commentaria*; Gr. et Lat. cum Notis: 3. *A Treatise on the Origin*

of the Romans: 4. *Demonstratio evangelica*, fol. 5. *Questiones Alnetanae de Concordia Rationis et Fidei*: 6. *Of the Situation of the terrestrial Paradise*; in French: 7. *A History of the Commerce and Navigation of the Ancients*, which has been translated into English: 8. *Commentarius de Rebus ad eum pertinentibus*; 9. *Huetiana*: 10. Latin and Greek verses, &c.

HUGONIA, in botany, a genus of the decandria order, and monadelphia class of plants. Five-styled; corolla five-petaled; drupe with a striated nut. There is but one species; viz. *H. mystax*, a native of the East Indies.

HUGONOTS, or **HUGUENOTS**, an appellation given by way of contempt to the reformed or Protestant Calvinists of France. The name had its first rise in 1560; but authors are not agreed as to the origin and occasion thereof. One of the two following seems to be the least forced derivations. One of the gates of the city of Tours is called the gate Fourgon, by corruption from feu Hugon, i. e. the late Hugon. This Hugon was once count of Tours according to Eginhardus, and was a very wicked man, so that after his death he was supposed to walk about in the night-time, beating all he met with: this tradition Thuanus mentions in his history. Davila and others pretend, that the nickname of Huguenots was first given to the French Protestants, because they used to meet in the night-time in subterraneous vaults near this gate of Hugon; and what seems to countenance this opinion is, that they were first called Huguenots at Tours. Others say that the leaguers gave this name to the reformed, because they were for keeping the crown upon the head of the royal line of Hugh Capet; whereas the leaguers were for giving it to the house of Guise, as descended from Charlemagne. Others derive it from a faulty French pronunciation of the German word eidgnossen, signifying confederates, originally applied to that valiant part of the citizens of Geneva, who entered into an alliance with the Swiss cantons, to maintain their liberties against the tyrannical attempts of Charles III. duke of Savoy. These confederates were called Eignots, whence Huguenots. The persecution which the Huguenots underwent has scarce its parallel in civil or ecclesiastical history: though they obtained a peace from Henry III. in 1576, it was of short continuance; and their sufferings, mitigated by the famous edict of Nantes, granted to them in 1598 by Henry IV. were again renewed, after the revocation of this edict, by Lewis XIV. in 1685.

HULK, in sea-language, an old ship of war, fitted with an apparatus, to fix or take out the masts of the king's ships, as occasion requires. The mast is extremely high, and properly strengthened by shrouds and stays, to secure the sheers, which serve, as the arm of a crane, to hoist out or in the masts of any ship lying along-side.

HULK signifies also any old vessel laid aside as unfit for further service. It is probably derived from the *hulke*, or vessels of burthen, of the ancient Grecians.

HULL, in sea-language, is a ship, without masts, yards, sails, or rigging. To strike a hull in a storm, is to take in the sails, and to lash the helm on the lee-side of the ship; and a ship is said to lie a hull, whose sails are thus taken in, and helm lashed a lee.

HULL, a river of Yorkshire, which falls into the Humber at Kingston upon Hull.

HULL, **KINGSTON UPON**. See **KINGSTON**.

HULPEN, a town of France in the department of Dyle, and late province of Austrian Brabant, 9 miles S. E. of Brussels.

HULST, an ancient and strong town of Batavia, in the department of the Meuse, and late province of Dutch Flanders; 16 miles W. of Antwerp.

HUMANITY, or **HUMANITIES**, in philology, grammar, rhetoric, and poetry, for the teaching of which, there are professors in the universities of Scotland, called Humanists.

HUMBER, a river formed by the Trent, Ouse, Derwent, and several other streams. It divides Yorkshire from Lincolnshire, and falls into the German Ocean near Holderness.

HUMBIRD. See **TROCHILUS**.

HUMBLE-BEE. See **BOMBYLUS**.

HUME, **DAVID**, was born at Edinburgh, in 1711. He was designed for the law, but not liking that profession, he applied to mercantile pursuits, and became in 1734 clerk in an eminent house at Bristol. But having a strong propensity to literature, he soon after went to France, where he wrote his treatise of Human Nature,

ture, which he published at London in 1738. This metaphysical work, however, met with an indifferent reception; nor were his *Moral Essays*, which appeared in 1742, more successful. About this time he resided with the marquis of Annandale as a companion, but soon after he became secretary to general Sinclair, whom he attended to Vienna and Turin; and while he was abroad his Enquiry concerning the Human Understanding was published at London. In 1752 appeared his *Political Discourses*, and his Enquiry concerning the Principles of Morals. In 1754 he published the first volume of the History of England, from the Accession of James I. to the Revolution. This work had little success; but the second, which came out in 1756, met with a better fate, and "helped (as the author said) to buoy up its unfortunate brother." About the same period he published his *Natural History of Religion*, which was smartly answered by Dr. Warburton in a pamphlet, which Mr. Hume attributed to Dr. afterwards bishop Hurd. In 1759 appeared his *History of the House of Tudor*, and in 1761 the more ancient part of the English History. The work had now acquired considerable celebrity, and the writer gained largely by its popularity, for besides the profits it brought him he obtained a pension through lord Bute. In 1763 he accompanied the earl of Hertford on his embassy to Paris, where in 1765 he remained as *charge d'affaires*. The year following he returned home, and became under-secretary of state to Mr. Conway. In 1769 he retired to his native country on an independent income. He died in 1776. After his death appeared a work by him, entitled, *Dialogues concerning Natural Religion*. One chief end of his metaphysical and religious writings is to extinguish every sentiment of religion. Mr. Hume was master of a good style of composition, and had the art of stating common objections in a new manner. His positions on religious points, however, are fallacious and frivolous. As a metaphysician he is sophistical and obscure, as a moralist lax and deceitful, and as an historian specious and partial.

HUMECTATION, in pharmacy, is the preparing a medicine by steeping it in water, to soften it when too dry, or to cleanse it, or prevent its subtle parts from being dissipated in grinding, or the like.

HUMECTATION is also used for the application of moistening remedies, such as fomentations, &c.

HUMERUS, in anatomy, the uppermost bone of the arm, popularly called the shoulder-bone; extending from the scapula, or shoulder-blade, to the upper end of the cubitus, or elbow. See **ANATOMY**.

HUMILITY, in ethics, is a virtue consisting in the moderate value which a person puts upon himself, and every thing relating to him. It is distinguished from affectation, bashfulness, and meanness.

HUMMING-BIRD. See **TROCHILUS**.

HUMOUR, in physiology, is used to express the fluids of the body; and, when, in a vitiated state, we say, that the fluids are full of humours. The only fluids of the body, which in their natural and healthful state, are called humours, are those in the eye; we say the aqueous humour, the crystalline humour, without meaning any thing morbid or diseased; yet, when we say that a person has got a humour in his eye, we understand it in the usual sense of a vitiated fluid.

HUMOUR. As the temper of the mind is supposed to depend upon the state of the fluids in the body, humour has come to be synonymous with temper and disposition. A person's humour, however, is different from his disposition, in this, that humour seems to be the disease of a disposition; it would be proper to say that persons of a serious temper or disposition of mind, were subject to melancholy humours; that those of a delicate disposition, were subject to peevish humours. Humour may be agreeable or disagreeable: but it is still humour; something whimsical, capricious, and not to be depended upon. An ill-natured man may have fits of good humour, which seem to come upon him accidentally, without any of the common moral causes of happiness or misery. A fit of cheerfulness constitutes good humour; and a man who has many such fits is a good-humoured man; yet he may not be good-natured; which is a character that supposes something more constant, equable, and uniform, than what was requisite to constitute good humour.

HUMOUR is also often used to express that quality of the ima-

gination, which bears a considerable resemblance to wit. Wit expresses sometimes what is more designed, concerted, regular, and artificial; humour, something that is more wild, loose, extravagant, and fantastical; something which comes upon a man by fits, which he can neither command nor restrain, and which is not perfectly consistent with true politeness.

HUMULUS, the *Hor*: a genus of the pentandria order, and dioecia class of plants; natural order, Scabridae. Male, calyx five-leaved; corolla none; female, calyx one-leaved, spreading obliquely, entire; corolla none; styles two; seed one, within a leaved calyx. There is only one species, viz. *H. lupulus*. See *Hor*.

HUNDRED, a division of a county: it was anciently so called either from its containing 100 families, or from its furnishing 100 able men for the king's wars. After king Alfred divided England into counties, and gave the government of each county to a sheriff, these counties were divided into hundreds, of which the constable was the chief officer.

HUNDRED COURT is only a larger Court Baron, being held for all the inhabitants of a particular hundred instead of a manor; and resembling the former in all points, except that it is of a greater jurisdiction.

HUNDSRUCK, in the late German constitution, a district of Germany, in the circle of the Upper Rhine.

HUNGARY, a kingdom of Europe, the greatest part of which was anciently called Pannonia. It had the name of Hungary, from the Hungns who subdued it in the ninth century. It lies between 18° and 22° Lon. E. and between 45° and 49° Lat. N. being bounded on the N. by the Carpathian mountains; on the S. by Servia, and the Drave; on the W. by Moravia, Austria, and Stiria; and on the E. by Wallachia and Transylvania. It is about 140 miles long, and 240 broad; and is divided into the Upper and Lower. The northern parts of the kingdom are mountainous and barren, but healthy; the southern parts are level, and extremely fruitful, but not very healthy. The country along the Danube, from Presburgh to Belgrade, for upwards of 200 miles, is one continued plain, and no soil can be more fertile; but the air, by the many swamps and morasses, is not so wholesome as on the higher and drier grounds. Here are mines of gold, silver, copper, iron, lead, quicksilver, cinnabar, antimony, yellow orpiment, sulphur, vitriol, marcasite, salt native and factitious, saltpetre, magnets, asbestos or stone flax, marble of several colours, alabaster, with diamonds, and all sorts of precious stones. Corn is in such plenty, that it is sold for one-sixth of its price in England. The grapes are large and luscious; and the wines preferred to any in Europe. There are vast numbers of cattle and horses, the latter mostly mouse-coloured, with buffaloes, deer, wild-fowl, game, and fish, and many species of wild beasts, particularly chamois-goats, bears, and lynxes. Besides vines, and the common sorts of vegetables, here are tobacco, saffron, buck-wheat, millet, melons, and chestnuts. Here also are excellent warm baths, and mineral springs of various qualities. The chief mountains are the Crapack or Carpathian, which is the general name for all those that separate this kingdom from Poland, Moravia, Silesia, and part of Austria. The sides of most of them are covered with wood, and their tops with snow. The chief rivers are the Danube, Drave, Save, Waag, Gran, Temes, Raab, and Theiss, all well stocked with fish. There are several lakes among the Carpathian mountains, and some in the lowlands. The inhabitants are a mixture of the descendants of the ancient Hungns, Slavonians, Camani, Germans, Wallachians, Greeks, Jews, Turks, and a wandering people called Zigduns, said to be of uncertain origin, but probably the same as those we call Gypsies. The Hungarians are said to be of a sanguine choleric temper, and somewhat fierce, cruel, proud, and vindictive. They have been always reputed good soldiers, being much more inclined to arms, martial exercises, and hunting, than to arts, learning, trade, or agriculture. The nobility affect great pomp and magnificence, and are much addicted to feasting and carousing. The men in general are strong and well proportioned. Their horse are called hussars, and their foot heydukes. The former wear a broad sword, or scymeter, and carry a hatchet or battle-ax. Five languages are spoken in this country, viz. the Hungarian, which is of Scythian origin, and has little or no affinity with any European tongue; the German, Slavonian, Wallachian, and Latin. The last is spoken, not only by the superior ranks, but also by the inferior, though very corruptly.

The disposal of the crown was disputed between the Turkish and German emperors for near 200 years: but after 1527, when Ferdinand archduke of Austria was advanced to the throne, the Austrians found means to influence the elections in such a manner, as to keep the crown in their family till 1687, when it was settled hereditarily on their heirs male; and now, in consequence of an act made by the diet at Presburg in 1723, in case of the failure of heirs-male, it is to descend to females. The states of the kingdom consist of the prelates, the barons, the gentry, and the royal towns. Hungary can easily bring into the field 100,000 men, regulars and militia; for there are 50,000 in actual pay, and the provinces furnish the other 50,000 when they are wanted. Presburg is the capital.

HUNGARY WATERS, are distilled water prepared from the tops or flowers of rosemary; so denominated from a queen of Hungary, for whose use it was first made.

HUNGER, an uneasy sensation, occasioned by long abstinence from food, when the body is in a state of perfect health. Without attempting to specify the different preparations used by the ancients, for the prevention of hunger, we shall merely communicate such substitutes as have been judiciously recommended on sudden emergencies; together with the most proper means of administering food to persons who have for a considerable time been deprived of aliment. In times of distress, life may be protracted with less pain and misery by a moderate allowance of water; because that fluid counteracts the acrimony and putrid tendency of the humours, while it furnishes the lungs with the degree of moisture essentially requisite to the performance of their functions. It is, however, a matter of serious consequence to such as are exposed to this dreadful calamity, to be provided with the means of alleviating its horrors, when about to undertake a long journey, in which they are apprehensive of a scarcity of provisions. The American Indians are supposed to use a preparation consisting of the juice of tobacco, and the shells of oysters, snails, or cockles, burnt so as to be reduced to the finest powder. These ingredients are dried, and formed into lozenges of a proper size to be held between the gum and the lip, so that, being gradually dissolved, they obtund or mitigate the sensations both of hunger and thirst. A more palatable and efficacious substitute for food, however, in a famishing situation at sea, is the powder of salep, which has been judiciously suggested by Dr. Lind, in order that it may form part of the provisions of every ship's company. This powder, together with portable soup, when dissolved in boiling water, forms a rich thick jelly, and one ounce of each article will furnish a whole day's subsistence for an adult. Indeed, from the experiments made on salep, by Dr. Percival, it appears to contain a larger quantity of nutritious aliment, in proportion to its bulk, than any other vegetable matter hitherto known as food. It also possesses the valuable property of suppressing the nauseous taste of salt water; and may thus be of great utility at sea, when fresh water is either wholly, so far consumed, that the mariners are "put upon short allowance." From the same mucilaginous property, it greatly tends to counteract the acrimony of both salted and tainted meat. When provisions are nearly exhausted, the most beneficial method of using salep in distressing circumstances will be, to mix it with an equal quantity of beef-suet, and form the whole into little balls. By swallowing this composition, at proper intervals, the coats of the stomach will be defended from irritation; and, these balls, like other oily and mucilaginous matters, being highly nutritive, and slowly digested, small portions are well calculated to support life, and thus to form an efficacious preservative against the most dreadful calamity that can possibly happen to mankind. Gum arabic is likewise a good substitute for, or addition to, salep, in the preparation above-mentioned; and, as it renders the whole mass more solid, it will require a degree of mastication, by which the saliva is separated and conveyed into the stomach; while it contributes to assuage the pains, both of hunger and of thirst. In attempting the restoration of those unfortunate persons who have endured the horrors of famine, we recommend the utmost precaution. Warmth, cordials, and the most nourishing broths, or jellies, are to be administered gradually, and with great circumspection; for otherwise, even these might prove fatal. The most judicious mode of communicating warmth to the exhausted patient, will be to place a healthy person on each side in contact with him, bathing the feet in warm water, and fomentations, may be advan-

tageously employed; but their temperature ought to be lower than that of the human body, and imperceptibly increased. New milk, weak broth, or water-gruel, may be used for both purposes, as well as in repeated clysters; because nourishment may, in this manner, be effectually conveyed into the body by different passages, which are most pervious during a state of long abstinence; provided the means of relief have not been too long delayed. Cordials should at first be given in very small doses, and much diluted: one of the best preparations is white-wine whey, which affords both a gentle stimulus and easy nutriment. When a patient's stomach acquires a little strength, a new-laid egg may be mixed with the whey, or given in some other form that may be more agreeable to his palate. Thus, he may progressively return to a more substantial diet; so that, by proper care and cheerful society, he will in a short time be restored to health.

HUNNINGUE, or **HUNNINGUEN**, a town of France, in the department of the Upper Rhine and late province of Alsace, strongly fortified by Vauban. Lon. 11. 40. E. Lat. 47. 42. N.

HUNNS, a fierce and savage nation, who formerly inhabited that part of Sarmatia bordering on the Palus Mæotis and the Tanais, the ancient boundary between Europe and Asia. Hungary obtained its name from this people who conquered it, and spread themselves over Transylvania, Wallachia, Servia, Carniola, Carinthia, and the greater part of Austria, together with Bosnia, Slavonia, and Hungary.

HUNTER, Dr. WILLIAM, a celebrated anatomist and physician, was born 23d May 1718, at Kilbride in Lanarkshire. His father had designed him for the church; but the idea of subscribing to articles of faith was repugnant to the liberal mode of thinking he had already adopted. In this state of mind he happened to become acquainted with the late celebrated Dr. Cullen, then just established at Hamilton. Dr. Cullen's conversation soon determined him to devote himself to the profession of physic. His father having consented, he, in 1737, went to reside with Dr. Cullen. In the family of this excellent preceptor he passed nearly three years; and these, as he often acknowledged, were the happiest of his life. It was then agreed, that he should prosecute his medical studies at Edinburgh and London. He accordingly set out for Edinburgh in Nov. 1740; where he attended the lectures of the medical professors, and in particular those of the late celebrated Dr. Munro. Mr. Hunter arrived in London in summer 1741, and took up his residence with Dr. Smellie, then an apothecary in Pall Mall. He brought with him a letter of recommendation to his countryman Dr. James Douglas, from Mr. Foulis, printer at Glasgow. Dr. Douglas was then intent on a great anatomical work on the bones, which he did not live to complete, and was looking out for a young man of abilities and industry whom he might employ as a dissector. This induced him to pay particular attention to Mr. Hunter; and finding him acute and sensible, he invited him into his family to assist in his dissections, and to superintend the education of his son, which Mr. Hunter accepted. In 1743 he communicated to the Royal Society an Essay on the Structure and Diseases of articulating Cartilages. As this subject till then had not been sufficiently investigated, it afforded a striking testimony of the rapid progress he had made in his anatomical inquiries. As he had it in contemplation to teach anatomy, his attention was directed principally to this object. He did not however precipitately engage in this attempt, but passed several years in acquiring such a degree of knowledge, and such a collection of preparations, as might insure him success. Dr. Nichols, to whom he communicated his scheme, and who declined giving lectures about that time in favour of the late Dr. Lawrence, did not give him much encouragement. But at length an opportunity occurred for the display of his abilities as a teacher. A society of navy-surgeons had an apartment in Covent Garden, where they engaged the late Mr. Samuel Sharpe to deliver a course of lectures on the operations of surgery. Mr. Sharpe continued to repeat this course, till, finding that it interfered too much with his other engagements, he declined the task in favour of Mr. Hunter; who gave the society so much satisfaction, that, in winter 1746, they requested him to extend his plan to anatomy, and gave him the use of their room for his lectures. He experienced much solicitude when he began to speak in public: but the applause he met with soon inspired him with courage; and by degrees he became so fond of teaching, that for many years before his death he was never happier

pier than when delivering a lecture. In 1747, he was admitted a member of the corporation of surgeons; and in spring 1748, soon after the close of his lectures, he set out in company with his pupil, Mr. James Douglas, on a tour through Holland to Paris. He returned to London early enough to begin his winter-course of lectures about the usual time. In 1750, he obtained the degree of M. D. from the university of Glasgow, and began to practise as a physician; and went to reside in Jernyn-street. In 1753, on the resignation of Dr. Layard, one of the physicians of the British lying-in hospital, the governors voted their "thanks to Dr. Hunter for the services he had done the hospital, and for his continuing in it as one of the physicians;" so that he seems to have been established in this office without the usual form of an election. In 1756, he was admitted a licentiate of the Royal College of Physicians. Soon afterwards he was elected a member of the Medical Society; and to the Observations and inquiries published by that society, he at different periods contributed several valuable papers. In 1762, we find him warmly engaged in controversy, supporting his claim to different anatomical discoveries, in a work entitled *Medical Commentaries*, the style of which is correct and spirited. In this publication he confined himself chiefly to a dispute with the present learned professor of anatomy at Edinburgh, concerning injections of the testicle, the ducts of the lachrymal gland, the origin and use of the lymphatic vessels, and absorption by veins. He likewise defended himself against a reproach thrown upon him by Dr. Monro senior, by giving a concise account of a controversy he was involved in with Mr. Pott concerning the discovery of the *Hernia Congenita*. In 1767, Dr. Hunter was elected F. R. S.; and in 1768 communicated to that learned body observations on the bones, commonly supposed to be elephants' bones, which have been found near the Ohio in America. In a subsequent volume of the *Philosophical Transactions* we find him offering his remarks on some bones found in the rocks of Gibraltar, and which he proves to have belonged to some quadruped. In the same work, likewise, he published an account of the nyl-gbau, an Indian animal not described before. In 1768 he became a fellow of the Society of Antiquaries; and at the institution of a Royal Academy of Arts, he was appointed by his majesty to the office of professor of anatomy. This opened a new field for his abilities; and he engaged in it, with his usual unabating zeal. He now adapted his anatomical knowledge to painting and sculpture, and the novelty and justness of his observations proved the readiness and extent of his genius. In Jan. 1781, he was unanimously elected president of the Medical Society. His name and talents were now known and respected in every part of Europe. In 1780, the Royal Medical Society at Paris elected him one of their foreign associates; and in 1782, he received a similar mark of distinction from the Royal Academy of Sciences in that city. The most splendid of his medical publications was the *Anatomy of the Human Gravid Uterus*. This great work, which had been begun so early as 1751, was delayed till 1775, only by the author's desire of sending it into the world as perfect as possible. It is dedicated to the king. In 1755, he communicated to the Royal Society an Essay on the Origin of the Venereal Disease. In 1777, he joined with Mr. Watson in presenting to it a short account of the late Dr. Maty's illness, and of the appearances on dissections; and in 1778 he published his *Reflections on the Section of the Symphysis Pubis*. He died in 1783.

HUNTER, JOHN, a late celebrated anatomist, brother of the Dr. was born at Long Calderwood on the 14th July, 1728. His father dying when he was about ten years of age, he was, perhaps, too much indulged by his mother; in consequence of which he made so little progress in learning, that he is said to have been put apprentice to a carpenter. He soon however tired of this employment, and hearing of his brother's success, who was then the most celebrated teacher of anatomy in London, John expressed a desire to assist him in his researches. The doctor, willing to serve him, invited him to London, where he arrived in Sept. 1748; and anxious to form some opinion of his talents for anatomy, gave him an arm to dissect for the muscles, with the necessary directions; and John's performance greatly exceeded his expectation. Having thus gained some credit with the Dr. by his first essay, Mr. Hunter was next employed in dissecting an arm, in which all the arteries were injected, and these, as well as the muscles, were to be exposed and preserved. The manner in which this was performed

gave Dr. Hunter so much satisfaction, that he prognosticated that his brother would soon become a good anatomist. From this period Mr. Hunter seriously engaged in anatomy, and under the instructions of his brother, and his assistant Mr. Symonds, he had every opportunity of improvement. In summer 1749, he attended Mr. Cheselden, at Chelsea Hospital; where he learned the first rudiments of surgery. In winter 1749, he was so far advanced in anatomical knowledge, that the Dr. entrusted to him the instruction of his pupils in dissection, which was now his constant employment during winter. In summer 1750, he attended the hospital at Chelsea; in 1751, he became a pupil at St. Bartholomew's, and in winter was present at all operations, when any thing extraordinary occurred. In 1752, he went to Scotland; and in 1753 entered, as a gentleman-commoner at St. Mary hall, Oxford. In 1754 he became a surgeon's pupil at St. George's hospital, where he continued during summer; and in 1756 was appointed house-surgeon. In winter 1755, his brother admitted him to a partnership in his lectures, and a certain portion of the course was allotted to him: besides giving lectures when the Doctor was called away to patients. Making anatomical preparations was at this time a new art, and little known; every preparation, therefore, that was skilfully made, became an object of admiration, and many were wanting for the use of the lectures. Anatomy seems indeed to have been a pursuit for which Mr. Hunter's mind was peculiarly fitted, and he applied to it with an ardour and perseverance of which there are few or no examples. His labours were so useful to his brother's collection, and so gratifying to his disposition, that although in many other respects they did not agree, this simple tie kept them together for many years. Mr. Hunter worked for ten years on human anatomy, during which period he traced the ramifications of the olfactory nerves upon the membranes of the nose, and discovered the course of some of the branches of the fifth pair of nerves. In the gravid uterus, he traced the arteries to their termination in the placenta. He was also the first who discovered the existence of the lymphatic vessels in birds. Many parts of the human body being so complex, that their structure could not be understood, nor their uses ascertained, Mr. Hunter examined similar parts in other animals, in which the structure was more simple, and more within the reach of investigation; this carried him into a wide field, and laid the foundation of his collection in comparative anatomy. In these new pursuits, this active inquirer began with the more common animals, and preserved such parts as appeared, by analogy, to elucidate the human anatomy. It was not his intention to make dissections of particular animals, but to institute an inquiry into the various organizations by which the functions of life are performed, that he might thereby acquire some knowledge of general principles. So eagerly did he attach himself to comparative anatomy, that he embraced every means of prosecuting it to advantage. He applied to the keeper of wild beasts in the Tower for the bodies of those which died there; and he made similar applications to the men who shewed wild beasts. He purchased all rare animals which he heard of, and entrusted them to the showmen to keep till they died, to encourage them to assist him in his investigations. His health was so much impaired by excessive attention to his pursuits, that he was advised to go abroad. In Oct. 1760, therefore, Mr. Adair, inspector-general of hospitals, appointed him a surgeon on the staff; and in spring 1761 he went with the army to Belleisle. Mr. Hunter served as senior surgeon on the staff, both in Belleisle and Portugal, till 1763; and in that period acquired his knowledge of gun-shot wounds. On his return he settled in London; where he taught anatomy and surgery for several winters, and resumed his researches in comparative anatomy; and as his experiments could not be carried on in a large town, he purchased for that purpose, about two miles from London, a piece of ground near Brompton, at a place called Earl's Court, on which he built a house. In the course of his inquiries, he ascertained the changes which animal and vegetable substances undergo in the stomach by the action of the gastric juice; he discovered, by feeding young animals with madder (which tinges growing bones red,) the mode in which a bone retains its shape during its growth; and explained the process of exfoliation, by which a dead piece of bone is separated from the living. On the 5th Feb. 1767, he was chosen F. R. S. and about this time he had frequent meetings, after the business of the society was over on scientific subjects, with Dr. G. Fordyce, Mr.

Cumming, Sir Joseph Banks, Dr. Solander, Dr. Maskelyne, Sir G. Shuckburgh, Sir H. Englefield, Sir C. Blagden, Dr. Nootie, Mr. Ramsden, Mr. Watt of Birmingham, &c. At these meetings discoveries and improvements in philosophy were discussed, and the works of the members were read over and criticised before they were given to the public. This year, by an exertion in dancing, he broke his tendo achillis, which led him to pay attention to the subject of broken tendons, and to make experiments to ascertain the mode of their union. In 1768, he became a member of the corporation of surgeons; and in 1769, was elected one of the surgeons of St. George's hospital. In May 1771, his *Treatise on the Natural History of the Teeth* was published; and in July he married Miss Home, daughter of Mr. Home, surgeon to Burgoyne's regiment. After his marriage, his private practice and professional character advanced rapidly. He omitted no opportunity of examining morbid bodies; from which he made a collection of facts which are invaluable, as they tend to explain the causes of symptoms, which during life could not be ascertained; the judgement of the practitioner being too frequently misled by theoretical opinions, and delusive sensations of the patients. In the practice of surgery, when the operations proved inadequate to their intention, he always investigated the causes of that want of success; and thus detected many fallacies, as well as made some useful experiments in the healing art. He likewise detected the cause of failure, common to all the operations which were in use for the radical cure of the hydrocele; and was enabled to propose a mode of operating, in which that event can with certainty be avoided. The collection of comparative anatomy which Mr. Hunter has left, and which may be considered as the great object of his life, must be allowed to be a proof of talents, assiduity, and labour, which cannot be contemplated without admiration. It remains an unequivocal test of his perseverance and abilities, and an honour to the country. In this collection we find an attempt to unveil the gradations of nature, from the most simple state in which life exists, up to the most perfect and most complex of the animal creation—man himself. By the powers of his art, this collector has been enabled so to expose and preserve in spirits, or in a dried state, the different parts of animal bodies intended for similar uses, that the various links of the chain of perfection are readily followed, and may be clearly understood. This collection of anatomical facts is arranged according to the subjects they are intended to illustrate, which are placed in the following order: 1. Parts constructed for motion. 2. Parts essential to animals respecting their own internal economy. 3. Parts superadded for purposes connected with external objects. 4. Parts for the propagation of the species, and maintenance or support of the young. Mr. Hunter died suddenly, October 16, 1793.

HUNTINGDON, the county-town of Huntingdonshire, seated on the N. side of the Ouse. Lon. 0. 15. W. Lat. 52. 23. N.

HUNTINGDON, a town and county of Pennsylvania.

HUNTINGDONSHIRE, a county of England, bounded on the S. by Bedfordshire; on the W. and N. by Northamptonshire; and on the E. by Cambridgeshire. It is 36 miles long from N. to S. 24 broad from E. to W. and nearly 67 in circumference. The E. side is fenny. The rest is diversified by rising hills and shady groves, and is watered by the Ouse and the Nen. The air is in most parts pleasant and wholesome, except among the fens and meres. The soil is fertile, and produces great crops of corn; and the hilly parts and fenny parts afford good pasture for sheep.

HUNTLY, a town and parish of Scotland in Aberdeenshire.

HUNTING, the exercise, or diversion, of pursuing wild quadrupeds, whether those of game or prey. Hunting has at all times been a favourite amusement, as well among the rudest, as the most polished nations. Much, however, has been said both for and against the continuance of this practice. The late Frederic the Great, of Prussia, never joined in the chase. Where wild or voracious animals abound, or where the object of hunting is to procure the necessary supply of food, the chase is doubtless justifiable. But, when it is attended with such mischief as is often the case in highly cultivated districts, we conceive, it ought to be gradually abolished. Nor should it be urged by professional sportsmen, that, without being chased, wild animals would multiply in such numbers as to become dangerous to men and cattle. This plea, however specious, is not conclusive; because we are in possession of various methods by which animals of prey might be

entrapped, taken, or otherwise exterminated, without any danger or inconvenience to the huntsmen.

HUNTSPIL, a town of Somersetshire, 5 miles N. of Bridgewater.

HURA, in botany, a genus of the monadelphia order, and monœcia class of plants; natural order, Tricocœæ. Ament of the male imbricated; perianth truncated; no cordla: filaments cylindrical, peltated on top, surrounded with numerous or double antheræ. The female has neither calyx nor corolla: style funnel-shaped; stigma cleft in twelve parts; capsule twelve celled, with a single seed in each cell. There is but one species, viz.

H. CREPITANS, SAND-BOX-TREE, a native of the West Indies. It rises with a soft ligneous-stem to the height of twenty-four feet, dividing into many branches, which abound with a milky juice, and have scars on their bark where the leaves have fallen off. The kernels are said to be purgative, and sometimes emetic.

HURDLE, a sledge used to draw traitors to the place of execution.

HURDLES, in fortification, twigs of willows or osiers interwoven close together, sustained by long stakes, in the figure of a long square, the length being five or six feet, and the breadth three and a half. The closer they are wattled together, the better. They serve to render the batteries firm, or to consolidate the passage over muddy ditches; or to cover traverses and lodgements for the defence of the workmen against fireworks or stones. The Romans had a kind of military execution for mutineers, called putting to death under the hurdle. The criminal was laid at his length in a shallow water, under an hurdle, upon which was heaped stones, and so pressed down till he was drowned.

HURDLES, in husbandry, certain frames made either of split timber, or of hazel-rods wattled together, to serve for gates in inclosures, or to make sheep-folds, &c.

HURDUAR, a town of Hindoostan, in Delhi. Lon. 78. 15. E. Lat. 29. 35. N.

HURL-BONE, in a horse, a bone near the middle of the buttock, which is very apt to go out of its sockets with a hunt or strain.

HURON, an immense lake of North America, one of the five principal ones which lie partly in the British territories, and partly in those of the United States. Its form is nearly triangular, and its circumference above 1000 miles, being upwards of 240 miles long from E. to W. and 180 broad from N. to S. Mr. Hutchins computes, that it covers 5,009,920 acres. It lies between 80° 10' and 84° 30' Lon. W. and between 43° 30' and 46° 10' Lat. N.

HURON, a river of the United States, in the North Western Territory, which rises near the Sciota, and running N. E. falls into Lake Erie.

HURONS, a nation of North American Indians, who reside on the banks of the above lake, and whose language is spoken over a great extent in the southern parts of America.

HURRICANE, a furious storm of wind, owing to a contrariety of winds. Hurricanes are frequent in the West Indies, where they make terrible ravages, by rooting up trees, destroying houses and shipping, and the like. The natives, it is said, can foretell hurricanes by the following prognostics: 1. All hurricanes happen either on the day of the full, change, or quarter, of the moon. 2. From the unusual redness of the sun, the great stillness, and at the same time turbulence, of the skies, swelling of the sea, and the like, happening at the change of the moon, they conclude there will be a hurricane next full moon; and if the same signs be observed on the full moon, they may expect one next new moon. "The ruin and desolation accompanying a hurricane, (says Dr. Mosely in his *Treatise on Tropical Diseases*,) cannot be described. Like fire, its resistless force consumes every thing in its track, in the most terrible and rapid manner. It is generally preceded by an awful stillness of the elements, and a closeness and mistiness in the atmosphere, which makes the sun appear red, and the stars larger. But a dreadful reverse succeeding—the sky is suddenly overcast and wild—the sea rises at once from a profound calm into mountains—the wind rages and roars like the noise of cannon—the rain descends in deluges—a dismal obscurity envelopes the earth with darkness—the superior regions appear rent with lightning and thunder—the earth often does and always seems to tremble—terror and consternation distract all nature—birds are carried from the woods

woods into the ocean; and those whose element is the sea, seek for refuge on land—the frightened animals in the field assemble together, and are almost suffocated by the impetuosity of the wind in searching for shelter; which, when found, serves only for destruction—the roofs of houses are carried to vast distances from their walls, which are beat to the ground, burying their inhabitants under them—large trees are torn up by the roots, and huge branches shivered off, and driven through the air in every direction, with immense velocity—every tree and shrub that withstands the shock, is stripped of its boughs and foliage—plants and grass are laid flat on the earth—luxuriant spring is changed in a moment to dreary winter. This dreadful tragedy ended, when it happens in a town, the devastation is surveyed with accumulated horror: the harbour is covered with wrecks of boats or vessels; and the shore has not a vestige of its former state remaining. Mounds of rubbish and rafters in one place, heaps of earth and trunks of trees in another, deep gullies from torrents of water, and the dead and dying bodies of men, women, and children, half-buried, and scattered about, where streets but a few hours before were, present the miserable survivors with a shocking conclusion of a spectacle to be followed by famine, and when accompanied by an earthquake, by mortal diseases.” These destructive phenomena are now thought to arise from electricity, though the manner in which it acts in such cases is unknown. See WIND, WHIRLWIND, &c.

HURTERS, in fortification, pieces of timber about six inches square, placed at the lower end of the platform, next the parapet, to prevent the wheels of the gun-carriage from hurting the parapet, whence the name.

HUS, or **HUSSU**, a town of European Turkey, in Moldavia, 70 miles S. W. of Bender.

HUSBAND AND WIFE, usually called baron and femme, are one person in law: that is, the very being or legal existence of the woman is suspended during the marriage, or at least is incorporated and consolidated into that of the husband, under whose wing, protection, and cover, she performs every thing. She is therefore called a femme couverte, that is, under the protection and influence of her husband, her baron, or lord; and her condition during her marriage is called her coverture. A man cannot grant lands to his wife during her coverture, nor any estate or interest to her, nor enter into covenant with her. But he may by his deed covenant with others for her use, as for her jointure, or the like; and he may give to her by devise or will, because the devise or will does not take effect till after his death. 1 Inst. 112. All deeds executed by the wife, and acts done by her during her coverture, are void, except a fine, or the like matter of record, in which case she must be solely and secretly examined, that it may be known whether or no her act is voluntary. 1 Black. 444. A wife is so much favoured in respect of that power and authority which her husband has over her, that she shall not suffer any punishment for committing a bare theft in company with, or by coercion of her husband. But if she commits a theft of her own voluntary act, or by the base command of her husband, or is guilty of treason, murder, or robbery, in company with, or by coercion of, her husband, she is punishable as much as if she was sole; because of the odiousness and dangerous consequences of these crimes. 1 Haw. 2. By marriage the husband has power over his wife's person; and the courts of law still permit an hus-

band to restrain a wife of her liberty, in case of any gross misbehaviour. But if he threaten to kill her, &c. she may make him find surety of the peace, by suing a writ of supplicavit out of chancery, or by preferring articles of the peace against him in the court of king's bench, or she may apply to the spiritual court for a divorce propter savitatem. The husband by marriage obtains a freehold in right of his wife, if he takes a woman to wife that is seised of a freehold; and he may make a lease thereof for twenty-one years, or three lives, if it is made according to the statute, 32 Hen. VIII. c. 28. The husband also gains a chattel real, as a term for years, to dispose of if he please by grant or lease in her life-time, or by surviving her: otherwise it remains with the wife. And upon execution for the husband's debt, the sheriff may sell the term during the life of the wife. 1 Inst. 351. The husband also by the marriage has an absolute gift of all chattels personal in possession of the wife in her own right, whether he survives her or not. But if these chattels personal are chosen in action, that is, things to be sued for by action, as debts by obligation, contract, or the like, the husband shall not have them, unless he and his wife recover them. 1 Inst. 351. By custom in London, a wife may carry on a separate trade; and as such, is liable to the statutes of bankruptcy with respect to the goods in such separate trade, with which the husband cannot intermeddle. Burr. 1776. If the wife is indebted before marriage, the husband is bound afterwards to pay the debt, living with the wife; for he has adopted her and her circumstances together. 1 Black. 143. But if the wife dies, the husband shall not be charged for the debt of his wife after her death, if the creditor of the wife does not get judgement during the coverture. 9 Co. 72. The husband is bound to provide his wife necessaries; and if she contract for them, he is obliged to pay for the same; but for any thing besides necessaries, he is not chargeable. And also if a wife elope, and live with another man, the husband is not chargeable even for necessaries; at least if the person who furnishes them be sufficiently apprized of her elopement. 1 Black. 442. A man having issue by his wife born alive, shall be tenant by the courtesy of all the lands in fee simple, or fee tail general, of which she shall die seised. Litt. 52. And after her death he shall have all chattels real: as the term of the wife, or a lease for years of the wife, and all other chattels in possession; and also, all such as are of mixed nature (partly in possession and partly in action,) as rents in arrear, incurred before the marriage or after: but things merely in action, as of a bond or obligation to the wife, he can only claim them as administrator to his wife, if he survive her. Wood, b. 1. c. 6. If the wife survive the husband, she shall have for her dower the third part of all his freehold lands: so she shall have her term for years again, if he have not altered the property during his life: so also she shall have again all other chattels real and mixed: and so things in action, as debts, shall remain to her, if they were not received during the marriage. Id. But if she elope from her husband, and go away with her adulterer, she shall lose her dower, unless her husband had willingly, without coercion ecclesiastical, been reconciled to her, and permitted her to cohabit with him. 1 Inst. 32.

HUSBAND-LAND, a term used in Scotland for a portion of land containing six acres of sock and scythe land; that is, of land that may be tilled with a plough, and mown with a scythe.

HUSBANDRY.

HUSBANDRY. This term comprehends the whole business of a farmer, or one who maintains himself and family by cultivating the earth. It includes the whole practice of agriculture; in which we have to consider the nature of the soils to be cultivated. Its practice demands a considerable knowledge of the relations subsisting between the most important objects of nature. It is eminently conducive to the advantage of those actively engaged in it, by its tendency to promote their health, and to cherish in them a manly and ingenuous character; and every improvement made in the art must be considered as of high utility, as it facilitates the

subsistence of a greater proportion of rational and moral agents; or if we suppose the number to be unincreased, furnishes them with greater opportunities than could be possessed before, of obtaining that intellectual and moral enjoyment which is the most honourable characteristic of their nature. The strength of nations is in proportion to their skilful cultivation of the soil; and their independence is secured, and their patriotism animated, by obtaining from their native soil all the necessaries for a comfortable and happy existence. The methods of correcting those which are unfavourable to the production of useful vegetables; the improve-

ment of such as are fittest for facilitating the operations of agriculture, the means and powers best adapted for such purposes; the cattle and live stock most profitable to man, whether for labour or more immediate use as food; the grass, grain, roots, and pulse, most beneficial to him; and the minor subjects connected with this important science. The culture of the earth is coeval with man; his beneficent Creator placed him in a well-stored garden, enjoining him "to dress and to keep it;" and when after the fatal lapse of obedience, he was driven from his paradisiacal situation, a new injunction was laid on him to till the ground. However, we are not to suppose that he was acquainted with all the methods of ploughing, harrowing, fallowing, &c. which are now made use of; and it would be equally absurd to imagine, that he used such clumsy and unartful instruments as wooden hoes, horns of oxen, &c. to dig the ground, which were afterwards employed for this purpose by certain savages. The prodigious length of life which the antediluvians enjoyed, must have been very favourable to the advancement of arts and sciences, especially agriculture, to which it behoved them to apply themselves early and assiduously, to procure their subsistence. It is probable, therefore, that, even in the antediluvian world, arts and sciences had made great progress, nay, might be farther advanced in some respects than they are at present. The discovery of metallurgy, upholstery, and instrumental music, by the descendants of Cain, as recorded by Moses, afford a strong probability of this having been the case. But by the terrible catastrophe of the flood, which overwhelmed the whole world, many sciences would be entirely lost, and agriculture would suffer; as it was impossible that Noah or his children could put in practice, or perhaps know, all the different methods of cultivating the ground that had been formerly used. The common methods, however, we cannot but suppose to have been known to him and his children, and by them transmitted to their posterity: so that as long as mankind continued in one body without being dispersed into different nations, the arts, agriculture especially, would necessarily advance; and that they did so, is evident from the undertaking of the tower of Babel. It is from the dispersion of mankind consequent upon the confusion of tongues, that we must date the origin of savage nations. In all societies where different arts are cultivated, there are some persons who have a kind of general knowledge of most of those practised through the whole society, while others are in a manner ignorant of every one of them. If we suppose a few people of understanding to separate from the rest, and become the founders of a nation, it will probably be a civilized one, and the arts will begin to flourish from its very origin; but, if a nation is founded by others whose intellects are in a manner callous to every human science (and of this kind there many in the most learned countries), the little knowledge or memory of arts that were among the original founders will be lost, and such a people will continue in a state of barbarism for many ages, unless the arts be brought to them from other nations. Different nations have always been in a different state of civilization; and agriculture, like other arts, has always been in different degrees of improvement among different nations at the same time. As soon as the descendants of Abraham were settled in Palestine, they generally became husbandmen, from the chiefs of the tribe of Judah to the lowest branch of the family of Benjamin. High birth or rank did not then make any distinction, for agriculture was considered as the most honourable of all employments: witness the illustrious examples of Gideon, Saul, and David. The Chaldeans, who inhabited the country where agriculture had its birth, carried that valuable art to a degree of excellence unknown in former times. They cultivated their lands with great assiduity, and seem to have found out means of restoring fertility to an exhausted soil, by having plentiful harvests in succession; on which account they were not obliged, as their predecessors had been, to change their situations, to procure a sufficiency for themselves and their numerous flocks and herds. The Egyptians, Phœnicians, Indians, Grecians, Carthaginians, and Romans, paid great attention to husbandry, and were remarkable for their skill in this advantageous employment. In our own country, we find that the art of husbandry was at a low ebb until the fourteenth century; at which time it began to be practised in the midland and south-western parts of England; yet it seems not to have been cultivated as a science, until the latter end of the sixteenth century; when Fitzherbert, a judge of the common pleas, studied

the nature of soils and the laws of vegetation with philosophical attention; and in 1534 published his first work entitled, "The Book of Husbandry." Beyond which, small advances only were made in the theory until the time of the commonwealth; when Sir Hugh Platt, one of the completest husbandmen of the age, discovered and brought into use a multitude of manures, little thought of by others, for meliorating and fertilizing exhausted soils. At the time of the Restoration, agriculture appears to have suffered considerable neglect, until Evelyn and Tull, by their literary labours, very much promoted the study. Since their days, many valuable improvements have been made in the practice, and many are the writers who have rendered essential services, by enlightening the minds of their countrymen, and exciting them to emulation. Of late years the exertions of individuals of societies and of government have been in this country so well directed that this art has attained a degree of perfection hitherto unknown. The many respectable agricultural societies established in different parts of the kingdom, have greatly contributed to the advancement of the practice as well as theory of agriculture; among which we must particularly notice that of high national concernment, instituted a few years since, under the title of the "Board of Agriculture." About the year 1790, Sir John Sinclair, a gentleman of genuine patriotic philanthropy, conceived an idea that such a board, properly constituted, would be of vast importance to the agricultural interests of the kingdom. Having, with much attention to the subject, matured his plan, and communicated the same to some of his parliamentary friends, in May 1793, "An address from the honourable house of commons was presented to his majesty, intreating that his majesty would be graciously pleased to take into his royal consideration the advantages which might be derived by the public from the establishment of a board of agriculture and internal improvement." After surmounting the difficulties naturally attending the formation of such an institution, the charter for the same was drawn up, and sanctioned by the authority of the great seal, in August of the same year, and the founder elected president. To this society we are indebted for 80 volumes of the most useful agricultural knowledge, which could be procured from literary men, resident in, or intimately acquainted with, the respective counties, under the title of a "General View of the Agriculture thereof, with Observations on the Means of Internal Improvement." The grand outlines of the plan of these views are, the geographical state of each county, the state of property, farm-buildings, mode of occupation, implements, fences, arable land, grass, orchards, plantations, draining, and other improvement, live stock, rural œconomy, means of improvement, &c. A work comprising so many important objects in the science of agriculture, cannot fail of producing national benefits, greater perhaps than have been derived from any other political institution of modern times. Besides the county-reports of agricultural views, the board have published sundry volumes of communications on various topics of husbandry, which have been transmitted to them by writers fully conversant with the subjects of their respective communications. By pursuing such a plan for a few years, and publishing to the world such communications, under some systematic arrangement, we may expect that agriculture will become the best understood, and the most accessible of any art in the whole circle of human acquirement.

OF THE NATURE OF SOILS.

Land, considered as the basis of vegetation, is called soil. The particles of the various solid, as well as less compact bodies, which are found in nature, and which have been rubbed down and reduced by the successive operations of the atmosphere, and the agency of other natural causes, being mixed and blended together in different ways and proportions, constitute the earthy compounds, which, from their being capable of absorbing, and in some measure retaining, moisture, as well as giving stability, afford the means of support to various products of the vegetable kind, and form the bases of soils in general; while the materials proceeding from the decomposition and decay of numerous organized animal and vegetable substances, uniting with such compounds, compose the superficial layers of rich mould, from which plants chiefly draw or derive their nourishment and support. Soils being formed in this manner, it is evident they must vary much, both in the qualities and proportions of the ingredients of which they are composed.

In one situation or district one sort of material is abundant, and consequently enters largely into the soil; in others it is deficient, while those of other kinds are plentiful, and constitute the principal parts of the soils where they are found. Some situations too abound much more with animal and vegetable matters than others, which produce great diversity in regard to the soils. The harder and more firm substances of nature, being, on account of their structure, reduced more slowly, and with greater difficulty, into the state of earth, generally enter in much smaller proportions into the composition of soils, than those which are of a soft and pliable disposition, and which approach nearer to the quality of earth. Thus argillaceous, loamy, and vegetable matters are found to predominate very much in soils in their primitive state, and, according to their particular qualities and proportions, to constitute very material differences in their properties. Calcareous and siliceous earthy matters are distributed over some districts in great abundance, while in others they enter into the composition of the soils in much smaller proportions, and thus contribute to vary their textures and qualities. One of the means of deciding in respect to soils, (which, in many cases, when properly limited and exercised, by a person of sound judgement and duly experienced, is certainly not a bad one, though in some respects also defective,) is that of determining from the nature of the plants that are naturally produced, and the degrees of their growth and luxuriance. Thus, where plants that are only accustomed to grow in good or peculiar sorts of soil, are met with in their natural and flourishing states in other places, the soils may be concluded to be of this or that kind, according to the circumstances in which they are found. The growth of certain sorts of timber-trees and hedges, may also in various instances serve to direct the judgement, and likewise the appearances or colours of the mould in particular instances; the smell and the touch will also help to inform us of the quality of a soil. The best emits a fresh pleasant scent, when fresh dug up; and if due proportions of clay and sand are intimately blended, it will not much stick to the fingers in handling. But, however, that our readers may be informed of some of the leading principles which chemistry employs, in analysing soils, we give him the following, which may be depended on: 1. To ascertain the quantity of water in any soil, take a pound of the soil, spread it very thin before the fire, or in the sun-shine in a warm day; let it lie till it is thoroughly dry; the evaporation of the water will be known by the weight lost. 2. To know if there are any metallic or earthy salts, take a pound of soil, pour upon it a pound of boiling distilled water, stir them thoroughly together, and let them stand for ten minutes, filter off the water through filtering paper, pour into it what comes through a solution of the fixt vegetable alkali; if there is any earthy or metallic salt, a precipitation will take place. 3. To know if the salt contained has calcareous earths for one of its elements, take the filtrated solution, pour into it half an ounce of caustic volatile alkali, or continue to drop in this alkali till no further precipitation takes place: afterwards filtrate it, and pour to what filtrates through a little solution of fixt vegetable alkali; if there is any further precipitation, it shews that there is an earthy salt consisting of calcareous earth for one of its elements; if a precipitation took place upon the application of the caustic volatile alkali, it shews that there certainly are earthy or metallic salts. 4. To know if the salt contained is metallic or aluminous, add to the filtrated solution an infusion of galls; if there is any metallic or aluminous salt, a precipitation will take place; if iron, a purplish black; if copper, or alum, a grey: copper may also be distinguished from iron by falling in a blue precipitate upon the application of an alkali, while iron forms a greenish, and alum a white one. 5. To know if magnesia is an element of the salts found, take the filtrated solution, apply to it a solution of galls; if no precipitation takes place, apply caustic volatile alkali, which will precipitate the magnesia if it is an element of the salt contained. 6. To know if a neutral salt is contained, evaporate the filtrated solution with a boiling heat, till the whole water is nearly gone off, and let it stand to cool: if there is any neutral salt, it will crystallize. 7. To know if there is any mucilage, and what quantity, take 30 or 40 lbs. of the soil, boil it in ten gallons of water for an hour, let the earth subside, pour off the clear solution, afterwards add four or five gallons of water to the earth, stir them thoroughly, let them stand to subside, pour off the water clear, mix it with the former, and evaporate the whole to dryness, putting it into a wa-

ter bath towards the end of the evaporation; what remains is the mucilage, making allowance for that part of the decoction which was not washed out from the earth, and deducting the saline substances, which will crystallize if there is a considerable quantity, but will be destroyed in the operation, if in small proportion, as they generally are. 8. To know if there is any calcareous earth in the soil, and what quantity, take $2\frac{1}{2}$ ounces of the dry soil, apply to it $\frac{1}{2}$ an ounce of muriatic acid, and 4 ounces of water in a glass-vessel sufficiently large; let them stand together till no more effervescence takes place; and if it was very considerable, pour in $\frac{1}{2}$ an ounce more of the acid, let this stand also till the effervescence ceases, if any arises upon pouring it in, continue to add more acid in the same manner, until what was poured in last produces little effervescence, which is often at the first, and generally at the second or third half-ounce. After the effervescence has ceased, put the whole in a filter, let the solution filtrate through: pour half a pint of water upon what remains in the filter, let that filtrate also in the same vessel; add to the solution thus filtrated $1\frac{1}{2}$ ounce of caustic volatile alkali for every ounce of acid used; if any precipitation takes place there is magnesia, earth of alum, or the calx of a metal (generally iron or copper) contained in the soil; after adding the volatile alkali, the whole is to be thrown into a filter again; after the filtration has taken place, pour into the liquor a solution of mild fixed vegetable alkali in water; if there is any calcareous earth in the soil, a precipitation will take place; continue to add the solution of the alkali till no fresh precipitation ensues, throw the whole into a filter, let the liquor filtrate off, pour on by degrees a pint of water, let that filtrate off also, dry what remains in the filter; it is the calcareous earth. 9. To know the proportion of sand and clay, take what remains in the filter after the first solution in the foregoing operation, and by the elutriation separate the sand from the clay, dry and weigh them; if there is any pyrites it will appear in the sand. In the above processes the principal things to be attended to are, whether there are any metallic or aluminous salts, as these are absolute poisons, and therefore are to be decomposed by quick lime; whether there is such a proportion of neutral or earthy as to be hurtful, in which case the solution in process 2, will taste salt. A soil containing them in so large a proportion will hardly ever admit of culture for grain; whether there is calcareous earth, and in what proportion, as that ascertains the propriety of applying any manure containing it, and the quantity of that manure: what the proportion of sand and clay is which ascertains the propriety of adding clay or sand: whether there are pyrites, as that shews why, and when a soil will be long in being brought into cultivation; pyrites are best destroyed by following, and afterwards applying lime. According as different substances predominate, soils may be distinguished into

Clayey,	Gravelly,
Loamy,	Peaty or Mossy, and
Calcareous,	Vegetable Earthy soils.
Sandy,	

Each of these divisions must of course comprehend several varieties, according to the nature and preponderancy of the different sorts of materials of which they are constituted or composed. By different combinations of these substances all the intermediate kinds of soils are formed; and upon a proper mixture of them, in certain proportions, depends the success of the farmer's industry. Sand, clay, and water, are the grand component parts, whatever colour or texture the soil may happen to have.

CLAYEY OR ARGILLACEOUS SOILS, differ very materially, according to the nature and quantity of the clay that enters into their compositions, and the adulteration which has been produced in it by the intermixture of different earthy matters, as well as various mineral, vegetable, and animal substances. Soils of this kind generally produce good crops of wheat; but the expences in cultivating them, are greatly enhanced on account of their heavy and adhesive stiff qualities.

LOAMY SOILS, are moderately cohesive, being less so than clay, and more so than loose chalk. They admit of considerable variety. The substances that are most commonly found to contribute to the formation of loamy soils, are clay, sand, gravel, and chalk: and according to the ingredient which predominates, the soil is denominated clayey loam, sandy loam, &c. From the soils of the loamy class being more friable and brittle, as well as more

more dry, than most of the clayey ones, they are capable of being tilled with much greater ease and facility, as well as much less strength of team, and at almost every season of the year. And, on account of their property of receiving and transmitting moisture more freely, they are less apt to be indurated by too much dry, or chilled by too much wet weather. Besides, they are more influenced on exposure to the agency of the atmosphere and other external causes, and thereby more adapted for the promotion and support of vegetation. And as they are found in most cases to be less disposed to the production of weeds, particularly those of the more injurious kinds, they can of course be kept clean with less labour, and without the expensive system of management which is requisite on many other kinds of soil.

CHALKY OR CALCAREOUS SOILS, are composed of clay, sand, and chalk, and occupy very extensive tracts of land in different parts of the kingdom. They are marked with considerable diversity, as proceeding from the nature, properties, and proportions, of the calcareous matter as it exists in them; the substances that are mixed and combined with it; the depth and qualities of the earthy stratum which is placed upon it, and the disposition of the sub-soil or basis on which this is formed and deposited. The proportions of clayey, loamy, and gravelly ingredients, which are conjoined with the calcareous matters of these soils, are various in different districts; where the argillaceous and loamy materials are comparatively in large quantities, soils of the heavier chalky kinds are formed, and where the sandy or gravelly are predominant, we have the lighter ones. There are also material differences proceeding from the earthy matter with which the calcareous ingredients is mixed in the state of soil. Where the quantity of this is small, and not reduced into any very perfect state of mould, the soil, as it is evident, must be poor and thin; but where the depth of this superficial stratum is considerable, and the animal, vegetable, and other substances, of which it is composed, is advanced to a more complete stage of decomposition and decay, the soils are more rich and heavy. Some variety is likewise caused by the state of the under-stratum or sub-soil. If it be compact, and much intermixed with siliceous or flinty matter, or have a mortary hardness, it is less favourable than where it is of a more open, brittle, or powdery texture. Whatever appearances of lightness there may be in chalky soils, they require considerable strength in the team, where the staple or earthy stratum of the lands will admit of their being wrought to a tolerable depth; but where there is a thinner surface of earthy materials, less force of draught will be requisite. In the latter cases, the soil is, however, far more precarious and uncertain, as well as much less productive in respect to the crops that are cultivated upon it, than in the former. As chalky soils are not so liable to be injured by water as others, the business of tillage is much less impeded from that cause: but a dry season sometimes renders them so hard as to be totally incapable of being broken up, until they have been moistened by the falling of a considerable quantity of rain.

SANDY OR SILICEOUS SOILS, seem to have been gradually formed by the attrition and rubbing down of the various solid substances that are found in nature, especially such as are of the siliceous, calcareous, and stony kinds, and are of different degrees of fineness as they approach the size of gravel. They are also met with of various colours and appearances in different regions or tracts of country, such as white, dusky, brown, yellow, and red. These differences, as well as those which respect their weight, tenacity, and other properties, depend on the nature and proportions in which many other materials enter into combination with them. Where the proportions of clayey, loamy, or other earthy substances with which they are mixed, approach nearly to that of the sand, the heavier sorts of sandy soils are formed; but where these enter only in very small quantities, we have the light sandy soils; and where they are hardly met with at all, the soil is a loose blowing sand, most commonly of a white or brownish appearance. The portions of vegetable matters that are intermixed with different soils of the sandy kind are not less various than those of the clayey and loamy, from which considerable differences of quality are produced. These differences in their textures and compositions also introduce others which respect their powers of admitting and retaining heat and moisture. The openness and want of adherence in such soils, while they allow of the admission of heat and water more readily, permit them to be carried off with greater

ease and expedition; they are, therefore, less permanently benefited by their influence than the closer and more adhesive soils. The light, open, and porous texture of sandy soils renders them much more easily cultivated and kept in order than those of the strong and close kinds; consequently the farms where they prevail are generally large; and when properly prepared, they are better adapted for the growth of many sorts of crops, such as those of the bulbous and tap-rooted sorts. They have also another advantage, which is that of pushing forward the crops with more expedition. Whatever inconveniences attend them are mostly such as proceed from the want of a sufficient degree of cohesion among their constituent particles and solidity of texture. On these accounts they often counteract the best and most judicious management. The roots of the crops are liable to become naked and exposed from storms and various other causes; and if grain, to fall down and be lodged so early in the season as to render them of little value.

GRAVELLY SOILS, admit of a variation of size in the pieces or particles of which they are composed, from that of a very small pea to the largest cockle. Where they become of still larger dimensions they are termed stones or rocks, according as they are in small portions or large masses; and the soils are then said to be stony or rocky, as the circumstances of the different cases may happen to be. The beds of gravel are mostly either of the siliceous or flinty kind, or of the calcareous or chalky; with other substances, in different states of reduction and pulverization blended and united in various proportions, so as to constitute gravelly soils that differ considerably in their textures and other properties. The chief of these are loams, and the mould or earthy matter formed by the destruction and decay of numerous animal and vegetable substances. The gravelly mixture is sometimes also found to approach nearly to the surface, while at others it recedes considerably from it. In some instances springs rise immediately underneath; in others they are at a great depth. The bottom, or sub-soil, is likewise various; in some cases it is stony and rocky, in others it is clayey, or a rocky gravel, and sometimes sand, &c. The open porous nature of gravelly soils disposes them to admit moisture very readily, as well as to part with it with equal facility; from the latter of which circumstances they are subject to burn, as it is termed, in dry seasons, which is not the case in the heavier or more retentive sort of soils. Gravelly soils, from the lightness of their texture, and their not affording great resistance, except where the stones are large, or there are rocks, are not expensive or difficult in the means of cultivation. All the necessary business of this sort is capable of being carried forward with much ease and expedition, and the lands are in general soon brought into the proper states for the reception of crops.

PEATY OR MOSSY SOILS, consist chiefly of the roots of decayed vegetables, mixed with earth, mostly argillaceous, and sand, and a coaly substance derived also from decayed vegetables. They differ, like all the other kinds of soils, according to the nature of the ingredients of which they are composed, and the proportions in which the different ingredients are found to prevail in them. All peaty soils seem to be gradually formed by the deposition of vegetable matter, supplied by the dissolution and decay of aquatic and other plants that grow in low moist situations, as well as substances of other kinds brought down by water, from the high grounds in their neighbourhood, in the states of solution and diffusion, and gradually deposited from it on its becoming in a state of stagnation, by means of obstruction and stoppages proceeding from different causes. From the nature of the composition of these soils, it is obvious that they must be very retentive of water, especially where they are of any great depth. Hence they seldom or ever become free from the excessive quantities of moisture, with which they are loaded in the rainy seasons.

VEGETABLE EARTH OR SOIL, constitutes the superficial bed or stratum, in which plants for the most part vegetate in every sort of soil, and differs very much in different places, from the variations that take place in its depth, and the greater or less progress that has been made in the several substances of which it is composed, to the stage of perfect decomposition or decay. Some variety may likewise be caused by its being more intimately or more loosely mixed and blended with the other bodies that are found in soils. It seems probable too, that the earthy matter which is formed from the destruction of some sorts of vegetable substances

may be better suited for the purposes of vegetation than that which proceeds from others. In general, we may observe respecting soils, that those are the best which contain the greatest store of those principles which constitute the pabula of vegetation. Such are calcareous soils, in which carbon must exist in large quantities, from the natural attraction of lime for carbon, and where there will be a constant supply by means of this attraction. Soils formed from the decomposition of animal and vegetable matters, are in their natures eminently favourable to vegetation; for they contain hydrogen and carbon combined, together with the remains of animals and vegetables, as yet only tending to decomposition, with various salts resulting from the decomposition of animal bodies, water, earth, and gaseous principles.

IMPROVEMENT OF SOILS. From various causes, we perceive that some sorts of soil are less adapted to a vigorous production of vegetables than others. To improve the less fertile is a main branch of husbandry. According to circumstances, various methods must be employed; such as commixing one kind with another; draining such as are too retentive of moisture; irrigating such as are by nature too dry; and refreshing those with manures whose fertility has been exhausted.

OF COMMIXING VARIOUS SOILS. Chemical analysis has shewn that substances of the calcareous kinds are the most beneficial in bettering the condition of clayey soils. Where the deficiency is in the want of calcareous matter, lime-stone, gravel, and calcareous marls, are the most proper. If, however, these substances cannot be conveniently procured, a mixture of the coarser sands with lime and dung may be employed; or even coal-ashes, sea-sand, or chalk in the state of coarse powder may be advantageously used. Loamy soils stand not in need of so much commixture with other substances as clayey soils; the soil of ponds, ditches, or even a small proportion of clayey soil, may however be applied to advantage, and especially dung. Chalky or calcareous soils of the heavier sorts may be benefited by the application of sandy loams; the lighter sort, by clay, dung, and argillaceous marl. Sandy soils may be improved by applying calcareous marl, argillaceous and loamy ingredients, and by the use of the fold. Gravelly soils of the calcareous kind may be improved by clay, clayey loam, or chalk. Peaty soils, after being properly drained of their superfluous moisture, may be improved by the application of gravel, common sand, coarse earth, chalk, calcareous marl, dung, or sea-sand.

OF DRAINING LAND.

The farmer having ascertained the nature of the soil, and having well secured his lands by suitable fences, (see *FENCES*,) he is next to apply himself to the proper management of it, so as to render it as productive as possible, in consequence of which it may become most advantageous to himself, and to the community at large. If the land be overcharged with water, which has not a proper way of escape, it will be nearly useless. The draining of such land is of the utmost consequence to the farmer; and also contributes very much to the health of the place. Land becomes charged with moisture from two causes: 1. from water collected in the higher grounds, and filtrating among the different beds of gravel and other porous materials, forming springs below, and flowing over the surface, or stagnating underneath it. 2. From rain or water lodging and becoming stagnant on the surface, from the clayey or impervious nature of the soil or superior stratum. The first of these is the occasion of bogs, swamps, and morasses, and is the most difficult to be remedied. It may be laid down as a maxim, that springs are formed in the bowels of the earth, by water percolating through the strata, where they are of a porous texture, and it continues to descend till it meets with a stratum of clay that intercepts it in its course; where, being collected in large quantities, it is forced to seek a passage through the porous strata of sand, gravel, or rock, that may be above the clay, following the course of these strata till they approach the surface of the earth, or are interrupted by any obstacle which occasions the water to rise, thus forming springs, bogs, and the other phenomena of this nature; which being variously diversified in different circumstances, produce that variety of appearances in this respect that we often meet with. This being the case, we may naturally conclude, that an abundant spring need never be expected in any country that is covered to a great depth with sand

without any stratum of clay to force it upwards, as is the case in the sandy deserts of Arabia, and the immeasurable plains of Lybia: neither are we to expect abundant springs in any soil that consists of an uniform bed of clay from the surface to a great depth; for it must always be in some porous stratum that the water flows in abundance; and it can be made to flow horizontally in that, only when it is supported by a stratum of clay, or other substance that is equally impermeable by water. Hence the rationale of that rule so universally established in digging for wells, that if you begin with sand or gravel, &c. you need seldom hope to find water till you come to clay; and if you begin with clay, you can hope for none in abundance till you reach to sand, gravel, or rock. It is necessary that the farmer should attend to this process of nature with care, as his success in draining bogs, and every species of damp and spouting ground, will in a great measure depend upon his thorough knowledge of this, his acuteness in perceiving in every case the variations that may be occasioned by particular circumstances, and his skill in varying the plan of his operations according to these. As the variety of cases that may occur in this respect is very great, it would be a tedious task to enumerate the whole, and describe the particular method of treating each; we shall therefore content ourselves with enumerating a few particular cases to shew in what manner the principles above-established may be applied to practice. Let fig. 1, Plate NC. represent a perpendicular section of a part of the earth, in which AB is the surface of the ground, beneath which are several strata of porous substances that allow the water to sink through them till it reaches the line CD, that is supposed to represent the upper surface of a solid bed of clay; above which lies a stratum of rock, sand, or gravel. In this case it is plain that when the water reaches the bed of clay, and can sink no farther, it must be there accumulated into a body; and seeking for itself a passage, it flows along the surface of the clay, among the sand or gravel, from D towards C; till at last it issues forth, at the opening A, a spring of pure water. If the quantity of water that is accumulated between D and C be not very considerable, and the stratum of clay approaches near the surface; in that case the whole of it will issue by the opening at A, and the ground will remain dry both above and below it. But if the quantity of water be so great as to raise it to a considerable height in the bed of sand or gravel, and if that stratum of sand is not discontinued before it reaches the surface of the ground, the water, in this case, would not only issue at A, but would likewise ooze out in small streams through every part of the ground between A and a, forming a barren patch of wet, sandy, or gravelly ground upon the side at a declivity, which every attentive observer must have frequently met with. To drain a piece of ground in this situation is perhaps the most unprofitable task that a farmer can engage in, not only because it is difficult to execute, but also because the soil that is gained is but of very little value. However, patches of this kind are seldom of great breadth, although they sometimes run along the side of a declivity in a horizontal direction for a great length. The only effectual method of draining this kind of ground, is to open a ditch as high up as the highest of the springs at a, which should be of such a depth as not only to penetrate through the whole bed of sand or gravel, but also to sink so far into the bed of clay below, as to make a canal in it sufficiently large to contain and carry off the water. Such a ditch is represented by the dotted lines *a c c'*; but as the expence of making a ditch of such a depth as this would suppose, and of keeping it afterwards in repair, is very great, it is but in very few cases that this mode of draining would be advisable; and never, unless where the declivity happens to be so small as that a great surface is lost for a little depth, as would have been the case here if the surface had extended in the direction of the dotted line *a d*. But supposing that the stratum of clay, after approaching towards the surface at A, continued to keep at a little depth below ground; and that the soil which lay above it was of a sandy or spongy nature, so as to allow the water to penetrate it easily; even supposing the quantity of water had flowed from D to C, was but very inconsiderable, instead of rising ~~out~~ at the spring A, it would flow forward along the surface of the clay among the porous earth that forms the soil, so as to keep it constantly drenched with water, and of consequence render it of very little value. Wetness arising from this cause is usually of much greater extent than the former; and as it admits of an easy cure,

t ought not to be delayed; as a ditch of a very moderate depth opened at A, and carried through a part of the stratum of clay (as represented by the dotted lines *A k f*.) would intercept and carry off the whole of the water, and render the field as dry as could be desired. It is, therefore, of very great consequence to the farmer accurately to distinguish between these two cases, so nearly allied to each other in appearance; and as this can be easiest done by boring, every one who has much ground of this kind ought to provide himself with a set of boring-irons, which he will likewise find use for on other occasions. We might here enumerate a great variety of cases which might be reduced to the same head with the foregoing; but as any attentive reader may, after what has been said, be able easily to distinguish these, we shall only in general observe, that every soil of a soft and porous texture that lies upon a bed of hard clay, whatever its situation in other respects may be, will in some measure be subjected to this disease. And if it is upon a declivity of any considerable length, the undermost parts of the field will be much damaged by it, unless ditches are thrown up across the declivity at proper distances from one another, to intercept the water in its descent. It may likewise be not improper here to observe, that in cases of this nature, unless where the soil is of a very great depth, the malady will always be increased by raising the ridges to a considerable height; as will appear evident by examining fig. 2, in which the line *AB* represents the surface of a field of this nature, and *CD* the surface of the bed of clay. Now if this field was raised into high ridges, as at *FFF*, so that the furrows *EEE* descended below the surface of the clay, it is plain that all the water that should sink through the middle of the ridge, would run along the surface of the clay till it came to the sides of the ridge *LLLLL*, which would thus be kept continually soaked with water. Whereas, if the ground had been kept level, as in the part of the field from *G* to *H*, with open furrows *H*, at moderate distances from each other, the water would immediately sink to the clay, and be carried off by the furrows, so as to damage the soil far less than when the ridges are high. If the soil be so thin as that the plough can always touch the clay, the ridges ought to be made narrow and quite flat, as from *G* to *H*: but if there be a little greater depth of soil, then it ought to be raised into ridges of a moderate height, as from *H* to *B*, so as to allow the bottom of the furrow to reach the clay: but neither is this necessary where the soil is of any considerable depth. Some industrious farmers having ground in this situation, have been at the very great expence of making a covered drain in each furrow. But, had they rightly understood the nature of the disease, they never would have thought of applying such a remedy, to those who examine the figure. We now proceed to take notice of such soils as are of a stiff clayey nature, which are often very different in appearance, and require a different treatment, from these already noticed. Suppose that the stratum of sand or gravel *DC*, fig. 3, should be discontinued, as at *E*, and that the stratum above it should be of a coherent clayey nature; in this case, the water that flowed towards *E*, being there pent in on every side, and being accumulated there in great quantities, it must at length force a passage for itself in some way; and pressing strongly upon the upper surface, if any one part is weaker than the rest, it there would burst forth and form a spring (as suppose at *A*). But if the texture of every part of this stratum were equally strong, the water would squeeze through many small crannies, and would ooze out in numberless places, as between *A* and *F*, so as to occasion that kind of wetness, that is known to husbandmen in general, by the name of a spouting clayey soil. The cure, in this case, is much more easily effected than in any of the former; for if a ditch of a considerable size be opened, as at *A*, towards the lowermost side of the spouting-ground, so deep as to penetrate through the upper stratum of clay, and reach to the gravel, the water will rise up through it at first with very great violence, but will gradually decrease as the pressure from the water behind is diminished; and when the whole of the water accumulated in this subterraneous reservoir is run off, there being no longer any pressure upon the clay above it, the whole soon becomes as dry as could be desired, and continues so ever afterwards, if the ditch be always kept open. It will hardly be necessary in this place to put the farmer upon his guard to be particularly careful in his observations, that he may distinguish between the wetness

which is produced from this cause, and that which proceeds from the cause before-mentioned; because the treatment that would cure the one would be of no use at all to the other. The attentive observer likewise will readily perceive, that if any field that is wet from this cause admit of being ploughed, it will be of equal danger of being hurt by being raised into high ridges with the other kind of damp ground before-mentioned. For as the depth of earth above the reservoir would be smaller in the deep furrows than any where else, there would be less resistance to the water in that place, so that it would rise there in greater abundance. And if, in this case, a farmer should dig a drain in each furrow, as a considerable quantity of water would rise into them, in some cases, the ground might be improved, or even quite drained by it, especially if they should have accidentally reached the gravel in any one place, although at an expence much greater than was necessary. Bogs are only a variety of this last-mentioned kind of wet ground, and therefore ought in general to be drained after the same manner with them. Clay is a substance that strongly resists the entrance of water into it; but when it is long drenched with it, it is, in process of time, in some measure dissolved by it, loses its firmness of texture and consistence, and becomes a sort of semifluid mass, which is called a bog; and as these are sometimes covered with a strong scurf of a particular kind of grass, with very matted roots, which is strong enough to bear a small weight without breaking, although it yields very much, it is in these circumstances called a shake-bog. But whatever is the nature of the bog, it is invariably occasioned by water being forced up through a bed of clay, as just now described, and dissolving or softening a part of it; we say only a part, because whatever may be the depth of the bog or swaggle, it generally has a partition of solid clay between it and the reservoir of water under it, whence it originally proceeds: for if this were not the case, and the quantity of water were considerable, it would meet with no sufficient resistance from the bog, and would issue through it with violence, and carry the whole semifluid mass along with it. But this would more inevitably be the case if there were a crust at the bottom of the bog, and if that crust should ever be broken, especially if the quantity of water under it were very considerable: and as it is probable that, in many cases of this sort, the water slowly dissolves more and more of this undercrust, we make no doubt that, in the revolution of many ages, a great many eruptions of this kind may have happened, although they may not have been deemed of importance enough to have the history of them transmitted to posterity. Of this kind, although formed of a different substance, we consider the flow of the Solway-moss in Northumberland to have been; which upon the 16th of November, 1771, burst its former boundaries, and poured forth a prodigious stream of semifluid matter, which in a short time covered several hundred acres of very fine arable ground. Nor will any one who is acquainted with the nature of moss, who knows its resemblance to clay in its quality of absorbing and retaining water, and its very easy diffusibility in it be surprised at this; as, from all these properties, it is much better adapted for forming an extensive bog, and therefore in greater danger of producing an extensive devastation by an eruption of the water into it, than those that are formed of any kind of clay whatever. If the bog or swampy ground be upon a declivity, the ditch ought to be carried across the field about the place where the lowest springs arise. But if the surface of the ground be level, or nearly so, as between *A* and *B*, fig. 4, and the springs break out in several places, *qqqqqq*, so as to form soft quagmires interspersed through the whole of the field, it will be of little consequence in what part the drain is opened; for if it is dug up so deep as to allow the water to rise in it with freedom, it will issue through that opening, and the field will be left perfectly dry. But as it may frequently happen that the stratum of gravel is at a considerable depth beneath the surface of the earth, and as it may be sometimes even below the level of the place into which the drain must be emptied, it might sometimes be extremely difficult to make a ditch so deep as to reach the bed of sand or gravel. But it is lucky for us that this is not absolutely necessary in the present case; as a drain of two or three feet deep, as at *D*, will be equally effectual with one that should go to the gravel. All that is necessary in this case is, to sink pits (*P*) in the course of the drain, at a moderate distance from one another, which go so deep as to reach the gravel; for as the water there meets with no resistance, it readily

dily flows out at these openings, and is carried off by the drain without being forced up through the earth, so that the ground is left entirely dry ever after. Let it be carefully noted, that if you attempt to make your pit in one of these soft quaggy places where the water is found in great abundance, you will meet with very great difficulty in forming it; for as the substance of which it is composed is soft, it will always flow into the hole as fast as you dig it; on which account we should advise not to attempt to make the pit in the swaggle or shake-bog, but as near it in the solid earth as you conveniently can. However, if it be pretty firm, and of no great extent, it is sometimes practicable to make a pit in the soft bog at the driest time of the year. This soft quaggy ground has seldom been found above three or four feet deep, below which there is always found a stratum of hard tough clay, usually mixed with stones, and so firm that nothing but a mattock or pick-axe could penetrate it; and as this is comparatively so much drier than the ground above it, an inexperienced operator is very apt to imagine that this is the bottom that he is in search of. In digging through this stratum, you will frequently meet with small springs oozing out in all directions; some of them that might fill the tube of a small quill, and others so small as to be scarcely perceptible; but without regarding these, you must continue to dig on without intermission till you come to the main body of the reservoir, if we may so call it, that is contained in the rock, gravel, or sand, which you will generally find from two to four feet below the bottom of the swaggle, and which you will be in no danger of mistaking when you come to it; for if there have been no opening made before that in the field, as soon as you break the crust immediately above the gravel or rock, the water bursts forth like a torrent, and on some occasions rises like a jet-d'eau to a considerable height above the bottom of the ditch, and continues to flow off with great impetuosity for some time, till the pent-up water being drained off, the violent boiling up begins to subside, and the strength of the current to abate; and in a short time it flows gently out like an ordinary spring: allowing it to remain in this state, the quaggy earth begins to subside, and gradually becomes firmer every day; so that, in the space of a few months, those bogs which were formerly so soft as hardly to support the weight of a small dog, become so firm, that oxen and horses may tread upon them without any danger of sinking, at the very wettest season of the year. As it is possible that the stratum in which the water runs may be in some places interrupted, it will be in general expedient to make several of these pits, if the field be of great extent, always carrying the drain forward through the lowermost part of the field, or as near the quag as you conveniently can, and sinking a pit wherever you may judge it will be most necessary. But if the stratum of gravel be not interrupted, there will be no violent burst of water at opening any of these after the first. To keep these wells from closing up after they are made, it is always expedient to fill them up with small stones immediately after they are made, which ought to rise to the height of the bottom of the drain. If the whole field that is to be drained consist of one extensive bog, it will require a long time before the whole work can be entirely finished, as it will be impossible to open a drain through it till one part of it is first drained, and becomes solid ground. In a situation of this kind, the undertaker, after having opened a drain to convey the water from the lowest part of the bog, must approach as near to the swampy ground as he can, and there make his first pit, which will drain off the water from the nearest parts of the bog. When this has continued open for some time, and that part of the bog is become so solid as to admit of being worked, let him continue the ditch as far forward through it as the situation it is in will admit of, and there sink another pit, and proceed gradually forward in the same manner, making cross-cuts where necessary, till the whole is finished. In this manner may any bog or track of spouting ground of this nature be rendered dry at a very inconsiderable expence; and as there can be no other method of draining ground of this sort effectually, we recommend the study of it to the attention of every diligent farmer who may have occasion for it. Let him first be extremely cautious in examining all the circumstances of his particular fields, that he may be certain which of the classes above enumerated it may be ranked with; and when he is perfectly sure of that, he may proceed without fear, being morally certain of success. There is, however, one kind of damp ground not yet particularly specified. The soil we have now particularly in view

consists of a deep, strong, clay, that does not vary its nature even on the surface, but in as far as manures may have rendered it more friable and tender; the colour usually inclines to a reddish cast, and for the most part it is situated upon the side of some declivity. This bed of clay reaches to a great depth, without any variation, and is intermixed with a considerable quantity of small, round, stones. Many soils of the sort now described are apt to be continually moist and full of water during the winter-season; but when the dry weather of summer sets in, the moisture is diminished, and the surface becomes hard, and it is rent into many large gaps which allow free admission to the sun and air, so as to scorch up almost every plant that is sown upon it; and as these soils are usually in themselves naturally fertile when drained, it is to be wished that some method could be discovered that would be less expensive. In this case hollow-covered drains are generally of little use on account of the impermeable nature of the soil to the water. The following simple method, published by Mr. John Middleton, in the Commercial and Agricultural Magazine, deserves particular attention. It consists merely in adding a piece of wood to the felly of a common six-inch cart-wheel, to which is prefixed a rim of iron, of a triangular form. The whole expence of this addition does not exceed one guinea. A wheel of this description, when put on the axle of a cart in the usual way, will of course rest on the edge of the triangular rim of iron above alluded to; and, on driving the horses forward, will make a small indent in the ground, merely by its own revolution. But, in order to press it down to the depth of six or eight inches, that side of the cart should be laden with stones, iron, or any other heavy material, until the whole of the rim, as well as the additional piece of wood, and the felly itself, if necessary, sink into the soil. The cart should then be drawn in such a direction that the cutting-wheel may revolve where the drains are intended to be formed. Sometimes it will be necessary to apply the indenting machine to every furrow; but, where the land is level, it should be drawn over it in parallel lines, five or ten yards apart. The wheel on the opposite end of the axle is a common six-inch wheel, which supports only the empty side of the cart, and consequently will not cut the ground. The advantage of this contrivance, as stated by Mr. Middleton, is, that it makes an indent in the soil sufficient to carry off the water during the ensuing winter, by pressing down the herbage, without destroying it. In the succeeding spring, these drains will be nearly grown up, so that there is no injury done to the grass. He observes, however, that this wheel should be drawn over the ground every year, on the approach of winter; but so easy is its application, that by means of it, and two old horses, one stout boy, or man, may drain from ten to twenty acres in eight hours. In many cases soil is of that porous substance which easily admits the passage of the water through it. Hollow-covered drains are particularly serviceable. Opinions differ with regard to the season for carrying these works into execution, some with plausible reason preferring the summer, and others having nearly as much to state in recommendation of winter for the purpose. The depth of the drain from the surface of the land should generally be from twenty-six inches to thirty-two; and the principal rule for their depth is, that they should be secured from receiving injury from the feet of horses or cattle ploughing on the spot under which they are made. It is desirable to constitute the drain in such a manner that the stones may lean towards each other, so as to form a triangle, of which the bottom of the drain forms the base; in which case the width of a foot may be regarded as sufficient for them. The ditches constructed for these drains must be executed with great neatness and care; and with respect to filling them up, which if they should be about ten inches deep, if stones are plentifully at hand they should be applied for this purpose. But in many places faggot-wood, horns, bones, straw, fern, and even turf, laid in like a wedge, are all used in different situations, and drains constructed of such materials, thirty years ago, are found in several places effectually to answer their purpose still. By many persons, straw twisted into a very large rope, has been successfully laid in the bottom of the ditch; and by others, after twenty years experience, the white thorn has been recommended as answering better than all other materials.

IRRIGATION, OR WATERING LAND. The systematic manner of watering meadow-land, as now practised, is of modern invention, but of material importance to that farmer who possesses land

of proper quality, and commands a stream of water suitable to the purpose; as he will be enabled to procure an earlier and fuller crop of grass than he could by other means. Water, independent of any substances it may hold in suspension, is of universal utility in vegetation; being composed of two chemical elements (hydrogen and oxygen) which are highly favourable to vegetation, and directly and powerfully nutritive to plants. It enters, even undecomposed, as an aliment into the organization of vegetables. It is the only vehicle by which nourishment can be conveyed from solid bodies to plants. And whatever gaseous food the roots of vegetables receive, it is presented to them by the intermediation of water. Although thus beneficial when administered in season and due proportion, yet an excessive affusion of water tends to the destruction of many of the better grasses, and to the nourishment of rushes, mosses, sedge, and other aquatic weeds; hence the necessity of draining as above stated. A gentle affusion of this fluid, dispersing itself in all directions, never stagnant, never running with great impetuosity of current, more copiously applied in the light and under the heat of the sun than in the dark, operates with the best efficacy, as a promoter of vegetation. The idea of watering meadows, so far as it relates to bringing the water upon the land, was undoubtedly taken from nature. It must have been always observed that winter-floods produced fertility, provided the water did not remain too long on the land. The idea of taking the water off the land at will, and bringing it on again at will, is the effect of art; and the knowledge of the proper seasons to do this, is the effect of observation. Suitable soils for water-meadows are such as are of a sandy or gravelly nature, especially in the nearest sub-soil. A bed of flints, or loose gravel, is the most desirable. It is also observable, that whatever may be the most abundant grasses in a meadow before irrigation, those kinds will always predominate which best agree with the soil and the water, provided the supply of water be regular and constant every winter. There are two distinct methods of watering land, according as a less or greater quantity of water can be commanded. If the water be taken from a streamlet, near to the spring-head, and the quantity small, only a small portion of land can be irrigated at a time, the water-carriages and floating sluices are laid out, and cut in a form which (provincially) is by some called catch-work, by others frame-work. But where a river or large stream can be commanded, the work assumes another appearance, and being of greater power than the foregoing, is called flowing-work. It is necessary, before entering upon works of this kind, to consider whether the stream of water to be employed will admit of a temporary weir or dam to be made across it, so as to keep the water up to a proper level for covering the land, without flooding or injuring other adjoining grounds; or if the water is in its natural state sufficiently high without a weir or dam, or to be made so by taking it from the stream higher up more towards its source, and by the conductor keeping it up nearly to its level till it comes upon the meadow or other ground. Further, if the water can be drawn off the meadow or other ground as rapidly as it is brought on. This is to be done by the use of a spirit-level, beginning from the highest part of the land that the stream can be commanded from, where the grounds on the different sides are the property of the same person, and weirs, or other works, as has been just observed, can be carried across the streams for the purpose of forcing the water, either wholly, or in a partial manner, into a different course. After it has been raised as high as possible in this way, the level is to be formed from the surface of the water, carrying it on what is termed the dead-level, allowing some small degree of depression for the flow of the current. After this has been done, the land on the different sides of the stream, below the lines set out by the level should be minutely examined and inspected, as the whole may be irrigated if the command of water be sufficient. The extent that can be properly performed, must, however, depend much on the degree of fall or descent from the entrance of the water and its out-fall, as well as on the declination of the more elevated parts of the ground. The next circumstance of importance is that of deciding where to commence the business. This must depend on various points, which can only be settled by the judgement of the operator. If there be a full supply of water, the whole should be covered; but in the contrary case, the expence of cutting the mains or carriers on such levels in a sufficient manner should be considered; and where one side of the stream is better adapted to the purpose

than the other, that on such side should be the first executed. And if the land most adapted to the purpose of watering be at much distance from the place whence the water is first taken, and there be not a supply for the whole of the land below the line of level on one of the sides, the expence of forming the carrier should be put in comparison with the greater advantage of irrigating the most suitable grounds, in preference to others that are nearer, without possessing equal advantages. It mostly happens that the beneficial consequences of irrigating at command are such as to overbalance that of forming the mains or carriers. Besides, though the supply of water may be insufficient in such seasons as are very dry, as it may be abundant in the winter-time, the simply covering the land at that period may be more than adequate to the expence of the business, which is a circumstance that may render it more benificial to lengthen the carriers, than by having them shorter to be confined to the watering of such lands as are less proper for the purpose. It is probable also, that in particular cases the winter-irrigation may extend through the whole of the level that has been set out. Where it can be done, it is best to begin with such parts as are contiguous to, or approach the nearest, the mains or carriers; and after having passed the water over them, to mark the lowest places, where it can be carried off to the best advantage; and from such parts it should then be seen to which other lands the water can be conducted with the greatest facility and benefit. Where the natural shelving of the ground is considerable, less care is necessary; but where this is not much, it may often be requisite to convey the water in a slanting direction for a considerable way, before lands sufficiently low for being covered by it are met with; as in this sort of business it is invariably necessary, in order to prevent the waste of water, to proceed with that which is first made use of to its final outlet into the river before the works on other divisions are commenced. When the piece of ground to be flooded is so much upon the level that the descent cannot easily be determined by the eye, it will be necessary to take an accurate level, and compare the highest part with the stream intended to be used, by which the degree of fall from the surface of the water to the highest point of the land will be ascertained; and in order to convey the water to this point, should it be distant from the stream, the sides of the ditch or canal should be sufficiently raised for the purpose not to keep the water in a dead level, but with such degree of descent as the two points will admit of. In the operation of cutting this canal or main feeder, it will be easy to preserve the proper degree of fall, having previously ascertained the length, for instance, in cutting fifty yards with a fall of five inches, it will be obvious that in every ten yards a descent of one inch should take place, this is necessary to keep the water in a constant lively motion. In some cases it may be necessary to have two main feeders, in order to effect a more equal distribution of the water; the depth and width of which feeders must be regulated by the supply requisite for the smaller gutters. Near to the mouth of the canal or feeder it will be proper to have a flood-gate or clow, by which the water may be admitted or excluded at pleasure. In forming the floating gutters, it is perhaps the best method to cut them at right angles, or nearly so, to the feeders; however, where the surface is uneven, in order to preserve a regular descent, a different direction must be given to them, the distance from each other being about ten yards, and the gutters becoming, as has been observed, gradually narrower as they recede from the main canal or feeder. The object in view being to throw the water as evenly over the surface as possible, these gutters should be so constructed that the water which has been introduced may overflow their little banks rather than run rapidly along the bed. Obstructions may sometimes occur, such as low parts, or deep ditches, over which a pipe or spout may easily be made to continue the progress of the water; and such as proceed from ridges, roads, or small eminences, by trunks or other contrivances made to convey the water underneath them. It has been observed, that there are two distinct methods of watering lands, catchwork and flowing. The methods of making such works may be thus described. From the spring at A, Plate N.C. fig. 5, take the level towards C, to include as much of the meadow BCDE as possible. Cut the trench or main drain AC of a width and depth sufficient to take all the water issuing from the spring, and convey it to the proposed meadow. Cut also the carriage-gutter of a sufficient depth to take off all waste water which may

fall into it; and also float sluices, &c. laid out by a level, placing sods taken from the sluices on the lower side. Was the meadow small, of a smooth surface, and regular declivity, the water might be let out of the main drain at different places, and so water the whole at once; but as these favourable circumstances seldom occur, recourse must be had to the floating sluices above-mentioned, which must be cut at proper distances, such as ten or twelve yards, according to the declivity of the land; the catches or frames may be about thirty yards apart. If the meadow be large, it must be divided into catches or frames, by several carriage-gutters, as in fig. 6, and a frame or two watered at a time, according to the body of water which can be commanded; and when the water is withdrawn thence, it may be conveyed to other frames. In meadows thus watered from springs or small streams, it is of material consequence that the works should be kept as dry as possible between the intervals of watering; and as such situations are not affected by floods, and generally have but little water, they must be re-watered the more frequently; and as the top-works of each frame will be in the way of getting more of the water than those lower down, care must be taken to give the latter a longer time, so as to make them as equal as possible.

FLOWING MEADOWS DESCRIBED. The other kind of water-meadows, viz. those usually called "flowing meadows," require much more labour, and system, in their formation than the foregoing. The land applicable to this purpose being frequently a flat morass, the first object to be considered is, how the water is to be got off when once brought on; and in such situations this can seldom be done without throwing up the land in high ridges, with deep drains between them, as *a, b, c, d*, fig. 7. A main carriage AB being then taken out of the river at a higher level, so as to command the tops of these ridges, the water is carried by small trenches or carriages along the top of each ridge, and by means of moveable stops of earth is thrown over on each side, and received in the drains below, from whence it is collected into a main drain CD, and carried on to water other meadows, or other parts of the same meadow below. One tier of these ridges being usually watered at once, is generally called "a pitch of work," and it is usual to make the ridges thirty or forty feet wide; or, if water is abundant, perhaps sixty feet, and nine or ten poles in length, or longer, according to the strength and plenty of the water. It is obvious, from this description, that as the water in this kind of meadow is not used again and again, in one pitch, as in the catch-meadows, that this method is only applicable to large streams or to vallies subject to floods; and as these ridges must be formed by manual labour, the expence of this kind of meadow must necessarily exceed the more simple method first described; and the hatches that are necessary to manage and temper the water or rivers, must be much more expensive than those in small brooks.

MANAGEMENT OF WATER-MEADOWS. As soon as the after-grass is eaten off as bare as can be, the manager of the mead, (provincially "the drowner") begins cleaning out the main drain, then the main carriage, and then proceeds to "right up the works," that is, to make good all the water-carriages that the cattle have trodden down, and open all the drains they may have trodden in, so as to have one tier or pitch of work ready for "drowning," and which is then put under water (if water be plenty enough) during the time the drowner is righting up the next pitch. In the flowing meadows this work is, or ought to be, done early enough in the autumn, to have the whole mead ready to catch, if possible, "the first floods after Michaelmas," the water being then "thick and good," being the first washing of the arable land on the sides of the chalk-hills, as well as dirt from the roads, &c. The length of this autumn-watering cannot always be determined, as it depends on situations and circumstances; but if water can be commanded in plenty, the rule is to give it a good soaking at first; perhaps a fortnight or more, with a dry interval of a day or two, always taking the water off at the first appearance of white scum; after which, the works are made as dry as possible, to encourage the growth of grass, and to allow the land to pitch or sink close together. Whilst the grass grows freely, a fresh watering is not wanted, but as soon as it flags, watering for a few days is necessary. In the months of October, November, or December, some meadows will bear the water for three weeks, which in February or March will not bear it one week, and in April or May not three

days. In all cases where the watering-system is undertaken, except in the time of floods, it may be highly useful to disturb the mud and dirt in the bottom of the main carriers, or drains, before watering; a practice frequently adopted on the continent. Lime has also been thrown into these cuts by some irrigating farmers, and raked with a heavy harrow, or other implement at the bottom, which is a process that will be found to add considerably to the manuring quality of the water. It is probable that many other substances might be employed in the same way, and be thus spread over the surface of grass-lands in a minute state of division, with vast advantage in promoting vegetation. The great degree of verdure and luxuriance which almost immediately succeeds the occasional covering of grass-lands with water, sufficiently demonstrates the power which it possesses in promoting vegetation. It is a means of fertility that has been employed for ages in more warm climates, with the most beneficial consequences in increasing the quantity of vegetable produce. Winter and spring are the two seasons when meadows are usually watered, as from the month of November till the beginning of March; the experience of the operator can alone regulate this proceeding as to the length of time they should remain under water. In some districts the water is allowed to flow over the fields for several weeks together, with only the interval of a day or two occasionally; in others, the practice is to flood them the alternate weeks. When frosts set in, floating is usually suspended; but it has been remarked, that in such cases the succeeding crop of grass has been abundant. As the spring advances, much less floating is found to be necessary. However, in all cases, when floating is performed to advantage, the meadows should be laid dry between every watering.

OF MANURES.

Besides the methods we have already spoken of for the improving of lands, mankind have discovered various substances, which, when judiciously applied, possess the power of increasing the fertility of soil in a wonderful degree. These substances are numerous, and always near at hand. They arise from the decomposition of animal and vegetable matter, and from the agency of fossil and saline substances. From the changes that are constantly taking place among bodies in nature, and the new combinations which are formed in consequence of those changes, a great variety of matters are unfolded, elaborated, and prepared, for the nourishment and support of vegetable life. Some of the substances which contribute in this way possess considerable fluidity and volatility, such as water, and various gaseous materials, as oxygen, hydrogen, azote, and carbonic acid, in different states of combination. While others are more gross and heavy, and require to be applied and incorporated with soils, or spread out upon their surfaces, in order that they may produce their effects in promoting vegetation. It is principally to these, as being the means of sustaining different sorts of plants as crops, that the term manure has been given by practical writers on agriculture; though it is extremely obvious that they must undergo different changes, and be resolved into their more elementary principles, before they can be taken up, and contribute to the increase and support of vegetables. In the various materials which the art and industry of mankind have rendered capable of being beneficially employed in this manner, there is great diversity; some are found to yield the matters which are necessary for the support of plants much more readily and more abundantly than others, as animal, vegetable, and all such substances as are rich in mucilage, saccharine matters, and calcareous earth, and readily afford carbon, phosphorus, and some aerial fluids; while others that are greatly deficient in all or many of these principles, or do not readily part with them, are found to be of much less utility, when employed in the way of manures. This is probably a principal reason why some sorts of manures, or substances, when put upon grounds, are so greatly superior to others, used at the same time, and in the same manner and proportion. There are, however, many other ways in which substances, when applied to soils, may render them more fertile and productive, and contribute to the aid of vegetation. Some, besides furnishing such matters as are suitable for the purpose of promoting the growth of plants, are known to add considerably to the quantity of vegetable and other matters contained in the soils on which they are placed, and thereby provide a more suitable and convenient

nient bed for the reception of the roots of plants; others contribute little in this way, but operate chiefly upon such materials as are contained in them, breaking down their organization or texture, and thus setting at liberty different volatile, and other ingredients, by which new compounds are formed, and brought to such states as are the most adapted to the support of vegetable life; others again act principally by producing certain changes and alterations in the constitution or texture of soils, such as rendering them more open and porous, or more stiff and compact, and by such means bringing them into the most proper conditions for the bearing of different vegetable productions; and there are still others that contribute in all, or several, of these ways, at the same time. Substances of the animal kind, when reduced by the process of putrefaction, or other means, into a soft, pulpy, or mucilaginous state, are found by experience to afford those matters which are suited to the nutrition and support of plants with greater readiness, and in more abundance, than most other bodies that can be employed. By chemical analysis it has been seen that the compounds of these substances, so far as agriculture is concerned,

are principally water, jelly, or mucilage, and saccharine oleaginous matters, with small portions of saline and calcareous earthy substances. Hence animal matters, though they agree in some circumstances with vegetable productions, each having, in common, water, saccharine, and calcareous matters, are far more compounded; and in animal substances, some of these materials are in large proportion, while in vegetables they only exist in a very small degree; and the jelly which, in some measure, resembles the gum and mucilage of plants, differs likewise from them, in its having much less tendency to become dry, as well as in its property of attracting humidity from the atmosphere, and of running with great rapidity into a state of putrefaction and decay. All these principles of animal substances are resolved by their ultimate decomposition into other matters, such as the different gaseous fluids that have been mentioned above, carbon, phosphorus, lime, &c. Animal substances of every kind, on being deprived of their vital principle, have a quick tendency to take on or run into the state of putrefaction; a process which is considerably affected and influenced by the circumstances under which it is produced. But in the horny and more compact animal matters, this tendency to putrefaction and decomposition is, under similar circumstances, much less rapid than in such as are of a less firm and dense texture.

HARD ANIMAL SUBSTANCES. In the matters of this sort that are employed as manures, there is considerable differences in respect to their texture and firmness, some being quite firm and solid, such as bones, horns, hoofs, shavings of horn, and some other similar substances, while others are more soft and pliable. The bones of all animals are capable of affording much nutritious matter to plants, but those which are procured from cattle that have been killed when fat, are the best for the purposes of manure. Those which have been boiled are far inferior, in this view, to those which have not undergone that process, as by such means they are principally robbed of their oily and mucilaginous properties, and consequently must yield much less nourishment to the immediate crop, whether it be grain or grass. All these sorts of substances require to be ground down in mills constructed for the purpose, or otherwise reduced into small pieces, before they are laid on and mixed with the soil. They are excellent for potatoes. These substances are constituted of a considerable proportion of mucilaginous or gelatinous matter, a slight portion of fat, and an earthy salt composed of the phosphoric acid and calcareous earth. If great heat be applied, they afford a large quantity of hydrogen gas, carbonic acid gas, and a volatile alkaline liquor. From the nature of these different principles, it is evident that some sorts of substances may be blended and united with the reduced particles of bony matters, so as to promote their effects, as manures, in a considerable degree, such as lime, chalk, peat, earth, and good vegetable mould, in suitable proportions, as by such means new combinations may be formed highly favourable to the process of vegetation.

SOFT ANIMAL SUBSTANCES. There are various matters, of this nature that may be of use for the purpose of improving land as manures, some of which have yet been but little attended to by the farmer. Of this sort are greaves, or the residuum which is left after the making of candles, and the scum which is collected in the boiling or reining of sugar. Different trials with the former

have fully convinced us that it is a substance that possesses great powers when employed as a manure. And although it is a substance which is generally procured at a high price, from its going a great way, and being a lasting manure, it may probably be more frequently had recourse to than has hitherto been the case. It is mostly procured in the state of hard compressed square cakes, though sometimes in a soft condition, without having undergone any pressure. When in the former state the cakes must be broken down and reduced into as great a state of division as possible, which may be rather a troublesome and expensive process, except a mill, or some proper machine for the purpose, be employed. But when it has been even reduced to the finest state possible, it will still be improper for application as a manure, until it has been mixed and incorporated with a pretty large proportion of some rich earthy substance with which it may combine. This is an excellent manure for turnips. A combination of lime and greaves, mixed with mould from the headlands, in the proportion of about fifty bushels of lime to a ton of greaves. This composition resembles sugar-scum, which consists of lime and bullocks' blood. Lime might thus be combined with bones or woollen rags, or with a compost of earth and night-soil; and would certainly greatly facilitate their conversion into manure, as will render them more active in producing their effects in the support of vegetable crops. And by some of their properties being absorbed by lime, during the time of their decomposition, and afterwards parted with more slowly in the soil, they may also by such means be probably rendered more durable and lasting as manures. Other substances of the animal class, such as the blood, serum, wool, hair of animals, refuse of glue-makers, the cuttings of felt-mongers, the clippings of furriers, the scrapings of oiled leather, and the chips or waste of shoe-makers, which may be made use of as manures, when they can be collected in sufficient quantities. These animal materials, from their abounding in mucilage and oil, their great attraction for moisture, and their being readily soluble in water, contribute quickly to the support of vegetation, but are not probably so durable in their effects upon land as many other substances. Hence they should only be made use of with a view to the immediate crop, which, we believe, is pretty much the case in those places where they can be obtained in such quantities as to be employed for the purposes of agriculture. Various animal substances of the fish kind, as the blubber remaining after the preparation of oil from the whale, and other large fishes, and different sorts of small fish, both of the shell and other kinds, may be employed as manures; and also the offals of such animals, where they can be procured in a large quantity, as in large towns, sea-districts, and where they are cured or prepared in great numbers for the market. These substances may be readily reduced to that state which is proper for manure, by mixing with them a small portion of the carbonate of lime, and afterwards according to circumstances, a quantity, two or three times more than the whole, of good vegetable mould.

ANIMAL DUNGS. The animalized substances that are, however, most generally made use of as manures, are the excrements of various kinds of animals, which are found in very different conditions, or states of preparation and richness, proceeding in some measure from the kind of food on which the animal has been fed, the matters with which they are incorporated, and the texture of the substances themselves. The dung of fat animals is unquestionably more rich, and consequently possesses greater powers of fertilization, than the dung of lean ones; and that the quality of the dung of every sort of animal will in a great measure be proportioned to the goodness or poverty of its food. The urine of animals appears to be a more perfect extract from the animal system than the other; it is therefore surprising that this valuable substance is not more attended to by agriculturists. Let it be mixed with the dunghill, or else carted to the field after it has passed through the putrefactive fermentation. Its effects on land is immediate. It is, however, from the larger animals that the farmer derives the principal part of the dung that is made use of as manure, in the cultivation and improvement of land. The dung of such horses as are highly fed being found to be much more valuable for the general purposes of agriculture, and some uses in horticulture, than that which is made by horses when fed with hay or grass only. Where the animals are kept in the latter way, it is probably not so good as that of well-fed cows and neat cattle

in general, as in these it may, perhaps, become more animalized from the circumstance of their food being more intimately blended with the saliva, or other juices, during the ruminant state of feeding in such animals. The dung of horses is, however, in common much more disposed to the process of putrefaction, and causes more heat, than that of cows and other neat cattle; and indeed these are the chief distinguishing circumstances between them as manures. The dung of neat cattle may also, on account of its less disposition to run into the state of putrefaction, contribute more of the earthy material to the land on which it is applied. Hence, probably, its superior utility on the leaner and poorer or thinner sorts of soil. The dung and urine of animals when newly voided are not, except when the animals are morbid, in a putrescent condition, the length of time in which they remain in their bodies being too short for its fully taking place; but some degree of, or tendency to, putridity is constantly necessary to their discharge. From the experiments that have been made with the dung of sheep, it is evident that it is equally valuable with that of many other animals that feed in the same way, but agriculturists have not yet turned their attention sufficiently to the means of collecting and preserving it, so that it may be used alone as a manure. The method by which it is at present applied to land is by folding the animals upon it, under which method of management, on many soils, a great part of the advantage must be derived from the operation or action of the ammonia of their urine upon the vegetable matters contained in them, as well as from the consolidation produced by their treading. It is well known that the urine and dung of sheep want no fermentation previous to its being applied to the land; the sooner therefore the seed is sown after folding, the greater is the effect. Vegetable, as well as animal substances, when deprived of their vital principle or life, are soon rendered fit, by the separation, reduction, and ultimate decomposition, of their constituent principles, for the nourishment and support of new plants. This process is greatly promoted, in all kinds of substances, by the materials being exposed to the free influence or agency of atmospheric air, moisture, and a middling degree of heat; various matters are set at liberty, by which different new combinations take place, that are capable of promoting vegetation in different degrees, and upon which their utility as manures, perhaps, chiefly depends. The stages of this decomposition have generally been supposed to regularly succeed one another, from that which is productive of sweetness, through the vinous and acetous, to that which is the ultimate result of putrefaction. Different sorts and parts of organized matters, when dead, undergo many different sorts of chemical changes, which are different according to the degrees of heat, the quantity of water and of air, to which they are exposed. In the vinous fermentation or process which commences after the saccharine, carbon becomes united with pure air in a large proportion; and it is probable that, at the moment of their combination, while they are in the form of a liquid, and before they assume the gaseous state, they may be taken up by the roots of vegetables. The substances of the vegetable kind that may be advantageously converted into manure are so extremely numerous, that it is impossible within our limits to describe them. All kinds of green vegetable production may be employed in this way; such as the luxuriant weeds of rivers, lakes, ponds, and ditches; fern, and the refuse of different kinds of garden-vegetables. Where green materials of this nature are made use of, they should always be cut down while in their juicy state, just before their flowers begin to appear, in order that they may be in the most suitable condition for becoming quickly putrid, and to prevent the injury that might otherwise be sustained from the vegetation of their seeds. They are afterwards to be collected into heaps of a moderate size, and their putrefaction promoted by their being thrown together as tightly as possible, and the occasional sprinkling of them with water, if the season be hot and dry; and as lime is found, when applied to vegetables in their green moist state, to disengage from them both hydrogen and azote, by the combination of which volatile alkali is produced, it may be advantageous to blend a portion of lime at first with the heaps, and afterwards add a suitable quantity of peat earth, or good vegetable mould, for the alkali thus formed to act upon. By this method, the quantity of manure from such substances may be greatly augmented, and rendered more valuable. But when dry materials, such as hay,

straw of different kinds, fern, and rushes, such additions cannot be had recourse to with equal success, unless where much of the dung and urine of animals have been incorporated with them; but their resolution and decay may be greatly promoted by their being kept in a state of moisture, without the water being suffered to stagnate upon them, and by their not being permitted to be trodden down too much by cattle, or other means, in the farmyards. Another beneficial means of vegetable manure, which is yet far from being sufficiently practised, is that of providing full crops of succulent green vegetables, such as clover, buck-wheat, tares, vetches, spurry, pease, beans, turnips, and many other similar plants, to be turned down by the plough, in order that they may undergo the putrefactive process under the ground, and by that means be converted into manure, and supply the nutrition of plants. Sea-weed is another vegetable production which is capable of being employed as a manure with great advantage, and should never be neglected where it is within the reach of the farmer. In some places it is the practice to spread it upon the lands as soon as possible after being cut from the verges of the rocks on the different sea-coasts, or collected after being left by the tides, and to plough it in: where this method is adopted, as little time as possible should be suffered to elapse after the cutting or collecting of the weed, before it is ploughed down; for as the plant in its green or succulent state readily decays and becomes putrid, if there be any considerable delay in the performance of the business, especially when the weather is hot, much of its valuable properties as a manure is dissipated, and carried away by means of evaporation. Bark, which has been made use of for the purpose of tanning leather, may likewise be employed as a manure: when used in this way it should be collected into moderately sized heaps, before it has become dry by too much exposure to the heat of the sun and wind; and then by having a quantity of lime mingled with it, and being kept slightly moistened with water, its putrefaction and decay may be greatly promoted. The mud taken from the bottom of rivers, ponds, and other places where water has stagnated for some length of time, fresh or maiden earth, and the scourgings of old ditches, are substances that may frequently be employed with advantage as manures, being principally composed of the recrements of decayed vegetable matters. They should not, however, be put upon grounds, especially those under grass, until they have been reduced into a considerable degree of fineness, by means of frequent turning over, and the mixing of a portion of lime, rotten dung, or other materials of the same kind, with them, in order to promote and render the decay of the more solid parts more full and complete. Substances of the calcareous kind, which are to be considered under this head, produce effects more or less powerful in promoting the growth of vegetable crops, in some measure, according to the state and quantity in which they are applied, the nature of the soils on which they are employed, and the properties of the matters with which they are combined. Substances that contain much saline matter in combination with their earthy and other ingredients, are found, in many instances, when properly employed as manures, to contribute greatly to the support of vegetation. The materials principally made use of in this way are the refuse of different manufactures, such as bleaching and soap-boiling, where they can be procured in sufficient quantities, as in the vicinity of large towns, and where such manufactures are carried on in an extensive manner; the ashes remaining after the combustion or burning of various green vegetable matters, wood, pit-coal, peat, &c. and some other substances, such as soot and sea-salt. It is most probably to the different alkaline principles contained in these substances, from the great facility and power which they possess of acting upon and dissolving the parts of animal and vegetable matters, especially such of the latter kind as have been rendered insoluble by the absorption of the oxygen, or pure air of the atmosphere, from long or frequent exposure to it, that their beneficial effects as manures are chiefly to be ascribed. But these substances, besides their forming in the soils, or the earthy materials with which they are mixed, such compounds as are beneficial in promoting the growth of vegetables may be useful in many cases when properly applied, and used in sufficient quantity, in correcting acidity, in altering the state or condition of the lands, as by the taking away of moisture from the surface where it prevails in an over-proportion in meadows and pastures, and thereby supports crops of coarse vegetables, and by rendering

ing the texture of such grounds as are under the plough more open and friable, consequently more suitable for the reception of the roots of corn-crops. It is evident, from what has been already observed on the nature of the different substances that are capable of being made use of as manures, that they may frequently be mixed and blended with each other, or with substances of other kinds, and by such means be not only considerably increased in quantity, but in many cases rendered more effectual and more suitable for application than in their simple states; but at the same time, that some of them may be mixed and incorporated in this way with much more advantage than others; for though the general experience of farmers has fully shewn the great importance and utility of employing compound manures, or composts, little attention has till lately been paid to the compounding or mixing together of such substances as are, from the principles which they originally contain, or which are formed from them in the changes which they undergo in the different stages of their decomposition, adapted to act in the most suitable manner for producing such combinations or alterations in the materials as are capable of being beneficial in the promotion of vegetation when they are employed as manures. Farm-yard manure, which is the most general application of any, from its being formed by the decay of various kinds of vegetable matters, such as hay, straw, fern, and many other materials of a similar nature, with which the dung and urine of animals is incorporated and combined, must be considered as a compound substance. And from the large proportion in which such vegetable productions enter into its composition, and the quantity of earthy materials that is in most cases, especially where the management is upon a judicious plan, added by the laying of suitable bottoms, it is not so frequently necessary to be blended with other substances that are usually employed in forming composts. But from most of the vegetable materials that constitute the chief part of this sort of manure, being made use of in a dry and hard state, they do not so quickly ferment or run into the state of decay, notwithstanding the proportion of animalized matters that may be mixed with them; it therefore becomes an useful practice to turn them over, by which their complete putrefaction may not only be promoted, but the different materials be more minutely blended together, on both which accounts they may become more useful when applied as manure upon land. In the forming of this manure, care should also be constantly taken that the heaps be so situated as that they may not become too dry, or too much soaked in water, as in either case they must be greatly injured. Whenever it may be requisite to incorporate any earthy material with this sort of manure, the agricultor should always carefully attend to the state or richness in which it may exist in the yard, and proportion such additions accordingly. It will, however, never demand nearly so large a proportion, as such manures as consist almost wholly of animal matters. Where animal matters are collected and thrown together in any quantity, there can be little doubt but that a great increase of good manure may be provided by mixing with them, as has been already observed, rich surface-mould, peat-earth, or the scrapings of old ditches and roads; as by such a practice the ammonia formed during the decomposition of the animal substances is prevented from escaping, as would otherwise be the case, which, by combining with and acting upon the earthy materials, quickly renders them proper for the purposes of manure. As substances of the animal kind have been shewn to run very rapidly into the state of putrefaction, they may frequently be incorporated with such vegetable materials as are little disposed, or with difficulty made, to rot or become putrid, and by such means useful composts be more expeditiously formed. In making use of such earthy substances as have been mentioned, it may be of much advantage to have them exposed to the influence of the atmosphere for a considerable length of time, frequently turning them over, before they are mixed with the manures, as by such means they become in a more pulverized state, and are capable of being more intimately blended with such materials, and afterwards spread over the land with much greater equality, a circumstance upon which their effects very much depend. If, in performing this business, the earthy substances be formed into a sort of ridge, about five or six feet in height, and nearly the same breadth in the bottom, they will be in the most proper situation for being united with dung, or other matters that may be employed. In the application

of manure to land, several circumstances are necessary to be considered, such as the state or condition of the substances which are to be made use of, the nature of the soils on which they are to be laid, the kind of crop that is to be promoted by them, and the season in which they are put into or upon the ground. As we have already seen that changes are continually taking place from the moment the materials of the dung-heap are thrown together, to the period in which they are reduced into a black carbonic earthy matter; and that in most of the different stages through which they pass in this process of decomposition, such substances are formed as are capable of contributing to the nutrition and support of vegetable crops; it seems probable, that in cases where manures are to be turned into the ground, and such crops cultivated as require a supply of nourishment for a considerable length of time, they should be employed in their long or more imperfectly reduced states, as by the heat which is evolved in the commencement of their dissolution, the process of early vegetation may be greatly promoted, and their gradual decomposition and decay afterwards, under the ground, afford a more durable and regular supply of nutrient materials, and thereby contribute more effectually to the growth of the crops; but that where they are to be buried in, or applied to, the surface of the soil, and intended merely for the benefit and support of such crops as are of short duration, or quickly arrive at their full growth, they may be more advantageously made use of after they have been more fully and completely reduced, as in this state the manure is, in the case of grass-lands, not only capable of being spread out in a more regular and uniform manner, by which it becomes more evenly as well as more generally carried down to the roots of the plants by rains, but it is in the most suitable condition for allowing the young plants the means of springing up with facility, and at the same time, whether used under or upon the soil, of affording the crops that abundant supply of nourishment which is necessary to their speedy growth and great luxuriance, and by these means to contribute the most perfectly to the promotion of their increase. And as in the slow and gradual decomposition of the materials which are made use of for manures, when slightly deposited beneath the soil, there is much less waste of heat and those elastic matters which contribute so greatly to the support of vegetation, than where they are made to undergo the various processes of dissolution in large masses, as in dung-heaps, they may probably sometimes on that account be most advantageously employed in this state. On this principle too the ploughing down of fresh vegetable crops, in many cases, in their most succulent states, may be a more economical as well as more beneficial practice; especially in such light and dry kinds of soil as will more readily admit of their gradual putrefaction and decay, than to cut and take them off for the purpose of being by other means converted into manure. It seems likewise probable, on the same grounds, that for the production of crops of bulbous-rooted vegetables on the more stiff and tenacious soils, the matters made use of as manures may be employed with the greatest advantage, when put into the earth before they have undergone any great degree of decay by means of putrefaction, as in this way there is no waste, the whole being ultimately converted and applied, though more slowly, to the support of the crops. As to the season in which manures may be put into the soil, or spread out upon its surface, with the greatest benefit and advantage, though in practice it must, in some measure, depend on the state of the land and the convenience of the farmer, it should, in cases where they are buried in the ground, be as nearly as possible to the periods in which the seeds or roots which they are designed to support, are sown or placed in the earth; and in the latter case, or where they are to be laid upon the surface of the land, it ought to be just before the crops of grass, or any other vegetables, begin naturally to spring or shoot forth. And by the application of such manures as are employed in the way of top-dressings in the beginning of the spring, they are laid on in the most favourable period for affording their nutritious principles, and for their being drank up by the roots of plants, consequently become useful at the time they are most wanted for the promotion of the crops, and the great waste which must otherwise be caused, either by the excessive falls of rains and floods in the winter-season, washing down much of the valuable properties into the adjoining rivers and ditches, or the evaporation of their more volatile or elastic matters by means

of the summer-heats, is most effectually guarded against and prevented. On all these accounts, therefore, farmers should contrive as much as possible to apply the manures, intended as top-dressings to grass-lands, as early in the spring as it can be conveniently done, which may be easily managed on those that are dry; and on such as are inclined to be wet and poachy, it may probably be greatly facilitated by having small light carts constructed for the purpose, and placed on broad cylinders as wheels. In the application of manures to lands under tillage, as well as those in the state of grass, there are a few other circumstances that require the attention of cultivators; such as the depth they may be deposited in the soil, the modes of putting them upon the ground, and the most economical methods of employing them. In respect to the advantage of using one sort of manure in preference to another, it may be observed, that as animal matters are found in general to undergo more speedily the process of putrefaction or decomposition, than those of the vegetable kind, and as in most instances they afford those mucilaginous and elastic principles that contribute so largely to the support of vegetable life in greater proportions; such manures as are either wholly or in a great measure composed of them, must be the most beneficially employed, where quick and abundant supplies of nourishment are required, as in the growth of all the more gross and luxuriant crops, whether of grain, plants, or grasses; and that as those vegetable substances which contain saccharine, farinaceous, oily, saline, or mucilaginous principles in the largest quantities are ascertained from experience to proceed the most readily into the state of dissolution or decay, and consequently to afford more fully and more expeditiously the nutrient food of new plants: where manures are principally formed from them, they should be preferred to such as have been made from the harder and more ligneous vegetable substances.

OF THE CULTURE AND MANAGEMENT OF GRASSES.

Having thus stated the nature and principles of the various soils which are met with on the surface of the earth, and shewn the different modes of improving the same, it becomes us, in the next place, to speak of the best natural productions; that from thence the agricultor may make his selection of such lands as may be most profitable, and first of grasses. In our meadow and pasture lands we find a great variety of grasses, of which some are far more valuable than others; to know the good from those which are indilient becomes the interest of the farmer; we therefore give him the characters of the most valuable, classed as they stand in precedence of quality one to another. See Plate XCII.

GREAT OR SMOOTH-STALKED MEADOW-GRASS. This grass is considered as the best of all we have; it is early in its foliage, makes the best hay, affords the richest pasture; all sorts of cattle are fond of it; it is in all our meadows, and will continue in the same land much longer than any other grass.

HARD FESCUE. This is an early and productive grass, with fine foliage, which grows well on downs and rich meadows. It is well adapted for being combined with other grasses in forming sheep-pastures, and stands high in esteem as a very good hay-grass.

MEADOW FESCUE-GRASS. This is a grass that comes near in its appearance to rye-grass, but to which it seems greatly superior, as being larger, and more productive of foliage. It is strictly perennial and hardy, thriving well in most soils, growing in all situations; and it abounds in the best meadows, in the best hay-districts; is sweet, luxuriant, and quick of growth, affording rich pasture, and making good hay.

RYE-GRASS. This is a sort of grass that has been much in cultivation, but is deficient in some of the properties necessary for meadow or pasture lands. In rich moist meadows its foliage is abundant; and it seems probable that it is highly acceptable and nutritious in feeding cattle; its foliage is of rapid growth, and flowering stems continually shoot forth. It is best adapted to the loamy and sandy descriptions of soils; but it will succeed on any except stiff clay, where it is generally thin. It should be cut for hay previous to its being so ripe as to have perfected its seed, and changed to a yellow colour.

MEADOW FOX-TAIL-GRASS. This is in some measure distinguished by the largeness of its foliage, which is rather coarse, and by its producing a soft spike on a long stalk, early in May. If it

be mown early, just as it comes into bloom, the hay will not be coarse. It shoots very rapidly after mowing, and produces a plentiful aftermath.

SHEEPS' FESCUE. This grass is praise-worthy both for the purposes of pasture and hay; sheep and other sorts of stock are fond of it, and are soon rendered fat in pastures where it prevails, giving to mutton a sweet delicious flavour.

ROUGH-STALKED MEADOW-GRASS. It delights in moisture, and situations that are sheltered; on which account, though there are few more productive, or better adapted for the purpose of hay or pasture, it is tender, and liable to be injured by severe cold or drought.

MARSH-MEADOW GRASS. This is a fine exuberant grass, and one of the best dairy grasses we have. It grows in all our rich marshes, which are subject to be flooded in the winter; generally four feet high.

COMPRESSED MEADOW-GRASS. This is an excellent grass for parks and sheep-walks, deer and sheep being fond of it; and as it is a dwarf-grass, the blades seldom exceeding two inches, it makes a fine turf, and renders the flesh of the animals short, and sweet-flavoured.

CRESTED DOG'S-TAIL-GRASS. This is a grass that is a favourite and wholesome food for sheep. It grows best in dry pastoral lands, and will not thrive in meadows that are very moist.

KNOTTY CAT'S-TAIL GRASS. It is a fine exuberant grass, very fit for dairy pastures and for cow-hay. It produces much rich milk, and kine are fond of it.

SWEET-SCENTED VERNAL GRASS. This is a sort of grass that comes early into blossom; and is also valuable for its readiness to grow in most kinds of soil and situation, but in point of crop it is not so productive as some others; and it is well known to be the only grass of this climate which is odoriferous; the agreeable scent of new made hay being produced almost entirely by it.

RED CLOVER is a very valuable grass to be cut for fodder, and is an excellent preparation for a crop of wheat.

SAINFOIN, LUCERNE, and BURNET, are also grasses much extolled by many agriculturists, and well worthy of the farmer's attention.

The same grasses are not alike good for all soils. One of our best writers on the subject has given the following arrangement:

Clay.	Loam.	Sand.
Cow-grass.	White clover	White clover
Cock's-foot	Rye	Rye
Dog's-tail	York white	York white
Fescue	Fescue	Yarrow
Fox-tail	Fox-tail	Burnet
Oat-grass	Dog's-tail	Trefoil
Trefoil	Poa	Rib
York white	Timothy	
Timothy	Yarrow	
	Lucerne	
Chalk.	Peat.	
Yarrow	White clover	
Burnet	Dog's-tail	
Trefoil	Cock's-foot	
White clover	Rib	
Sainfoin	York white	
	Rye	
	Fox-tail	
	Fescue	
	Timothy	

Grass-lands, designed to be cut for hay, are to be distinguished from those on which the herbage is intended to be consumed by cattle upon the spot. In fields of the latter kind, properly called pastures, manure is supplied by the cattle; in the others it must be applied artificially, as large crops of hay exhaust the land, and always in proportion to the maturity which the herbage is suffered to attain before cropping, while nothing is returned to the soil for all that is thus detached from it. In consequence, moreover, of depasturing lands, the plants, being unable to propagate themselves by seed, do it by root, forming a compact and matted turf, incapable of sending forth strong and powerful stems to form a good

good crop of hay, but abounding in slender and delicate shoots, such as the closeness of the turf will alone permit to pass, and which constitute a most nourishing and pleasing food for cattle. These two modes of employing land therefore should not be intermixed. What has for some time been applied to either purpose, should by all means be permitted to remain so; and to attempt to alternate the application of grass-lands between pasture and cropping, is an effectual method of completely defeating both objects. The stocking of poor pastures with sheep, rather than black cattle, is of particular consequence to their improvement, and the perseverance in this practice for years, the sheep being folded upon the spot, has been more recruiting to poor soils than any other practice. A habit of matting its roots is given to the grass by the close bite of these animals, and a growth of delicate herbage is promoted. Weeds are likewise cleared by sheep, as every thing young and tender (even heath and broom) is readily eaten by them. By means also of the dung necessarily arising, an amelioration of the soil as well as produce takes place, of extreme and surprising importance. Quicklime, spread in powder over the surface of pasture-lands, will scarcely fail to improve, not only the poor, but the more valuable ones. The moss-plants, which are so particularly pernicious, are thus destroyed, and converted into valuable manure. Upon impoverished and worn-out lands, about 270 bushels per acre on the sward, in summer, will be found of great and durable efficacy in cleaning and improving them. Mixing lime with earth taken from ditches or ponds is superior to using it alone, and, as a general rule, double the quantity of earth should be mixed with that of lime. The requisite proportions vary, however, with the nature of the soils; but are easily ascertained by attentive workmen. Paring and burning may be applied to pasture with great success in a partial manner, by grubbing up rushes and bushes with which it may be encumbered, burning them after they are dried, and before the autumnal rains come on spreading their ashes on the surface. In some instances this husbandry may be successfully exercised on pasture over the whole surface, as particularly on a poor worn-out ley, which, by such a process, attended with the harrowing in of white clover and several other grass-seeds, at the time of spreading the ashes, has been improved into very fine meadow. Where suitable, such a practice may be regarded as one of the cheapest of all improvements. From whatever cause land may be over-run with moss-plants, or covered with fern, rushes, and ant-hills, it should be subjected for some time to the plough, as no other method is equally useful to prepare for permanently meliorating its pasture. To prepare arable land for grass, it must be cleared from weeds, and well manured, just in the same manner as that which is required for a crop of grain. Excepting upon stiff clays, the most eligible preparation for grass is a crop of turnips, consumed by cattle in the field: the ground being thus at once manured and cleaned. Where lands are broken up expressly for the purpose of improving the pasture, the turnips scarcely fail to succeed, through the manure afforded so abundantly by the fresh turf; and the cattle deriving from the abundant crop consequent on this circumstance a plentiful food, are thus enabled the more extensively to improve the soil by dung. On clay-land the soil should be very liberally manured in spring or autumn; it ought to be ploughed once in autumn, and three or four times more in summer, previously to the period of sowing the seeds, which should take place in August. As to the much agitated question of sowing grass-seeds with or without a crop of corn, it may be observed, that it is impossible for lands intended for grass-crops, or meadow, to possess too high a state of richness; and that after the soil is improved with a view to its permanent fertility in grass, to weaken it by a crop of corn appears little better than blind or infatuated counteraction. If, however, the practice be persevered in which has so generally been followed in this respect, barley should be the grain preferred, as springing up with a slight stalk, and not overshadowing and smothering the grass-plants, and also as being the incumbrance to those plants more speedily removed than any other. Whether grass-seeds be sown in August after a fallow, or with corn in spring, all trampling by horses or cattle should be effectually prevented. Every thing therefore should be kept out from it both during autumn and winter. Not only is the tender soil, which is extremely susceptible of injury thus secured from it, but the pasturage in the spring is of proportionably

more value for not having been eaten off in autumn, and affords a most valuable early bite for the ewes and lambs. The proper treatment of leys during the first year is to feed them with sheep, unless, after a crop of hay be taken from them, vast quantities of manure be spread over their surface. In the cutting of grass-crops for the purpose of being converted into hay, it is necessary that they be in the most suitable states of growth and maturity for affording the best and most nutritious fodder. With this view, it would seem that they should neither be cut at too early a period, nor suffered to stand too long; as in the former case there will be considerable loss in the drying, from the produce being in so soft and green a condition, and in the latter from a large proportion of the nourishing properties being expended. It is probable, therefore, that grass, when mown before it becomes in full flower, while the rich saccharine juice is in part retained at the joints of the flower-stems, is in the most proper condition for being cut down, as at that period it must contain the largest proportion of nutritious material, but which then begins to be absorbed and taken up in proportion as the flowers expand, and the seeds ripen. But there are other circumstances besides those of ripeness to be attended to in determining the period of cutting crops of grass; as in some cases, where they are thick upon the ground, the bottom-parts become of a yellow colour before the flowering fully takes place: under such circumstances, it will always be the most advisable practice to mow as soon as the weather will possibly admit; for if this be neglected there will be great danger of its rotting, or at any rate of its acquiring a disagreeable flavour, and of becoming of but little value. Where grass is very tall, as is often the case in moist meadows, it is liable to fall down and lodge, by which the same effects are produced. In this case also the mowing should be performed as soon as possible. The great art in converting grass into hay consists in rendering it sufficiently dry to prevent its fermentation taking on too great a degree of heat in the stack or mow, and at the same time preserving a large proportion of the natural juice of the plants. Where this medium can be attained with the most exactness, the best and most nutritious hay will be produced. In the making of hay, some attention should be paid to the quality of the soil, and the kind of herbage growing upon it. The hard bent hay of a poor soil is in little or no danger of heating too much in the stack: it should, therefore, be put very early together, in order to promote a considerable sweating, as the only means of imparting a flavour to it, which will make it agreeable to horses and lean cattle, as it will be nearly unfit for every other sort of stock. It is the succulent herbage of rich land, or land highly manured, that is most likely to generate too great a degree of heat; of course grass from such land should have more time allowed in making it into hay. In moderately hot seasons the proper point of drying may be easily judged of; but when they are very hot and scorching it is easy to be mistaken; as in such weather the grass becomes crisp, rustles, and handles like hay, before the moisture or sap is sufficiently dissipated for it to be in a state fit to be laid up in large stacks. If that, however, be done when it is thus insufficiently made, it mostly heats too much, becoming mow-burnt in some cases. The art of hay-making much depends in the due observance of the following rules, as nearly as circumstances will admit. In the first day's process all the grass mown before nine o'clock in the morning must be tedded or spread out, great care being taken to shake it so as to leave it free from lumps, and to strew it evenly over the whole surface of the ground. It is soon afterwards turned, with an equal degree of care and attention; and if the number of hands be sufficient, they turn the whole again, or at least as much of it as they can before one o'clock. It is then raked into what are termed single windrows, or so as that each person may form a row at about three feet distance; and the last operation of the day is to put it up into grass-cocks. The business of the succeeding day commences with the process of tedding all the grass that was mown the first day after nine o'clock, and all that was mown the second day before the same hour. The grass-cocks are then well shaken out into separate plats of five or six yards in breadth. The plats are next turned, and after that, the grass that was tedded in the first part of the morning once or twice, in the same manner as described in the first day. This business should all be performed before one o'clock, that the whole may lie to dry while the people are at dinner. After this the first thing is to rake the plats into double

double windrows, which is done by every two persons raking the hay in opposite directions or towards each other, forming a row between them of double the size of the single windrows, each being about six or eight feet distant from the other. They afterwards rake the grass tedded thus into single windrows; then put the double windrows into bastard-cocks; and conclude by putting the single windrows into grass-cocks. The labour of the third day is begun by first tedding and spreading out the grass mown and not spread the preceding day, as well as that mown in the early part of the day, and then the grass-cocks are thrown out into plats as before, and the bastard-cocks into plats of less extent. These narrow plats, though last spread out, are first turned, then those which were in grass-cocks; and lastly the grass is turned once or twice before one o'clock. When the weather has been sunny and fine, the hay which was last night in bastard-cocks will this afternoon be in a proper state to be carried, as in fine seasons it may mostly be performed on the third day; but when the weather has been cool and cloudy, no part of it probably will be fit to carry. In that case, the first business after dinner is to rake that which was in grass-cocks last night into double windrows; then the grass which was this morning spread from the swaths into single windrows. After this the hay which was last night in bastard-cocks is made up into full-sized cocks, and care taken to rake the hay up clean, and also to put the rakings upon the top of each cock. And lastly, the double windrows are put up into bastard-cocks and the single ones into grass-cocks, as in the preceding days. On the fourth day the great cocks just described are mostly carried before dinner. The other operations are similar to those of the former days, and proceed in the same order, continuing them daily until the whole is finished. During the whole course of hay-making the grass should, as much as possible, be protected both in the day and night against rain and dew, by cocking. The preserving hay of a proper green colour is a circumstance of some importance. In order to effect it, the bastard-cocks, previous to their being carried, should be put up in the heat of the day, and remain in that condition till the following morning, when they must be turned and opened so as to dissipate any damp that might induce it to heat in the stack, and in that way spoil the colour. The acquisition of a lightish brown colour in the stack is not found injurious to hay, but where it becomes of a dark brown from too much heat, it is said to weaken and relax horses that are fed upon it by its powerful diuretic quality. It is of course of inferior value for that purpose, but not the worse for fattening cattle with. For the purpose of facilitating the business of getting the hay together in bad showery seasons, hay-sweeps have been constructed. A contrivance of the first sort has been invented, and described in vol. xiv. of the Transactions of the Society for the Encouragement of Arts, Manufactures, &c. It is so constructed as to be drawn by four horses in pairs, but smaller ones might be made to be drawn by two, and is managed by two boys, one of whom drives each pair of horses, being mounted on one of them. Where the ground is level, little more will be necessary in order to assist the machine, than merely to break and turn up the rows of hay in different places. In catching or showery weather, such a machine may be particularly useful, in getting a field of hay, nearly dry, into large heaps in different parts of the field, whence it may be made into large cocks of half a ton or more each, with the utmost facility. See Plate XCI. fig. 6. Where after-grass is fed off by stock, there is much difference of opinion in regard to the most proper periods of turning in the animals. Some have contended that it is the best practice to let them into the field before the young grass has attained any very great head; while others maintain the opposite doctrine, and think it the best method to allow the grass to get up to a full bite before the stock is turned upon the land. Both endeavour to support their opinions by experience. But as they cannot be both of them true, it is probable that the extremes of each are to be avoided; and that, as in many other matters, the truth may lie in the middle. This is indeed equally supported by fact, and the observation of the most intelligent managers; as when the cattle are turned in too early there is not a sufficient bite to keep up the condition of the animals; while in the contrary extreme, the stock so soon fill themselves, that much of it is trodden down and wasted afterwards in their roaming about the fields to pick the sweetest morsels.

OF THE IMPLEMENTS USED IN HUSBANDRY.

These are exceedingly various, the principal are ploughs, brakes, harrows, carts, waggons, rollers, with a great number of machines invented for the different purposes of husbandry, most of these having many varieties, according to the judgement of the farmer, or the different purposes it is to answer. As these instruments are generally known it would be superfluous to enter into a detailed description of them. Figures of some varieties of ploughs, and of the Rev. Jas. Cooke's improved drill machinery are given in Plates XC. and XCI. With respect to implements, the skill of the farmer, is exhibited in adopting such as are most easily applied in practice to the intended purpose, most effectually perform it, and are best calculated for saving time. In cases of draught it is of great consequence to have the instruments formed and attached in the best manner for that purpose, otherwise much labour and time is lost. Before the farmer proceeds to the operation of ploughing, &c. he ought to take care that every impediment be removed as much as can be done: thus, in many cases, stones are to be removed, wood eradicated, different sorts of plants destroyed, and wet lands properly drained. Without attention to these and similar circumstances, the agriculturist will labour under many inconveniences.

OF THE PLOUGHING OF LAND. This is one of the most essential operations in the culture of the earth, and requires to be performed with the greatest care. Whatever, therefore, may be the design of the farmer, or the destination of the ground, thus moved, it ought never to be plowed, in a wet state; because the soil cannot be improved by such labour. Farther, the plough ought to be carried to a considerable depth into the soil and, if one turning be not sufficient, it will be advisable to pass another plough over the same furrow, so that the land may be effectually stirred; when, being thus exposed to the air, its fertilizing properties will not only be considerably augmented, but all perennial weeds will be completely eradicated. Deep ploughing, however, is unnecessary for land that has been recently manured with lime or marl; but, on exhausted soils, it is uncommonly beneficial, and has, therefore, been generally recommended by the most skilful husbandmen. But it must be here observed, that soil should be plowed deeper than the sole or stratum between the fertile and unfertile mould which is found in most land, and is the preservative of the top-layer. Ploughing increases the food of plants; as it opens the soil for the reception of vegetable aliment from the air; and, the surface being consequently enlarged, a greater portion of land is thus exposed to its influence. Farther, by breaking up the ground, if it be too solid, and rendering it firm, in case it be too light, this operation greatly tends to improve the earth; and, as weeds and other vegetable substances are thus reduced to a state of putrefaction it promotes the nourishment of the new roots. Lastly, ploughing removes too great humidity, by forming the land into ridges, and contributes to the eradication of weeds; as it first causes their seeds to vegetate; and, afterwards tearing up the young plants, exposes their roots to the drought; in consequence of which, they are deprived of their vegetative power. There are certain circumstances that constantly demand notice in the practice of ploughing land. In all the stiff, heavy, and more adhesive kinds of soils, that are much disposed to the retention of moisture, whether they be perfectly clayey, or have more of a loamy quality, it should be a common rule never to plough or turn them up when wet in any great degree, except where the nature of the crop requires it. And further, great injury is produced by the treading or the team, as well as a much greater power necessary in performing the operation. But at the same time they should not be permitted to become so dry and hard as to afford too great resistance in that way, before the operation is proceeded upon. But in the dry, sandy, and probably in some of the more mellow and friable kinds of loamy soils, the business of ploughing, especially for the putting in of the seed, may be performed when they are in a state of considerable moisture, not only without their suffering any inconvenience, or the seed being injured, but often with advantage, as they are liable to part with the watery pastures that they contain too readily. On this last account the very dry sorts of sandy land should, whenever the weather is hot and dry, merely be stirred in such way as may be necessary to prevent the growth of weeds, otherwise the great exhalation of moisture in such seasons may render them too dry for the healthy vegetation.

getation of the seeds or plants that may be sown or set upon them. In regard to the frequency of ploughing or turning over ground, in order to prepare and render it suitable for the production of good crops, it is obvious there must be much difference according to the nature and condition of the soil, as well as the kind of crop that is to be grown. The stiff, clayey, loamy, and even chalky soils will, in general, stand in need of more frequent stirring, either by means of the plough, drag, or harrow, in order to separate and break down their tenacious particles, than those of the sandy or gravelly, and more light kinds, in which there is much less adhesion. Besides, where lands have been in a course of tillage for some length of time, whether they are of a clayey, loamy, or even sandy quality, they may require less frequent stirring than where the contrary is the case. And where the method of putting the seed into the ground by means of drill-machines is to be had recourse to, a fine state of tilth will in general, be indispensably necessary. The nature of the crop that is to be cultivated must, however, in most cases direct the number of ploughings that may be necessary, as some demand a much finer state of tillage than others; though in most cases a well-reduced earth is favourable. The following contrivance will be found useful for ascertaining the force necessary in the draught of various ploughs. It was presented to the public by Mr. More the late ingenious Secretary to the Society for the Encouragement of Arts, &c.; it consists of a spring coiled within a cylindrical case, which is furnished with a dial-plate numbered in a manner similar to that of a clock; and which is so constructed, that the hand moves in consequence of the motion of the spring, and points to the numbers according to the force exerted: thus, if the draught be equal to one cwt. over a pulley, the hand will be directed towards figure 1; when the draught equals two cwt. it points to figure 2; and continues to increase, or diminish, its progress in proportion to the exertions made. Various experiments were conducted under the inspection of the Society, when the accuracy of this machine was fully evinced; a detailed account of which is inserted in the first volume of "Annals of Agriculture;" where the different results are minutely recorded.

OF DRILL HUSBANDRY.

This is a method of sowing grain or seed of any kind, so that it may be deposited in the ground at an uniform depth; a circumstance of the utmost importance to the production of healthy and vigorous plants. This method differs from the old, or broad-cast husbandry, which is performed by sowing the grain, or seed, with the hand; whereas the new practice is effected by one of the most useful machines ever invented, and called a drill-plough. It was originally introduced into this country about sixty years since, and at first violently opposed as an useless innovation, till it was proved, by repeated experiments, to be indisputably the best mode of sowing hitherto contrived. By the broad-cast-system of culture, the land is often sown in bad tilth, the seed is always scattered at random, and sometimes by very unskilful hands. In drilling, the ground must be in good order; and the seed set in trenches regularly drawn, all being nearly of an equal depth, which is adapted to the nature of each particular kind of seed. These seeds are also distributed at proper distances: and, by being equally and speedily covered, are most effectually protected from vermin, and other accidental injury. Farther, in consequence of the broad-cast-practice, the seed falls in many places too thick, in others too thin; and, being imperfectly covered, part of it is devoured by vermin which follow the sower; the remainder is exposed to rain or frost, or to heats, either of which are very hurtful. When harrowed in, a considerable portion of the seed is so deeply buried in the soil, that if the latter be wet, it putrefies before it can vegetate. Besides, when corn is thus sown, the crop will not admit of being touched afterwards, because its growth is irregular. The soil cannot be broken in order to afford it more nourishment; nor can even the weeds be destroyed without much damage and inconvenience. On the contrary, in the drill-husbandry, the intervals between the rows, whether double or single, may be horse-hoed; and nourishment may thus be repeatedly given to the plants, and the weeds almost totally extirpated. Drilling, however, is not calculated for every soil; yet as there are but few situations, in which the broad-cast-method is preferable to it, they ought not by any means to impede the more general introduction of the former. The drill-husbandry is said to be at-

tended with many disadvantages: namely, 1. That it is very difficult to procure persons who are acquainted with the use of the drill-plough, or its proper management, when on the soil. 2. That the earth requires to be well prepared to admit of it. 3. That the crop is too thinly sown by it. 4. That drilled-crops are harvested later than broad-cast ones. 5. That clover does not succeed, when cultivated according to the drill-husbandry. 6. That oats produce rank and coarse straw, which does not afford wholesome food for cattle. These objections appear formidable, and it must be allowed, that no person can acquire a thorough knowledge of the drill-husbandry in one season. It is nevertheless untrue, that the seed is too thinly sown; for, though the quantity required is nearly one-half less (which is consequently saved,) yet the crops of drilled wheat are, in general, so much more valuable than those of broad-cast, whether we consider the quantity, quality, or weight, of the grain, that the inferiority of the latter is evident to every impartial observer. This reason is likewise a sufficient answer to the objection alledged against the expence of horse-hoeing, which eradicates almost every weed, even where hand-hoeing is impracticable; and consequently in a very considerable degree promotes vegetation. To this we may add, that by drilling, the seed grows more regularly and vigorously; and that though the crops are harvested later than broad-cast ones, yet they are gotten in with less expence, and with greater safety, while the soil is left in a better state for future crops. Such are the advantages and disadvantages attending the drill-husbandry, which we have endeavoured fairly to state: after these decisive proofs, no rational agriculturist will hesitate to pronounce in favour of the new system. That useful instrument the drill-plough, was first introduced in this country by the ingenious Jethro Tull, in the beginning of the last century. Since that period, various other machines, or drill-ploughs, have been invented by different persons, of which we shall mention the principal. One of the earliest implements of this description is the hand-drill, which is chiefly employed in the low lands of Scotland, where it was also invented. It is pushed along by two handles, in a manner similar to wheel-barrow, and sows one row at a time. The principal part of this machine is a wheel, about twenty-two inches in diameter, and made of solid deal, upon the axle of which is fixed a notched roller $2\frac{1}{2}$ inches in diameter, and two inches long, that turns in the fore-part of the drill-box. The quantity of seed intended to be sown, is regulated by a slider, which moves up and down in the fore-part of the box, by an adjusting screw fixed at the top; and has a strong brush, that projects from its lower end, and sweeps upon the notched roller. There is also a sluice, or slider which lies flat on the bottom, on the inside of the drill-box, and juts out between the two handles of the drill, so as to be within the reach of the person guiding it; who, by pushing the slide forwards, completely covers the notched roller, and prevents any of the seed from being scattered, while the drill is turning at the end of the ridges. With this implement, a woman, or boy, is able to drill from two to two and a half acres in a day; the rows being at the distance of twenty inches. The next contrivance is that of the ingenious Mr. Arthur Young, whose indefatigable labours in promoting agriculture, are too well known to require our encomium. In the common drill-ploughs, there are generally two or three barrels, with corresponding hoppers, or receptacles for seed, through which it is committed to the ground. Such an arrangement renders them necessarily complex; and to obviate the defect resulting from it, Mr. Young has two divisions in the barrel, and two corresponding ones in the hopper, which are more simple, and doubtless preferable to moveable beards. In his drill-plough the whole machinery is fixed, yet he sows with it single rows at any distance, double ones at two feet, or three rows at one foot; relinquishing the other powers of mechanism, to render the plough in all its parts stronger, and more steady. It is likewise calculated for the stiffest soil; and Mr. Young adds, that it will even deposit seed in drills cut through a clay-field, without any previous ploughing. For a more detailed account of this excellent machine, we refer our readers to the 3d vol. of "Annals of Agriculture," p. 240, where it is fully described, and illustrated with an engraving. In Plate XC1. we have given a view of the celebrated drill-plough invented by the Rev. James Cooke, late of Heaton Norris, near Manchester.

Fig. 1. A, A, are the shafts of the machine, applied to the axis of the wheels, so that the horse may walk in the furrow, without treading on the land, either for the purpose of drilling or horse-hoeing.

B, B, the wheels. C, C, coulters-beam, with holes or mortices for the coulters, at different distances. D, D, handles of the machine, applied to the coulters-beam, and also to the axis of the wheels, by hooks and eyes, or staples. E, E, the upper seed-box, in partition, covered by a lid, to protect the grain from wind or rain. F, F, lower seed-box, in partitions. G, G, slides between the upper and lower seed-boxes, for regulating the quantity of seed sown. H, H, a cylinder with cups or ladles of different sizes, for various sorts of grain or seed, by which the latter are taken up and dropped into the funnels I, I, and conducted through these into the incisions or drills, made in the land by the coulters K, K. L, a hook affixed to the axis of the wheels; l, a chain applied to the coulters-beam, the last link of which, when put upon the lowest hook, prevent the tubes of the funnels from being displaced; while the machine is crossing deep furrows or gutters. M, an iron-pin, projecting from the coulters-beam, which being lifted on the hook L, at the end of the land, will bear the coulters out of the ground, while the machine is turning round, or on any other occasion, without additional labour to the person who attends the plough. N, a cog-wheel. O, another cog-wheel, turned by the wheel N. P, a lever and string, passing over a pulley to the axis of the cylinder H:—by moving the lever P, to the notch in the staple Q, the wheel O, will be prevented from acting with the wheel N; so that the distribution of grain or seed may be stopped at pleasure. R, an iron-bar, perforated with holes, by means of which, and of a pin passing through the holes, the seed-box may be raised or lowered, so as to keep the lid of the box horizontal, whether the machine be ascending or descending steep hills, or moving on level ground. S, S, two staples in the ends of the seed-box, for the reception of two slips of wood, with canvas to prevent the wind from dispersing the grain or seed: and also to prevent dirt or soil from falling off the wheels into the funnels I, I. This machine may be easily converted into a horse-hoe, see fig. 2, which represents the shafts, the axis, and wheels: the coulters-beam with handles, &c. as in fig. 1; being part of the same machinery, and convertible into an horse-hoe, with six shares, by taking away the seed-box E, E, the cylinder H, H, the funnels I, I, the coulters K, K, as in fig. 1, and substituting the hoes A, A, A, A, A, A, fig. 2, for the coulters.

HAND-HOE. Fig. 3, A, is the hoe-plate or share of different sizes, for drills at different distances. B, the wings for earthing up the soil to the rows of corn; and which may be occasionally taken off. C, the handle. D, a wedge, applied to the upper or under side of the handle C, so as to raise, or reduce it, according to the height of the person using it. Fig. 4, a rake that may be applied to the handles of the machine instead of the coulters-beam, and may be used for making hay, clearing land from dog's-grass, or couch-grass, and for other purposes.

DIRECTIONS FOR USING THE MACHINE: the practice of drilling, says Mr. Cooke, should not be attempted, unless the soil be so dry, as not to adhere to the feet, except it be to regain a late or lost seed-time. If the soil abound with large dry clods, these should be reduced by a heavy roller. Previously to being drilled, the land ought to be ploughed deep, and lightly harrowed, to render the surface level. When the horse is put in the shafts, care should be taken that the chains, by which he draws, be of equal lengths; otherwise the machine will deviate from the direction in which the animal advances. In going to, or returning from, the field, the pin or guide M, must be lifted on the hook L, which will bear the coulters off the ground. And, when passing through rough roads, if the coulters-beam C, C, and the axis of the wheels, be lashed together by a rope or chain, it will prevent the coulters from receiving any injury, by reaching the ground suddenly. The cylinder H, H, is furnished with cups or ladles of four different sizes, for various kinds of grain or seeds, which are distinguished by the numbers 1, 2, 3, 4. No. 1, (the smallest size painted white) is calculated for rape, lucerne, cole-seed, clover, &c. and will sow 2lbs. per acre. It will also sow turnip, after the rate of one pound per acre; every other cup being closed with a small quantity of soft clay. No. 2, (painted red) for wheat, and will sow one bushel per acre. No. 3, (painted green) for barley; and will sow from 1 to 1½ bushel per acre. No. 4, (painted yellow) for peas, beans, oats, vetches, &c. and will sow two bushels per acre. Although the above quantities of grain or seed are specified, they may be increased or diminished

by raising or lowering the slides (G, G, fig. 1) at pleasure. The funnels are applied to their respective places by numbers 1, 2, 3, 4, 5, 6; and for drilling at nine inches, they ought to correspond with the numbers 1, 2, 3, 4, 5, 6, of the seed-box; six coulters being fixed in the beam, at the distance of nine inches from each other. For drilling 12 inches apart, five coulters should be fixed in the beam, 11½ inches from each other, when the order of the funnels will stand 1, 4, 5, 2, 3, 6, and no seed will be put in the box opposite the funnel No. 5, when placed as above: the unemployed funnel may be stopped with paper to receive any seed dropping into it accidentally. In a similar manner, Mr. Cooke's machine may be so regulated as to deposit grain or seed in drills at 18 or 22 inches apart, or at any other distance. If the coulters should not make the incisions or drills deeper than two inches in light sands or loams, or less than two in strong clays or wet soils, they may be forced into the ground by the hand, or by weights, or a beam of wood four feet long, and three or four inches thick, being suspended by chains or cords at the hooks T, T, in the handles of the machine, for that purpose. In attempting to render the drills straight, if the horse should deviate from his proper course, the coulters-beam and coulters may be easily removed in any direction, in order to remedy that irregularity. In different parts of the kingdom, the lands or ridges are of various sizes: where the machine is too wide for them, one or more funnels may be stopped with loose paper, and the seed received into such funnel, returned into the upper seed-box. In drilling narrow high-ridged lands, the outside coulters may be lowered, and the middle ones raised, so that the points of the coulters may form a curve similar to that formed by the ridge. When shut, the top of the seed-box should always be kept horizontally level; thus, the distribution of the seed will be uniform. The higher the front-edge of the box is raised upon the bar R, the more copiously will the seed descend into the lower boxes; and consequently a greater quantity be distributed. No wheat should be deposited more than 1½ or 2 inches deep in strong clays, or wet soils, nor less than two inches deep in all dry lands.

DIRECTIONS FOR USING THE HORSE-HOE. Having already explained the construction, we shall briefly state a few circumstances relative to the management of this instrument. In order to hoe a crop of any kind that is drilled at the distance of nine inches, the horse ought to be conducted along the third row, or drill, computing the rows from the left side of the six rows, drilled at one operation of the machine. The person who attends the hoe should carefully keep the pin (B, fig. 2,) immediately over the third row of corn, by which means the implement cannot receive any injury. For hoeing corn at 12 inches apart, the horse should be conducted along the second space, between the rows or drills, computing the spaces from the left side of the five rows, drilled at one operation of the machine. The man attending the hoes ought carefully to keep the pin (B, fig. 2,) directly over the middle of the second space, described as above: this rule will apply to the hoeing of ground at various distances. Different soils require to be hoed with shares of a proportionate size, which experience alone can ascertain. In light sandy loams, or any other soils sufficiently pulverized, shares from five to six inches broad, for nine inch drills, and eight inches broad for 12 inch drills, may be safely and effectually worked: for strong clays intermixed with pebbles, the hoe-shares should be somewhat less in breadth. But, if the soil, in the spaces of the rows of corn, be pulverized with long narrow plates of iron, similar to chisels, being introduced into the shafts of the hoe-share, A, A, A, A, A, A, (fig. 2,) instead of hoe-plates, the advantages resulting from such a process will be very considerable. Beside the hoeing of drilled corn, this horse-hoe may be applied to many useful purposes, particularly for cutting up the rows of stubble, as soon as the crop is harvested, together with such weeds as may have escaped the hoe: it may also be employed for the stirring of fallows, &c. after the rate of 10 acres per day, with one man, a boy, and two horses, especially in the busy time of harvest, when it would be impossible to spare so many men and horses as are required to break up the land effectually with the common ploughs. The price of Mr. Cooke's Improved Drill-plough, together with Horse-hoe, &c. was in the year 1790, twelve guineas. This very excellent machine has since been greatly improved and simplified by the celebrated Dr. Darwin. Mr. M'Dougal invented a hoe represented in Plate XCI.

fig. 7, which is extremely simple in its construction, and answers all the purposes of a hand-hoe in a very superior manner, particularly the clearing from weeds and loosening the soil in the intermediate spaces of pulse or grain which has been sown in equidistant rows, and at the same time for earthing up the plants. It consists of two principal parts; the first a beam of wood, having at its fore-end a semicircle forming two handles, between which one man walks, and draws the instrument forwards: this beam at the other end is divided, and moves on two small gudgeons, by which it is accommodated to the height of the hands of the person drawing, and room allowed for a wheel to move in. The other beam is held at its further end by another man, who guides the instrument and regulates its depth in the ground, at the same time that he assists its action by thrusting it forwards. This beam is also divided at its fore-end, so as to admit a wheel to run between the sides, which wheel serves to adjust the depth and ease the draught in working. The hoes are made of cast iron, and fixed in a mortise, in the hinder beam, by a proper wedge, and may be made of different forms or dimensions, as the work to be performed may require. Another implement upon a new principle was invented by Mr. John Horn, of Dover, and by him denominated an "Universal Sowing Machine, for Drilling or Broad-casting;" for which he obtained a patent, about the year 1785. It is so constructed that, whether worked by the hand, drawn by a horse, or fixed to and used with a plough, it is not liable to be put out of order; there being but one movement to direct the whole. It sows every kind of grain with equal ease and regularity, so that the quantity sown may be varied at pleasure, and in any degree. A correspondent in the 12th vol. of "Annals of Agriculture," p. 481, states, that Mr. Horn's invention possesses the peculiar advantage of cultivating turnips, so as to ensure the crop against the ravages of the fly. By sowing the usual quantity of turnip-seed broadcast by the machine, and at the same time striking furrows at proper distances in the land, part is deposited in the drills, and the rest sown broadcast between them; so that, if the season be dry, it will be favourable to the drills, and, if wet, to that which is broadcast. And, if it happen that the latter be injured by the depredations of the fly, the former, by coming at a later period, is saved; or, if the former be destroyed, the latter is preserved. If the whole thrive, the farmer has the choice of selecting the most vigorous plants from both. This machine is represented in Plate XC. fig. 10. The machine fixed to a plough. A, the machine. B, the apron upon which the seed falls and rebounds upon the land, in broadcast. C, lid to cover the hopper. D, wheel at the heel of the plough. E, strap. FF, hooks, upon which the apron turns by a pivot on each side. G, stay, to keep the machine steady. H, lever, to prevent it from sowing.

Fig. 11. The same machine, with the front laid open to shew the inside. A, the catch-wheel fixed upon the axle. BB, the axle upon which the machine hangs between the handles of the plough. C, the pulley, by which the strap from the wheel at the heel of the plough turns the catch-wheel. D, the bar, upon which the upper spout rests, suspended by the diagonal-supporters EE, bearing against the catch-wheel by the trigger F, and thereby kept in motion while the plough is going. G, the apron in a sloping position, upon which the corn or seed falls from the upper spout, and is scattered by rebounding upon the land. It turns upon pivots, and thus throws the seed either towards the right hand or left at pleasure.

Fig. 12. The long spout to be applied when the machine is used for drilling.

Fig. 13. Is the same machine with that in fig. 10, A, B, G, H, C, &c. The dotted lines express the situation of the long spout, when the apron is removed, and the machine adapted for drilling. For a more particular account, we refer the reader to a treatise on the subject, published by the inventor (8vo. 6d. Johnson, 1786,) entitled, "Description and Use of the Universal Sowing Machine for Drilling and Broad-casting."

The Rev. T. C. Munnings's drill for turnips, which is represented in Plate XCI. fig. 8. A, the wheel with an iron rim. B, the tin-barrel, or seed-box, which is fixed to the axis of such wheel. C, the opening, through which the seed is introduced into the box; and which is afterwards closed by a cover. D, a semi-circular plate of tin, the design of which is to exclude all impurities from the seed-box. E, E, the two handles of the machine.

Mr. Munnings considers his drill for turnips, as much superior to any other, from the single circumstance of its depositing the seed so instantly after the plough, as entirely to preserve the good effects of the first evaporation: and he conceives, that such evaporation contributes to the uniform vegetation of minute seeds. Thus, in the six acres of his drilled plants, there was not a deficiency of six square yards; though, on three acres of broadcast, before rain fell, not one-half, perhaps not one-third, of the seeds vegetated. He is fully persuaded, that the drill-method, in the cultivation of turnips, will, in all seasons, be superior to the broadcast; but, that the very great and striking difference between the two methods, will most effectually be perceived in a season of uncommon drought.

OF THE CULTIVATION OF PARTICULAR PLANTS.

The grand object of a farm is, that of raising plants for the nourishment of man and other animals. Of these, wheat is of the first importance. Any time from the middle of April to the middle of May, the following for wheat may commence. The moment should be chosen, when the ground, beginning to dry, has yet some remaining softness: in that condition, the soil divides easily by the plough, and falls into small parts. This merits the strictest attention of the farmer. Ground plowed too wet, rises, as is said, whole fur, as when pasture-ground is plowed: where plowed too dry, it rises in great lumps, which are not reduced by subsequent plowings; it also requires double force to plow ground too dry, and the plough is often broken to pieces. When the ground is in proper order, the farmer ought not to lose a moment. A sandy soil is too loose for wheat. The best chance for a crop is after red clover, the roots of which bind the soil. Rye is a crop much fitter for sandy soil than wheat; and like wheat, it is generally sown after a summer-fallow. Sow wheat as soon in October as the ground is ready. When sown a month more early, it is too forward in spring, and apt to be hurt by frost; when sown a month later, it has not time to root before the frost comes on, and frost sows it out of the ground.

SETTING OF WHEAT is a method which is reckoned one of the greatest improvements in husbandry that was made last century. It seems to have been first suggested by planting grains in a garden from mere curiosity, by persons who had no opportunity of extending it to a lucrative purpose. This was first attempted on a larger scale, by a little farmer near Norwich. And a few years after by one of the largest occupiers of lands in Norfolk, who set 57 acres in one year. His success, from the visible superiority of his crop, both in quantity and quality, was so great, that the following autumn he set 300 acres, and has continued the practice ever since. This noble experiment established the practice, and was the means of introducing it generally among the intelligent farmers in a very large district of land; there being few who now sow any wheat, if they can procure hands to set it. It has been generally observed, that although the set crops appear very thin during the autumn and winter, the plants tiller and spread prodigiously in the spring. The ears are indisputably larger, without dwarfish or small corn; the grain is of a larger bulk, and specifically heavier per bushel than when sown. The lands on which this method is particularly prosperous, are either after a clover stubble, or on which trefoil and grass-seed were sown the spring before the last. These grounds, after the usual manuring, are once turned over by the plough in an extended flag or turf, at ten inches wide; along which a man, who is called a dibbler, with two setting irons somewhat bigger than ram-rods, but considerably bigger at the lower end, and pointed at the extremity, steps backwards along the turf, and makes the holes about four inches asunder every way, and one deep. Into these holes the droppers (women, boys, and girls,) drop two grains, which is quite sufficient. After this, a gate bushed with thorns is drawn by one horse over the land, and closes up the holes. By this mode, three pecks of grain is sufficient for an acre; and being immediately buried, it is equally removed from vermin or the power of frost. The regularity of its rising gives the best opportunity of keeping it clear from weeds, by weeding or hand-hoeing. Setting of wheat is a method peculiarly beneficial when corn is dear; and, if the season be favourable, may be practised with great benefit to the farmer. Sir Thomas Beevor of Hethel-Hall in Norfolk, found the produce to be two bushels per acre more than from the wheat which is

sown;

sown; but having much less small corn intermixed with it, the sample is better, and always fetches a higher price, to the amount generally of 2s. per quarter. This method, too, saves to the farmer and the public six pecks of seed wheat in every acre; which, if nationally adopted, would of itself afford bread for more than half a million of people. Add to these considerations, the great support given to the poor by this second harvest, as it may be called, which enables them to discharge their rents and maintain their families without having recourse to the parish. The expence of setting by hand is now reduced to about six shillings per acre; which, in good weather, may be done by one dibbler, attended by three droppers, in two days. This is five shillings, per day; of which, if the dibbler gives to the children sixpence each, he will have himself 3s. 6d. for his day's work, which is more than he can earn by any other labour so easy to himself. But if he has a wife who dabbles with him, and two or three of his own children to drop to him, his gains will then be prodigious, and enough to ensure a plenty of candidates for that work, even in the least populous parts of the country. But this method, in seasons when seed-corn is very cheap, or the autumn particularly unfavourable to the practice, must certainly be lessened. In light lands, for instance, a very dry time prevents dibbling; as the holes made with the instruments will be filled up again by the mould as fast as the instrument is withdrawn. So, again, in a very wet season, on strong and stiff clays, the seeds in the holes cannot be properly covered by the bushes drawn over them. But these extremes of dry and wet do not often happen, nor do they affect lands of a moderately consistent texture, or both light and heavy soils at the same time, so that the general practice is in fact never greatly impeded by them.

PROPAGATING OF WHEAT BY DIVIDING AND TRANSPLANTING ITS ROOTS. In the Philos. Trans. for 1768, we meet with a very extraordinary experiment, of which the following is an abstract. On the 2d of June 1766, Mr. C. Miller sowed some grains of the common red wheat; and on the 8th of August a single plant was taken up and separated into 18 parts, and each part planted separately. These plants having pushed out several side-shoots, about the middle of September some of them were taken up and divided, and the rest between that time and the middle of October. This second division produced 67 plants. These plants remained through the winter, and another division of them, made between the middle of March and the 12th of April, produced 500 plants. They were then divided no further, but permitted to remain. The plants were in general stronger than any of the wheat in the fields. Some of them produced upwards of 100 ears from a single root. Many of the ears measured seven inches in length, and contained between 60 and 70 grains. The whole number of ears which, by the process above mentioned, were produced from one grain of wheat, was 21,109, which yielded three pecks and three quarters of clear corn, the weight of which was forty-seven pounds seven ounces; and from a calculation made by counting the number of grains in an ounce, the whole number of grains was about 576,840. By this account we find, that there was only one general division of the plants made in the spring. Had a second been made, Mr. Miller thinks the number of plants would have amounted to 2000. The ground was a light blackish soil, upon a gravelly bottom; and, consequently, a bad soil for wheat. One-half of the ground was well dunged, the other half had no manure. There was, however, no difference discoverable in the vigour, or growth of the plants. It is evident, that the expence and labour of setting in the above manner by the hand, will render it impracticable upon a large scale. However, in particular cases, it may be practised to great advantage. Instances have been known of wheat transplanted in September, October, November, February, March, April, and to the middle of May, which have all answered very well.

2. OATS. As winter-plowing enters into the culture of oats, we must remind the reader of the effect of frost upon tilled land. Providence has neglected no region intended for the habitation of men. If in warm climates the soil be meliorated by the sun, it is no less meliorated by frost in cold climates. Frost acts upon water, by expanding it into a larger space. Frost has no effect upon dry earth or sand. But upon wet earth it acts most vigorously; it expands the moisture, which requiring more space puts every particle of the earth out of its place, and separates them from each other.

In that view, frost may be considered as a plough superior to any that can be made, by the hand of man: its action reaches the minutest particles: and, by dividing and separating them, it renders the soil loose and friable. This operation is the most remarkable in tilled land, which gives free access to frost. With respect to clay-soil, there is no rule in husbandry more essential than to open it before winter in hopes of frost. It is even advisable in a clay-soil to leave the stubble rank; which, when plowed in before winter, keeps the clay loose, and admits the frost into every cranny. It is, therefore, dangerous to plow clay-soil when wet, because water is a cement for clay, and binds it so as to render it unfit for vegetation. It is, however, less dangerous to plow wet clay before winter than after. A succeeding frost corrects the bad effects of such plowing; a succeeding drought increases them. The common method is, to sow oats on new-plowed land in March, as soon as the ground is tolerably dry. If it continue wet all March, it is too late to venture them after. It is much better to summer-fallow, and to sow wheat in the autumn. But the preferable method, especially in clay-soil, is to turn over the field after harvest, and to lay it open to the influences of frost and air, which lessens the tenacity of clay, and reduces it to a free mould. The surface-soil by this means is finely mellowed for reception of the seed; and it would be a pity to bury it by a second plowing before sowing. In general, the bulk of clay-soils are rich; and skilful plowing without dung, will probably give a better crop, than unskilful plowing with dung. The culture of oats is simple. That grain is probably a native of Britain: it grows on the worst soil with very little preparation. Before turnips were introduced, it was always the first crop upon land broken up from the state of nature. Upon such land, it may be a good method, to build upon the crown of every ridge, in the form of a wall, all the surface-earth, one sod above another, as in a fold for sheep. After standing in this form all summer and winter, let the walls be thrown down, and the ground prepared for oats. This will secure one or two good crops; after which the land may be dunged for a crop of barley and grass-seeds. This method may answer in a farm where manure is scarce.

3. BARLEY is a culmiferous plant that requires a mellow soil. Upon that account, extraordinary care is requisite where it is to be sown in clay. The land ought to be stirred immediately after the crop is removed, which lays it open to be mellowed with the frost and air. Barley is less valuable when it does not ripen equally. Barley, which comes up speedily in a dusky soil, gains a great advantage over seed-weeds. Therefore, first take out about one-third of the contents of the sacks of seed-barley, to allow for the swelling of the grain. Lay the sacks with the grain to steep in clean water; let it lie covered with it for at least 24 hours. When the ground is dry, and no likelihood of rain for ten days, it is better to lie 36 hours. Sow the grain wet from steeping, without any powdered quicklime, which would suck up part of its useful moisture. The seed will scatter well, but the sower must put in one-fourth or one-third more seed in bulk than usual of dry grain, as the grain is swelled in that proportion: harrow it in as quickly as possible after it is sown: and give it the benefit of a fresh furrow. It will rise in a fortnight at farthest. The following experiment by a correspondent of the Bath Society is considered as very interesting: "The last spring (1783) being remarkably dry, I soaked my seed-barley in the black water taken from a reservoir which constantly receives the draining of my dung-heap and stables. As the light corn floated on the top, I skimmed it off, and let the rest stand 24 hours. On taking it from the water, I mixed the seed-grain with a sufficient quantity of sifted wood-ashes, to make it spread regularly, and sowed three fields with it. I began sowing the 16th, and finished the 23d of April. The produce was 60 bushels per acre, of good clean barley, without any small or green corn, or weeds at harvest. No person in this country had better grain. I sowed also several other fields with the same seed dry, and without any preparation; but the crop, like those of my neighbours, was very poor; not more than 20 bushels per acre, and much mixed with green corn and weeds. I also sowed some of the seed dry on one ridge in each of my former fields, but the produce was very poor in comparison of the other parts of the field." Where the land is in good order, and free of weeds, April is the month for sowing barley. Every day is proper. The dressing loamy soil and light soil for barley, is the

same with that described; only that to plow dry is not so essential as in dressing clay-soil. Loam or sand may be stirred a little moist; better, however, delay a week or two, than to stir a loam when moist. Clay must never be plowed moist, even though the season should escape altogether. But this will seldom be necessary; for not in one year of twenty will it happen, but that clay is dry enough for plowing some time in May. Frost may correct clay plowed wet after harvest; but plowed wet in the spring, it unites into a hard mass, not to be dissolved but by very hard labour. When the barley is sowed and harrowed in, the land should be rolled after the first shower of rain, to break the clods. This will close the earth about the roots, which will be a great advantage to it in dry weather. When the barley has been up three or four weeks, roll it again with a heavy roller, which will prevent the sun and air from penetrating the ground to the injury of the roots. This rolling, before it branches out, will also cause it to tiller into a greater number of stalks; so that if the plants be thin, the ground will be thereby filled, and the stalks strengthened. If the blade grows too rank, as it sometimes will in a warm wet spring, mowing is a much better method than feeding it down with sheep; because the scythe takes off only the rank tops, but the sheep being fond of the sweet end of the stalk next the root, will often bite so close as to injure its future growth.

4. **BUCK-WHEAT.** This is applied with success to the feeding of horses, hogs, poultry, &c. It delights in a mellow sandy soil; but succeeds well in any dry loose healthy land, and moderately so in a free loamy stone-brash. A stiff clay is its aversion, and it is entirely labour lost to sow it in wet poachy ground. The proper season for sowing is about the end of May or the beginning of June. After spring-feedings, a crop of turnip-rooted cabbage, or vetches, there will be sufficient time to sow the land with buck-wheat. In hot dry summers, a crop of vetches might even be mown for hay early enough to introduce a crop of this grain after it. Buck-wheat is reckoned a better preparative for a succeeding crop than a summer following.

5. **BEANS.** The most proper soil for beans is a deep and moist clay. They require to be sown early; hence the ground should be plowed before winter, to give access to the frost and air; beneficial in all soils, and necessary in a clay-soil. As beans delight in a moist soil, and have no end of growing in a moist season, they cover the ground totally when sown broadcast, keep in the dew, and exclude the sun and air: the plants grow to a great height; but carry little seed, and that little not well ripened. Hence the advantage of drilling; which gives free access to the sun and air, dries the ground, and affords plenty of ripe seed. Beans, where the land is proper for them, deserve from the farmer every attention, constituting one of the surest funds of profit. He is enabled by them to lessen, if not absolutely explode, the practice of fallowing. When cultivated, however, with a view of substituting them in the room of fallow, drilling or dibbling must be uniformly employed, so as to admit the plough between their rows, as no hand-work will sufficiently pulverize the lands for the purpose, without extreme expence. Dibbling, when well performed, with respect to beans, is an admirable method. The difficulty, however, of procuring it to be well done must be considered as no trifling objection to it. Beans are too often imperfectly delivered by the various drill-machines employed. On the other hand, however, the practice is less expensive than dibbling, and the seed is more surely put in to the desired depth, so that, on the whole, the drilling method seems preferable to that by dibbling. It is a point on which different circumstances will safely and judiciously lead to different conclusions, and soil, season, dependence upon servants, together with other considerations, will be resorted to, previously to the decision upon either of these methods. The common little horse-bean has the advantage of being more marketable than any other. Beans thrive upon light loams better than has been generally imagined. The soils, however, generally applied to their culture, are all the strong and heavy ones. Wherever they can be cultivated, the farmer ought to have them. They do not exhaust the soil. Wheat is prepared for by them, perhaps, better than by any other mode. They preserve their upright attitude to the latest period, admitting of horse-hoeing to the very last. The ground is well shaded by them from the sun; and their straw is useful as fodder and manure.

PEAS. All the varieties of peas delight in dry warm soils,

though the blue pea will also succeed on poor land. They may be sown from the middle of February to the middle of April, in the proportion of from three to five bushels per acre, broad-cast; but, if drilled, two bushels will be fully sufficient. When they are sown broad-cast, the ground must be well harrowed, to protect the seed from the depredations of birds; but the drill-peas are to be earthed up, and weeded twice; the first time, when they are about an inch above the ground; and secondly, when they attain the height of about four inches. The method of drilling is much superior to that of the broad-cast sowing. No sooner do peas arrive at maturity, than they are attacked and devoured by rooks, wood-pigeons, and other birds: hence, it will be necessary to watch them with care: and, after cutting, or hacking them, as it is provincially termed, they should be formed into small wads, or bundles, and exposed for some days, so that the straw may wither, and the fruit become dry. Besides their utility for culinary purposes, peas, when harvested dry, and ground into meal, are uncommonly serviceable for fattening hogs; as no other grain agrees better with those animals. If the straw be forward in autumn, and has been housed without injury, it will be little inferior to ordinary hay, and afford a very useful article of fodder; on which every kind of cattle will thrive: and, though it be apt to occasion gripes in horses, if given to them before the month of January, yet such effects may be corrected, by allowing a few turnips, cabbages, or potatoes, either with, or after they have eaten the pea-straw. A crop of peas is so far from exhausting the land, that it may be considered as an excellent and meliorating manure. Thus, grey peas, in particular, if sown towards the end of March, and plowed in shortly before they flower, will prove a valuable dressing for wheat. The following method is practised in Norfolk, for sowing peas upon a dry light soil, immediately open from pasture. The ground is pared with a plough extremely thin, and every sod is laid exactly on its back. In every sod a double row of holes is made. A pea dropped in every hole lodges in the clayed ground immediately below the sod, thrusts its roots horizontally, and has sufficient moisture. This method enabled Norfolk farmers, in the barren year 1740, to furnish white peas at 12s. per boll.

TURNIPS. These plants can be raised to great perfection, and with the least hazard of miscarrying. At the same time, there is no soil but will bear-turnips when well prepared. No person ever deserved better of a country, than he who first cultivated turnips in the field. No plant is better fitted for the climate of Britain, no plant prospers better in the coldest part of it, and no plant contributes more to fertility. In a word, there has not for two centuries been introduced a more valuable improvement. Of all roots, turnips require the finest mould; and to that end, of all harrows frost is the best. Turnips, in general, succeed better in light soils, consisting of a mixture of sand and loam, than in very rich or heavy lands: the crops of the latter will be rank, and run to flower at too early a period of the spring; though their weight may not be perceptibly diminished. These roots are raised from seed, which ought to be changed annually, or every second year, without exception; as it is apt to degenerate, and the quality of the roots will consequently be impaired. The season for sowing varies according to the time of feeding; thus, if the turnips be intended for feeding cattle from December to February, the seed must be committed to the ground from the middle of May to the end of June; but, in case they be designed to supply food till May, it should not be sown before the latter end of July, or early in August. The quantity of seed depends upon the method of culture; for, if it be broad-cast, two pounds per acre will be necessary: but a more advantageous mode is that of drilling, in rows three feet asunder, which requires only one pound of seed. Although we have given an account in the preceding pages, of the most valuable drill-machines, yet as two implements of this description have lately been contrived, for the express purpose of drilling turnips, we have been induced, from their remarkable simplicity, and practical utility, to furnish our readers with a complete account and delineation of such improvements. The eminent advantage of turnips is, that beside a profitable crop, they make a most complete fallow; and the latter cannot be obtained but by horse-hoeing. Upon that account, the sowing turnips in rows at three feet distance is recommended. Wider rows answer no profitable end, straighter rows afford not room for a horse to walk in. When the turnips

turnips are about four inches high, annual weeds will appear. Go round every interval with the slightest furrow possible, two inches from each row, moving the earth from the rows toward the middle of the interval. A thin plate of iron must be fixed on the left side of the plough, to prevent the earth from falling back and burying the turnips. Let women weed the rows with their fingers; which is better, and cheaper, than with the hand-hoe, which is also apt to disturb the roots of the turnips that are to stand, and to leave them open to drought by removing the earth from them. The standing turnips are to be twelve inches from each other; a greater distance makes them swell too much; less affords them not sufficient room. A woman soon comes to be expert in weeding. The following hint may be necessary to a learner. To secure the turnip that is to stand, let her cover it with the left hand; and with the right pull up the turnip on both sides. After thus freeing the standing turnip, she may safely use both hands. Let the field remain in this state till the appearance of new annuals make a second plowing necessary; which must be in the same furrow with the former, but deeper. As in this plowing the iron-plate is removed, part of the loose earth will fall back on the roots of the plants: the rest will fill the middle of the interval, and bury every weed. When weeds begin again to appear, then is the time for a third plowing in an opposite direction, which lays the earth to the roots of the plants. This plowing may be about the middle of August: after which, weeds rise very faintly. If they do rise, another plowing will clear the ground of them. Extraordinary crops of barley frequently succeed turnips, especially when fed off the land. In feeding them off, the cattle should not be suffered to run over too much of the ground at once, for in that case they will tread down and spoil twice as many as they eat. In Norfolk, they are confined by hurdles to as much as is sufficient for them for one day. By this mode the crop is eaten clean, the soil is equally trodden, which if light is of much service, and equally manured by the cattle. A notion prevails in many places, that mutton fattened with turnips is thereby rendered rank and ill tasted; but this is a vulgar error. The best mutton in Norfolk is all fed with turnips. Rank pastures, and marshy lands, produce rank mutton.

POTATOES. The common mode of planting potatoes is, by setting the small roots entire; or, by cutting the larger ones to pieces, and reserving one eye or bud to each: it appears, however, that the rind may be employed with equal advantage; as crops have thus been produced, which fully equalled those obtained from seeds, sets, shoots, or by any other method. These plants will flourish in any tolerable soil; but they thrive most luxuriantly in light sandy loams, that are neither too moist nor too dry. Such lands ought to be deeply plowed, two or three times; and, shortly before the ground is stirred for the last time in the spring, it will be necessary to spread a considerable quantity of rotten dung on the surface, which should be plowed early in March, provided the weather be open; but, if it be frosty, this operation must be delayed till the end of that month, or the beginning of April. After the last plowing, the ground ought to be levelled; the furrows drawn at the distance of two or three feet apart; and at the depth of about seven or eight inches. In the centre of this furrow are to be set the rind, eyes, cuttings, &c.; and then covered in with the earth. A short time before the young plants appear, it will be advisable to pass a harrow over the whole, in order to eradicate weeds, to break the clods, and to remove every obstacle to their vegetation. Farther, as the potatoes increase, it will be proper to mould, or earth them up twice; a process, by which their growth will be greatly promoted. Beside the depredations of worms, grubs, and various other insects, to which potatoes are subject in common with other vegetables, there is a disease termed the curl, that peculiarly affects these roots; and for which ingenious agriculturists have endeavoured to account by various conjectures. By some it is considered as a species of blight, but it is more generally attributed to one or more of the following causes: 1. Frost, either before, or after, the sets, &c. have been planted. 2. The planting of such sets, from large or unripe potatoes. 3. From not placing them at a sufficient depth, or from putting them in exhausted lands. 4. By the first shoots of the sets having been broken off previously to planting; in consequence of which, the seminal plant is incapacitated from sending forth other shoots sufficiently vigorous to expand. 5. To a white grub, that preys upon the

roots. 6. To the propagation of shoots, sets, eyes, &c. constantly from the same variety, and on the same land; so that the potatoes degenerate, and at length yield very indifferent crops. In the eighth volume of the Transactions of the Society for the Encouragement of Arts, &c. we meet with an interesting communication on the curl, by Mr. W. Hollins, who divides the disease into three different stages, viz. 1. The half-curl, in which the leaves of the plants are somewhat long, and slightly curled: they produce, however, tolerable crops, if the summer be not too dry; otherwise the potatoes will be small and watery. 2. The full curl: in this stage the plants seldom exceed the height of six or seven inches; speedily attain to maturity, and decay. The potatoes are, in general, less than a nutmeg; of a dusky-red colour; and are extremely unwholesome as an article of food. 3. Corrupted potatoes, the vegetative power of which is almost destroyed, never appear above the surface of the ground. The seed will be found at Michaelmas in a state apparently as fresh as when it was first set; a few small potatoes, perhaps, growing from the parent root. This accurate observer attributes the curl first, to late setting in rich soil, succeeded by a hot, dry, summer; in consequence of which, the flower of the plant falls off; the seed is exhausted in feeding the plant; and few potatoes appear. Should moist weather occur in autumn, the plants, after being earthed, will blow a second time, and a plentiful crop of potatoes will be produced. These are, in his opinion, perfectly wholesome as food; but, being generated from the stalk of the plant after the seed had been exhausted, their vegetative power is defective, and the plants that proceed from them, will necessarily be curled. The second cause of this disease, Mr. Hollins attributes to the forcing of potatoes, by setting them in too rich a soil. His preventive method consists in planting them early, in ridges about one yard apart, having previously spread a little manure in the trench. They are to be set in a triangular form, five or six inches distant, and covered with soil to an equal depth: thus they will be protected from the heat of the sun, in case the weather be too dry, while they remain sufficiently apart for receiving the full benefit of the air. When the plants have attained the height of six or seven inches, he directs them not to be earthed up, but to be occasionally weeded. By this simple method, roots will be formed in due season, and grow gradually; and, as the stalk will decay at the proper time, the sap will be left in the potatoe, and become a seed, possessing a perfect power of vegetation; so that the plants raised from it will be wholly exempt from the curl. As these roots materially contribute to the comfort of mankind, we have discussed the subject at some length; and shall now concisely state those remedies which have been successfully adopted. These are, steeping the sets for two hours, in a brine made of Whitsters' ashes; changing the seed, raising new kinds from the seed, or apple of the plant; or renewing the same sorts again from the same seed: and, lastly, salt is said to be an excellent preventive against the depredations of the grub. Beside the curl, potatoes are liable to two other disorders, viz. the scab, which consists of excrescences that arise in very dry seasons; and the canker, which is occasioned by small cavities, that appear in wet weather. These defects have been conjectured to be in some measure the cause of the curl; and they increase, according to the length of time the potatoes remain in the earth, after the roots have attained to maturity. The proper time for digging up potatoes, is in the dry weather of autumn, when the leaves and stems begin to decay. If they are cultivated on a small scale, this work is performed by means of a three-pronged fork, furnished with flat tines: but, when raised in fields, the roots are turned up by a plough, the coulter of which is taken out, to prevent them from being cut. After those, which appear on the surface, are collected, a pair of drags is passed over the whole; in order to separate and expose such as may adhere to the clods. The potatoe is one of the most valuable roots for culinary uses: when boiled, it forms a principal article of food, and serves partly as a substitute for bread. Mixed with wheaten flour, fermented with yeast, and properly baked, it makes a wholesome and nutritious loaf. The best method of taking up potatoes is, to plow once round every row at the distance of four inches, removing the earth from the plants, and gathering up with the hand all the potatoes that appear. This distance is proper to prevent cutting the roots. When the ground is thus cleaned by the plough, raise the potatoes with a fork having three broad toes. The pota-

atoes must then be gathered with the hand. As potatoes are a comfortable food, it is of importance to have them all the year round. For a long time, potatoes in Scotland were confined to the kitchen-garden; and after they were planted in the field, it was not supposed at first that they could be used after December. Of late years, they have been kept good even till April; which has proved a great support to many a poor family. But it is easy to preserve them till the next crop: when taken out of the ground, lay in the corner of a barn a quantity that may serve till April, covered from frost with dry straw pressed down: bury the remainder in a hole dug in dry ground, mixed with the husks of dried oats, sand, or the dry leaves of trees, over which build a stack of hay or corn. When the pit is opened for taking out the potatoes, the eyes of what have tendency to push must be cut out; and this cargo will serve to the end of June. To be certain of making the old crop meet the new, the setting of a small quantity may be delayed till June, to be taken up at the ordinary time before frost. This cargo, having not arrived to full growth, will not be so ready to push as what are set in April. If the old crop be exhausted before the new crop is ready, the interval may be supplied by the potatoes of the new crop that lie next the surface, to be picked up with the hand; which, far from hurting the crop, will rather improve it.

CARROTS AND PARSNEPS. Of all roots, a carrot requires the deepest soil. It ought at least to be a foot deep, all equally good from top to bottom. If such a soil be not in the farm, it may be made artificially by trench-plowing, which brings to the surface what never had any communication with the sun or air. When this new soil is sufficiently improved by a crop or two with dung, it is fit for bearing carrots. Beware of dunging the year when the carrots are sown; for with fresh dung they seldom escape rotten scabs. The only soils proper for carrots are loam and sand. The ground must be prepared by the deepest furrow that can be taken, the sooner after harvest the better. At the end of March, or beginning of April, which is the time of sowing the seed, the ground must be smoothed with a rake. Sow the seed in drills, with intervals of a foot for hand-hoeing, where the crop is an acre or two: but if the quantity of ground be greater, the intervals ought to be three feet for horse-hoeing. In flat ground without ridges, it is proper to make parallel furrows with the plough, ten feet asunder to carry off redundant moisture. The farmer will find carrots a very advantageous crop; they afford excellent food for horses, cattle, and hogs. The culture of parsneps is the same with that of carrots.

CABBAGE. This is an interesting article in husbandry. It is easily raised, is subject to few diseases, resists frost more than turnips, is palatable to cattle, and sooner fills them than turnips, carrots, or potatoes. The season for setting cabbage depends on the use it is intended for. If intended for feeding in November, December, and January, plants procured from seed sown the end of July the preceding year must be set in March or April. If intended for feeding in March, April, and May, the plants must be set the first week of the preceding July, from seed sown in the end of February or beginning of March the same year. The late setting of plants retards their growth; by which means they have a vigorous growth the following spring. And this crop makes an important link in the chain that connects winter and summer green-food. Where cabbage for spring-food is neglected, a few acres of rye, sown at Michaelmas, will supply the want. After the rye is consumed there is time sufficient to prepare the ground for turnips. Where the cabbage-plants are to be set in March, the field must be made up after harvest in ridges three feet wide. In that form let it lie all winter, to be mellowed with air and frost. In March take the first opportunity, between wet and dry, to lay dung in the furrows. Cover the dung with a plough, which will convert the furrow into a crown, and the crown into a furrow. Set the plants upon the dung, three feet from each other. Plant them so as to make a straight line cross the ridges, and along the furrows, for which a gardener's line stretched perpendicularly cross the furrows will be requisite. This will set each plant at the distance precisely of three feet from the plants that surround it. The purpose of this is to give opportunity for plowing, not only along the ridges, but across them. This mode saves hand-hoeing, is a more complete dressing to the soil, and lays earth neatly round every plant. If the soil be deep, and composed of good earth, a trench-plowing after the preceding crop will be proper; in

which case, the time for dividing the field into three-foot ridges ought immediately to precede the dunging for the plants. If weeds rise so close to the plants as not to be reached by the plough, destroy them with a hand-hoe. Unless the soil be much infested with annual weeds, twice plowing after the plants are set will be a sufficient dressing. The first removes the earth from the plants; the next at the distance of a month or so, lays it back.

RAPE, OR COLESEED. This plant is cultivated principally for the purpose of expressing the oil from its seed, by which it is also propagated: the best kind of the latter should be large and black; it ought to be sown in the month of June (in the proportion of two pounds to an acre, broad-cast), with the two fore-fingers and thumb, to prevent it from shooting up in patches: it may likewise be drilled, at the distance of twelve or fourteen inches apart. Sometimes rape and turnips are sown together; but such practice is not economical; as the two crops mutually injure each other. Rape yields most abundantly after beans, turnips, or cabbages; the soil being previously plowed twice, north and south, for the better reception of the solar heat; and if transplanted, such plants will vegetate with uncommon luxuriance, so as amply to repay the additional expence. For this purpose, Mr. Hazard (Letters and Papers of the Bath and West of England Society, &c. vol. iv.) recommends one rood to be sown in the middle of June, and to remove the young plants towards the middle of August, into ridges two feet apart, and at the distance of sixteen inches from each other. As soon as they have taken root, and begin to shoot up, it will be necessary to manage them by the horse or hand-hoe; and to draw the earth around their stems. A rood of land, thus sown, will, according to his experience, produce a sufficient number of plants for the stocking of ten acres: and in the following spring the leaves may be fed off with sheep; because new ones will immediately succeed. But, as these tender plants are much infested by slugs, which devour them with avidity, it will be advisable to scatter over them a mixture of slacked lime and wood-ashes in the proportion of ten bushels of the former to fifteen of the latter per acre. Rape-seed attains to maturity from July to September; and, as it is easily shed, the plants are generally cut with sickles; laid on the ground to dry; and the seed is rubbed out on a large cloth spread in the middle of the field, whence it is conveyed to the mill. The oil which these seeds yield by expression is employed for various useful purposes in domestic life, and particularly for burning in lamps. The whole plant is of great service in feeding cattle; and, after the seed is threshed, the straw and chaff, on being burnt, afford ashes equally valuable as the best pot-ashes.

HEMP AND FLAX. The profit of cultivating hemp-seed is by no means small. It requires, however, the best land that can be found on a farm, or which is made such by manuring. A rich, deep, putrid, and friable loam, is what it particularly delights in; and in addition to natural richness, forty cubical yards of dung per acre should be applied. Besides this original cost of land in natural richness and preparation, it is to be considered that hemp returns nothing to the farm-yard, while corn will give straw, and the dunghill is improved by green crops. The question concerning the propriety of its cultivation by any individual is not to be determined, therefore, only from the circumstance of any price in the market, but is to be inferred from a view of all its bearings and connections. For many crops, tillage should be given with caution. With hemp such caution is unnecessary, as its rank and luxuriant growth proves fatal to all those weeds by which corn would not only be injured but destroyed. From the autumn preceding to the time of sowing hemp, the land should be three or four times plowed, and be well harrowed to a fine surface. The quantity of dung should be proportioned to the deficiency of the soil; and when the culture is continued from year to year, a plentiful dressing must be every time applied. About twelve pecks should be sown per acre: and as the destruction of weeds in the tillage is here no object, the broad-cast method is universally preferable to the drill. It will be ready for pulling in August, or about thirteen weeks after it is sown. Flax is cultivated not only with a view to the common purposes of making linen, but for the sake of its seed also, from which the oil used by painters is extracted. Though this plant is in universal culture over the whole kingdom, yet it appears by the vast quantity imported, that by far too little ground is employed in that way. As Mr. Marshall

takes

takes notice of its culture only in Yorkshire, it probably does not make any great part of the husbandry of the other counties of which he treats; and even in Yorkshire he tells us that its cultivation is confined to a few districts. The kind cultivated there is that called "blea line," or the blue or lead-coloured flax, and this requires a rich dry soil for its cultivation. A deep, fat, sandy loam is perhaps the only soil on which it can be cultivated with advantage. If sown upon an old corn-land, it ought to be well cleaned from weeds, and rendered perfectly friable by a summer-fallow. Manure is seldom or ever set on for a line-crop; and the soil-process consists generally of a single plowing. The seed-time is May, but much depends on the state of the soil at the time of sowing. "It should neither be wet nor dry; and the surface ought to be made as fine as that of a garden-bed. Not a clod of the size of an egg should remain unbroken." Two bushels of seed are usually sown upon an acre; the surface after being harrowed, is sometimes raked with garden or hay-rakes; and the operation would be still more complete if the clods and other obstructions, which cannot be easily removed, were drawn into the inter-furrows. A light hand-roller, used between the final raking and harrowing would much assist this operation. The chief requisite during the time of vegetation is weeding, which ought to be performed with the utmost care; and for this reason it is particularly requisite that the ground should be previously cleansed as well as possible, otherwise the expence of weeding becomes too great to be borne, or the crop must be considerably injured. It is an irreparable injury, if through a dry season, the plants come up in two crops; or if by accident or mismanagement they be too thin. The goodness of the crop depends on its running up with a single stalk without branches; for wherever it ramifies, there the length of the line terminates; and this ramification is the consequence of its having too much room at the root, or getting above the plants which surround it. The branches are never of any use, being unavoidably worked off in dressing; and the stem itself, unless it bear a due proportion to the length of the crop, is likewise worked off among the refuse.

WOAD. The use of woad in dyeing is well known, and the consumption is so great, that the raising of the plant might undoubtedly be an object to an husbandman, provided he could get it properly manufactured for the dyers, and could overcome their prejudices. Woad grows to the greatest advantage on a light-black rich soil, which has a southern situation. Land intended for woad should be dunged a year before it is sown with this plant, and made first to bear a crop of wheat, &c. This being taken off, three deep stirrings should be given with the plough, the first in November, and the other two in spring. It is often sown so early as in the beginning of April; but when it is too cold at that period, the sowing must be deferred till May. In this climate, however, it is often not sown until some time later. In some parts of Kent this plant is much cultivated. It is frequently sown on poor, stiff, and some chalky lands, in the proportion of ten or twelve pounds of seed to the acre, and among beans before the last hoeing in the beginning of July. It requires no culture while growing, unless the land be full of weeds; in which case the weeds must be drawn out by the hand, or cut up with a narrow hoe. When the plants have produced their bloom up to the top of the stem, they are pulled up, then tied by a single stalk in small handfuls, and set up in a conical form to ripen. When thoroughly dry, the seed is shaken out on a cloth, or into a tub, the plants being then bound with rope-yarn into bundles, each weighing thirty pounds: sixty of these bundles make a load of woad, the price of which is generally from 4*l.* to 10*l.*

HOPS. The cultivation of this plant ought not to be attempted without due consideration; since perhaps no crop is more uncertain and precarious, and a large capital must be employed; for the first year's cost of preparing and planting an acre amounts to about eighty pounds, and the following year to not less than half that sum. The dry stalks of hops should be burnt on the ground in winter, covering them with a little fresh earth as they burn. This makes together an excellent compost, to make the hills of. The land must be dug or plowed well, and laid very even, and then the places for the hills marked out by a line, and a stick put in every place where one is to be. Mr. Young is of opinion that some improvement in the culture is necessary, and recommends the planting of them in espaliers. He also remarks, that hops which are late picked carry more next year than such as are picked early; for which reason he recom-

mends the late picking. The only reason for picking early is, that the hops appear much more beautiful than the others.

OF THE ROTATION OF CROPS.

No branch of husbandry requires more skill and sagacity than a proper rotation of crops, so as to keep the ground always in heart, and yet to draw out of it the greatest profit possible. Some plants rob the soil, others are gentle to it: some bind, others loosen. The nice point is, to intermix crops, so as to make the greatest profit consistently with keeping the ground in trim. In that view, the nature of the plants employed in husbandry must be accurately examined. There is a great difference between culmiferous and leguminous plants, which ought to be duly considered. Culmiferous plants, having small leaves and few in number, depend mostly on the soil for nourishment, and little on the air. During the ripening of the seed, they draw their nourishment from the soil; as the leaves by this time, being dry and withered, must have lost their power of drawing nourishment from the air. Culmiferous plants are chiefly cultivated for their seed, and are not cut down till the seed be fully ripe. But such plants, while young, are all leaves; and in that state draw most of their nourishment from the air. And the foggage, excluding the frost by covering the ground, keeps the roots warm. A leguminous plant, by its broad leaves, draws much of its nourishment from the air. A cabbage, which has very broad leaves, and a multitude of them, owes its growth more to the air than to the soil. A cabbage cut, and hung up in a damp place, preserves its verdure longer than other plants. A seed is that part of a plant which requires the most nourishment; and for that nourishment a culmiferous plant must be indebted entirely to the soil. A leguminous crop, on the contrary, when cut green for food, must be very gentle to the ground. Pease and beans are leguminous plants; but being cultivated for seed, they seem to occupy a middle station: their seed makes them more severe than other leguminous crops cut green; their leaves, which grow till reaping, make them less severe than a culmiferous plant left to ripen. These plants are distinguished no less remarkably by the following circumstance. All the seeds of a culmiferous plant ripen at the same time. When they begin to form, the plant becomes stationary, the leaves wither, the roots cease to push, and the plant when cut down is blanched and sapless. The seeds of a leguminous plant are formed successively: flowers and fruit appear at the same time in different parts of the plant. This plant accordingly is continually growing, and pushing its roots. Hence the value of bean or peas straw above that of wheat or oats: the latter is withered and dry when the crop is cut; the former, green and succulent. The difference, therefore, with respect to the soil, between a culmiferous and leguminous crop, is great. The latter, growing till cut down, keeps the ground in constant motion, and leaves it to the plough loose and mellow. The former gives over growing long before reaping; and the ground, by want of motion, turns compact and hard. Nor is this all. Dew falling on a culmiferous crop after the ground begins to harden, rests on the surface, and is sucked up by the next sun. Dew that falls on a leguminous crop, is shaded from the sun by the broad leaves, and sinks at leisure into the ground. The ground accordingly, after a culmiferous crop, is not only hard, but dry: after a leguminous crop, it is not only loose, but soft and unctuous. Till the middle of last century, the best common courses of farming in Britain, consisted of a fallow, which, by several plowings, broke up and cleaned the ground, but left the soil exposed to the scorching rays of the sun, during the hottest season, without any shading crop; and on this the farmer sowed wheat, which was succeeded by peas or beans; then followed barley, or oats, (or both) on one part of the farm, for the space of ten or twenty years: the other moiety, during that time, being laid out in common pasture-grasses. When any change was to be made, the part in grass was plowed and prepared, and then thrown into the same course or rotation of crops as above: that which had been in crops, was sown with mixed grass-seeds (but not clover), to lie for ten or twenty years, as before. The whole arable part of the farm, thus parcelled, included neither the homestead nor the standing meadow; so that an arable farm of 300 acres admitted of 150 being in grass-lay, or old field, and 150 in crops. The fields which bore crops were seldom equal in quantity, but in the following plan we have ventured to consider them so, for the better comparing of the old and new systems:

OLD SYSTEM.

Acres.	Bushels.
37½ fallow, naked, yields nothing.	
37½ wheat.....	555
37½ peas, or beans.....	555
37½ barley.....	740
150 in crops, four fields.....	1850
150 in grass, or lay.	
300 acres.	

NEW SYSTEM.

Acres.	Bushels.
60 barley.....	1200
60 clover.....	
60 wheat.....	900
60 clover.....	
60 peas or beans.....	900
	3000
300 acres in five fields	

According to this new course, the wheat and barley exhaust the soil, while the clover and peas, or beans, meliorate and improve it. When we compare these two systems of rotations of crops, the latter is evidently the most profitable, as the hundred and twenty acres in clover are far superior to the hundred and fifty acres of common grasses on the hide-bound soil of the lay, or old field; and the grain and straw are more advantageous in the proportion of three hundred to one hundred and eighty-five. Clover, peas, and beans, (if sown in drills, and kept clean from weeds by hoeing,) are inoffensive, and even meliorating. They all shade the ground during the hottest season of the year. Every kind of corn impoverishes the soil, and, if small, lets in weeds, which, together with rest, bind and foul the land. The superiority of the new course of crops is still farther evinced by a series of conclusive experiments made by Mr. A. Young. He divided three acres of old upland pasture into thirty-six squares, of nine roods each, which he planted with beans, peas, wheat, barley, oats, cabbages, clover, potatoes, &c. in different rotations, with various success. From these comparative trials he drew the following practical inferences, which we recommend to the serious attention of our agricultural readers: 1. That potatoes exhaust the land more than any other fallow-crop hitherto tried; and, in some courses, to a greater degree than barley, or even wheat. 2. That potatoes will not yield a tolerable crop, even on old lay newly broken up, without the aid of dung, and not a profitable one, even with it. 3. That barley, beans, and oats, succeed much better than wheat after potatoes. 4. That beans are the most valuable fallow-crop on new land of this quality. 5. That the preservation of the fertility of old turf depends much on the number of bean-crops introduced; as, the more frequently they are planted, the better the succeeding crops of white corn will be: and three successive years of beans are attended with an extraordinary produce of wheat. 6. That beans and barley, and beans and wheat, alternately, are both courses of great produce and advantage. 7. That the introduction of beans in bad rotations, tends to remedy the evil of such courses. 8. That successive crops of white corn destroy that fertility which different rotations will preserve in new ground; and that three such crops will render the land extremely foul and unprofitable. 9. That the two most productive courses are beans and barley, alternately; the former being the most abundant, but the latter the most profitable, from the saving of tillage. 10. That four crops of beans, and one of wheat, even with the drawback of one year's cabbages, is the third course in profit; and the land will be left in such order, as to make it perhaps the first. 11. That the most unproductive, and in a still greater degree, the more unprofitable courses, are those in which turnips, cabbages, and potatoes, most frequently occur. 12. That, on such new land, oats are the best white grain that can be sown, as they yield very extraordinary and valuable crops. The same intelligent cultivator, consequently, recommends the following course, which is calculated to prove the most profitable:

- | | | |
|-----------|-----------|------------|
| 1. Beans. | 4. Oats. | 7. Clover. |
| 2. Oats. | 5. Beans. | 8. Beans. |
| 3. Beans. | 6. Oats. | 9. Wheat. |

The profit of beans in every rotation, by which the soil is not exhausted, is decisive: and oats are far more productive than either barley or wheat, while the old turf is decaying; because clover will revive the fertility, which beans in the eighth year will not lessen; and wheat cannot fail, after those two successive meliorating crops, to yield a plentiful harvest. In justice to Mr. Young, we shall observe, that he proposes such a rotation only for new land, as there are circumstances that would render it inapplicable to other fields. There is so great a variety in soils, and so much difference in the opportunities of obtaining manure, that rules cannot be given precisely to answer all cases; it may, however, be observed in general, that two crops of white corn ought never to be produced from a field in immediate succession. In reference to several varieties of soil, it may be useful to give a succession of crops which has been recommended by a gentleman of considerable judgement and experience. It should be observed that on this plan the crops must be all particularly well hoed, and kept properly clean; and that the turnips, peas, and beans, must be put in double rows, on three-foot ridges; the cabbages in single rows of three-foot ridges.

Clay.

Turnips or cabbages
Oats
Beans and clover
Wheat
Turnips or cabbages
Oats
Beans and vetches
Wheat

Clayey Loams.

Turnips or cabbages
Oats
Clover
Wheat
Turnips or cabbages
Barley
Beans
Wheat

Rich Loams and Sandy Loams.

Turnips & potatoes
Barley
Barley
Clover
Wheat
Wheat
Beans
Barley
Peas
Wheat

Peat Earth.

Turnips
Barley
Clover
Wheat
Potatoes
Barley
Peas
Wheat

Chalky Substratum.

Turnips
Barley
Clover
Wheat
Potatoes
Barley
Peas
Wheat

Gravels.

Turnips
Barley
Clover
Wheat
Potatoes
Barley
Peas
Wheat

Light Lands.

Turnips
Barley
Clover and rye-grass
Clover and rye-grass
Clover and rye-grass
Peas
Wheat or rye

For many interesting particulars relative to this great subject, we must refer our reader to the twenty-third volume of *Annals of Agriculture*, in which he will find it minutely and perspicuously treated.

OF THE CULTIVATION AND MANAGEMENT OF TREES.

As far as this subject relates to fruit-trees we refer the reader to the Articles *GARDENING*, and *ORCHARD*. Respecting trees in general we may observe that there are four distinct species of woodlands, viz. woods, timber-groves, coppices, and woody wastes. The woods are a collection of timber-trees and underwood; and the coppices are collections of underwood alone. All these turn out to advantage sooner or later, according to the quick or slow growth of the trees, and the situation of the place with respect to certain local advantages. Thus in some places underwood is of great consequence, for rails, hoops, stakes, fuel, &c. and by reason of its growth it may be accounted the most profitable of all plantations. An osier-bed will yield a return of profit the second or third year, and a coppice in 15 or 20 years; while a plantation of oaks will not arrive at perfection in less than a century. This last period is so long, that it may be supposed likely to deter

people from making such plantations of this kind, as few are willing to take any trouble for what they are never to see in perfection. It must be remembered, however, that though the trees themselves do not come to perfection in a shorter time, the value of the ground will always increase in proportion to their age. Mr. Pavier in the Bath Papers, vol. iv. computes the value of 50 acres of oak-timber in 100 years to be 12,100l. which is nearly 50s. annually per acre; and as this is continually accumulating without any of that expence or risk to which annual crops are subject, planting of timber may be accounted one of the most profitable articles in husbandry. Evelyn calculates the profit of 1000 acres of oak-land in 150 years, at no less than 670,000l. But it would be improper to occupy with timber of such slow growth, the grounds which either in grass or corn can repay the trouble of cultivation with a good annual crop. In the Annals of Agriculture, vol. 6, we find the culture of trees recommended by Mr. Harries: and he informs us, that the larch is the quickest grower and the most valuable of all the resinous timber-trees: but unless there be pretty good room allowed for the branches to stretch out on the lower part of the trunk, it will not arrive at any considerable size; and this observation, he says, holds good of all pyramidal trees. Scotch firs may be planted between them, and pulled out after they begin to obstruct the growth of the larch. Some of these larches he had seen planted about 30 years before, which at 5 feet distance from the ground measured from four feet to five feet six inches in circumference. The most barren grounds, he says, would answer for these trees, but better soil is required for the oaks. In this paper he takes notice of the leaves of one of his plantations of oaks having been almost entirely destroyed by insects; in consequence of which they did not increase in bulk as usual; but another which had nearly escaped these ravages, increased at an average one inch in circumference. "A tree four feet round (says he), that has timber 20 feet in length, gains by this growth a solid foot of timber annually, worth one shilling at least, and pays 5 per cent. for standing. It increases more as the tree gets from five to six feet round. I have in my groves 3000 oaks that pay me one shilling each per annum, or 150l. a year. My poplars have gained in circumference near two inches, and a Worcester and witch-elm as much. I have lately been informed that the smooth cut of a holly-tree, that measures 20 inches and upwards round, is worth to the cabinet-makers 2s. and 6d. per foot. With respect to the growth of under-wood, which in some cases is very valuable, it is to be remarked, that to have an annual fall of it, the whole quantity of ground, whatever its extent may be, ought to be divided into annual sowings. The exact number of sowings must be regulated by the uses to which it is intended to be put. Thus if, as in Surrey, stakes, edders, and hoops, are saleable, there ought to be 8 or 10 annual sowings; or if, as in Kent, hop-poles are demanded, 14 or 15 will be required; and if, as in Yorkshire, rails be wanted, or, as in Gloucestershire, cordwood be most marketable, 18 or 20 sowings will be necessary to produce a succession of annual falls. Thus the business, by being divided, will be rendered less burdensome: a certain proportion being every year to be done, a regular set of hands will, in proper season, be employed; and by beginning upon a small scale, the errors of the first year will be corrected in the practice of the second, and those of the second in that of the third. The produce of the intervals will fall into regular course; and when the whole is completed, the falls will follow each other in regular succession. The greatest objection to this method of sowing woodlands is the extraordinary trouble in fencing: but this objection does not hold if the sowings lie at a distance from one another; on the contrary, if they lie together, or in plots, the entire plot may be inclosed at once: and if it contain a number of sowings, some subdivisions will be necessary, and the annual sowing of these subdivisions may be fenced off with hurdles, or some other temporary contrivance; but if the adjoining land be kept under the plough, little temporary fencing will be necessary. But in raising a woodland from seeds, it is not only necessary to defend the young plants against cattle and sheep, but against hares and rabbits: so that a close fence of some kind is absolutely necessary.

OF HORSES AND BLACK CATTLE.

As great part of the stock of an husbandman must always con-

sist of cattle, and one of his principal expences is in the maintenance of them, this part of his business is certainly to be looked upon as very important. The cattle belonging to a farm may be divided in two classes, viz. such as are intended for work, and such as are designed for sale. The former are now principally horses, the oxen formerly employed being fallen into disuse, though it does not yet certainly appear that the reasons for the exchange are satisfactory. In the second vol. of Bath Papers, we have an account of a comparative experiment of the utility of horses and oxen in husbandry, by Mr. Kedington near Bury, in Suffolk, in which the preference is decisively given to oxen. The following reasons are assigned. 1. They are kept at much less expence, never eating meal or corn of any kind. In winter they are fed with straw, turnips, carrots, or cabbages; or instead of the three last, they have each a peck of bran per day while kept constantly at work. In spring they eat hay; and if working harder than usual in seed-time, they have also bran. When the vetches are fit for mowing, they get them only in the stable. After the day's work in summer they have a small bundle of hay, and stand in the stable till they cool; after which they are turned into the pasture. Our author is of opinion, that an ox may be maintained in condition, for the same constant work as an horse, for at least 4l. less annually. 2. After a horse is seven years old, his value declines every year; and when lame, blind, or very old, he is scarce worth any thing; but an ox, in any of these situations, may be fatted, and sold for even more than the first purchase; and will always be fat sooner after work than before. 3. Oxen are less liable to diseases than horses. 4. Horses are often liable to be spoiled by servants riding them without their master's knowledge, which is not the case with oxen. 5. A general use of oxen would make beef plentiful, and consequently all other meat; which would be a national benefit. To invalidate this statement, it has been objected, that though oxen may be maintained at a less expence than horses, yet the latter are far preferable, as they perform their work with much greater alacrity; and that the extra ploughing which a pair of horses will accomplish in one week, will fully pay the balance of keeping. Such is the difference of opinions. However it ought in justice to be added, that an ox improves in value 2l. per annum, upon an average, from the time he is used and fed as an ox; and, when fattened, affords good and wholesome meat; while a horse progressively declines, till he, literally, is of no value. It may also be observed, that oxen are not only able to stand working every day, but to bear long hours better than horses going in the same pasture. An ox in a good pasture soon fills his belly, and lies down to rest; but a horse can scarce satisfy his hunger in a short summer's night. Oxen are also much superior at a difficult pull to horses. Also it is evident, that were only a small share of the attention paid to the breeding of draught-oxen which is now bestowed on the breeding of cart-horses, animals equally powerful, more active, less costly, equally adapted to the purposes of husbandry if harnessed with equal judgement, less expensive in keep and attendance, much more durable, and infinitely more valuable after they have finished their labours, might be produced. A steer, like a colt, ought to be familiarized to harness at two or three year old, but should never be subjected to hard labour until he be five years old; from which age, until he be 15 or 20, he may be considered as in his prime as a beast of draught. There are great varieties found among horses, see *Equus*. Yorkshire has long been distinguished for its superior breed of this noble animal, especially for those denominated saddle-horses. The midland counties of England have for some time been celebrated on account of their breed of the black cart-horse; though Mr. Marshall is of opinion that this kind are unprofitable as beasts of draught in husbandry. A more useful horse is described as having a thick carcase, his back short and straight, and his legs short and clean: as strong as an ox, yet active as a poney; equally suitable for a cart or a lighter carriage." With regard to the general maintenance of horses, Mr. Marshall recommends the Norfolk management of horses as the cheapest method of feeding them practised any where. In winter, when little work is to be done, their only rack-meat is barley-straw; a reserve of clover-hay being usually made against the hurry of seed-time. A bushel of corn in the most busy season is computed to be an ample allowance for each horse, and in more leisure times a much less quantity suffices. Oats, and sometimes barley,

when the latter is cheap and unsaleable, are given; but in this case the barley is generally malted, *i. e.* steeped and afterwards spread abroad for a few days, until it begin to vegetate, when it is given to the horses, and is supposed to be less heating than in its natural state. Chaff is universally mixed with horse-corn: and the chaff of oats is much better than that of barley. In order to have black cattle proper for the purpose of working, Mr. Marshall remarks, that it is necessary to procure a breed without horns, and is of opinion that it would be quite practicable to produce a hornless breed of black cattle as well as of sheep, which last has been done by attention and perseverance. The first step is to select females; and having observed their imperfections, to endeavour to correct them by a well chosen male. The other properties of a perfect breed of black cattle for the purposes of the dairy as well as others, according to Mr. Marshall, are as follows: 1. The head small and clean, to lessen the quantity of skull. 2. The neck thin and clean, to lighten the fore-end, as well as to lessen the collar, and make it fit close and easy to the animal in work. 3. The carcass large, the chest deep, and the bosom broad, with the ribs standing out full from the spine; to give strength of frame and constitution, and to admit of the intestines being lodged within the ribs. 4. The shoulders should be light of bone, and rounded off at the lower point, that the collar may be easy, but broad to give strength; and well covered with flesh for the greater ease of draught, as well as to furnish a desired point in fattening cattle. 5. The back ought to be wide and level throughout; the quarters long; the thighs thin, and standing narrow at the round bone; the udder large when full, but thin and loose when empty, to hold the greater quantity of milk; with large dug-veins to fill it, and long elastic teats for drawing it off with greater ease. 6. The legs (below the knee and hock) straight, and of a middle length; their bone, in general, light and clean from fleshiness, but with the joints and sinews of a moderate size, for the purposes of strength and activity. 7. The flesh ought to be mellow in the state of fleshiness, and firm in the state of fatness. 8. The hide mellow, and of a middle thickness. With regard to the method of fattening cattle, turnips are coming into general use throughout Britain. In Norfolk no other method is thought of. The general rule is, to allow them to eat their turnips in the field while the weather remains moderately warm, but to give them under cover when it becomes wet or very cold. In this respect, however, there is a considerable difference with regard to the manner in which the cattle have been brought up; for such as have been accustomed to a severe climate will stand the winter in the field much better than those which have been brought up under shelter. The flesh of cattle fattened under cover is also less agreeable than that of such as feed in the open air.

OF CATTLE PROPER FOR THE MANAGEMENT OF THE DAIRY.

Cows which are to serve the purposes of the dairy should be chosen with care. We are to attend more to the quantity of cream which the milk of a cow yields, than to the absolute quantity of milk; and this may commonly be judged of from the thickness of it. The small Alderney cows (he says) afford the richest milk hitherto known; though there are many individuals of different kinds which afford much richer milk than others; and these ought carefully to be sought after, that a good breed may be established. For this purpose of making them yield milk plentifully they must have plenty of food; and of all other kinds Dr. Anderson determines grass to be the best; and that grass which springs up spontaneously on rich dry soils to be the best of all. He is of opinion, that there is no virtue in old pastures, as many suppose, more than in new ones; and he has seen much richer butter made from the milk of cows fed upon hay from clover and rye-grass in the house, than such as had liberty to range in old pastures. But the cows should be permitted to pasture at pleasure during the mornings and evenings, and at noon should be taken into a house, and supplied with fresh food. If abundantly fed, they should be milked three times a day; and as great care should be taken that the operation be properly performed, only confidential persons should be employed. He supposes that a cow well fed, will give as much milk each time when milked thrice, as when milked only twice. The qualities of the milk he reduces to the following: 1. Of the milk drawn from a cow at any time, that which comes first is always thinnest, and continues to increase in thickness to the last drop. This, as well as all the succeeding ones, are proved by experiment;

and so great is the importance of attending to it, that "the person who by bad milking of his cows, loses but half a pint of his milk, loses, in fact, as much cream as would be afforded by six or eight pints at the beginning, and loses besides that part of the cream which alone can give richness and high flavour to his butter." 2. When milk throws up cream to the surface, that portion which rises first will be thicker, and of better quality, as well as in greater quantity, that which rises in a second equal portion of time. 3. Thick milk throws up a smaller quantity of cream to the surface than such as is thinner; but that cream is of a richer quality. If water be added to that thick milk, it will afford a considerably greater quantity of cream than before, but its quality is at the same time greatly debased. 4. Milk when carried in vessels to any distance, so as to suffer considerable agitation, never throws up cream so rich, nor in such quantity, as if the same had been put into the milk-pans without any agitation. From these aphorisms, the following corollaries are deducible. 1. The cows ought always to be milked as near the dairy as possible. 2. The milk of different cows should be kept by themselves, that the good cows may be distinguished from the bad. 3. For butter of a very fine quality, the first drawn milk ought always to be kept separate from the last. Our author commends the method used by the Highlanders of Scotland, where every cow is allowed to suckle her own calf. The calves are kept in an inclosure till the time of milking, when they are allowed to come to the door. Each calf there is allowed to suck its dam as long as the milk-maid pleases; when it is driven away, and the woman milks the remainder. Thus they obtain only a small quantity of milk, but of exceeding good quality; and to this practice Dr. Anderson ascribes the richness of the Highland butter, which is usually attributed to the old grass in the remote glens of the Highlands. For the management of the dairy, see DAIRY, MILK, BUTTER, and CHEESE.

OF THE MANAGEMENT OF SHEEP.

Sheep are important both as supplying food and clothing, and as a mean of improving the farm. See OVIS. The sheep of different counties excel in these different properties, and in some parts they have been lately much improved by crossing the breeds. The best sheep for fine wool are those bred in Herefordshire and Wiltshire; but they are small and black-faced, and consequently bear but a small quantity. Warwick, Leicester, Buckingham, and Northamptonshire, breed a large-boned sheep, of the best shape, and deepest wool. The marshes of Lincolnshire also breed a very large kind of sheep, but their wool is not so good. The northern counties in general breed sheep with long, but hairy wool: and Wales breeds a small hardy kind of sheep, which has the best tasted flesh, but the worst wool of all. The farmer should always buy his sheep from a worse land than his own, and they should be big-boned, and have long greasy wool curling close and well. These sheep always breed the finest wool, and are also the most approved of by the butcher. Ewes generally breed at the age of eighteen months; though the most experienced breeders never suffer them to increase their species, till they are at least two years old; and, as these animals are of considerable value, great attention is bestowed on their management at this period. The first object therefore is, whether the breeder has sufficient grass to maintain the ewes and their lambs in the spring: or, whether he has a stock of turnips adequate to their support, till the pasture affords them food. Another circumstance of great importance, is that of attending to the breed; because no certain degree of excellency can be attained in any species of cattle, unless the female possess an equal degree of blood with the male. Ewes bring forth one, two, and sometimes three lambs, after a gestation of twenty weeks; so that the most advantageous period may, in general, be easily ascertained. The best time of yearning is the month of April; unless the owner have very forward turnips or grass, or the animals be field-sheep. Lambs are subject to few disorders:—when they are sick, the drinking of mare's or goat's milk, diluted with warm water, will greatly tend to preserve them from taking cold; and as many, when yearned, are apparently dead, it is advisable to blow into the mouth and nostrils; by which simple method numbers have been immediately restored. The most fatal distemper, however, with which lambs are affected, is the blood or red-water. The disordered animals are, in general, seized with lameness, and a slight swelling of the joints, but which is attended with a violent inflammation, that spreads over the whole body, and, if neglected, proves fatal.

fatal in the course of twenty-four hours. The red water is occasioned by too great a quantity of undigested food remaining on the stomach. As soon, therefore, as the lambs are attacked, the best method hitherto known is, to take them from grass, bleed them, and administer an emollient clyster, which is to be repeated, in case no evacuation take place in a short time. Two or three grains of tartar emetic, or as many ounces of sweet oil, are now to be given, and the bleeding repeated, if the animals do not appear to recover. This treatment is to be continued for the space of four or five days, during which the diseased creatures should be fed with milk. If the males be designed for wethers, the necessary operation should be performed early, except when they are unusually weak; in which case it will be advisable to defer it, till they acquire sufficient strength; on weaning the lambs, their dams may be milked two or three times, in order to relieve their udders. The most proper time for shearing sheep, is towards the middle of May, or at the farthest, about Midsummer; though some breeders defer it till the middle of July; because they suppose that an additional half-pound weight in every fleece may be obtained, by the increased perspiration of the animal. An early shearing, however, is preferable; for the new wool will thus not only gain time to get a head, but the animals are also secured from the attacks of the fly; whereas, by delaying the operation, they become a more easy prey to the maggot; in consequence of which, they pine away, and lose all their flesh. But, previously to shearing, the sheep ought to be washed, and kept for a few days in a clean rick-yard, or in a dry pasture, whence they should be taken out separately; after they are shorn, it has been recommended to wash them with seawater; or, where this cannot be procured, with a brine made of common salt and soft water; as such practice is calculated to prevent the various diseases incident to these useful creatures. The practice of fattening sheep on turnips, assisted by oil-cake, corn, hay, sainfoin, &c. is greatly in use among farmers; not so much for the profit by feeding with those articles, as for the great improvement of the soil where the turnips are fed off. The manure from sheep fed on oil-cake and turnips is reckoned very enriching to the land.

OF THE MANAGEMENT OF SWINE.

The hog is proverbially the most rude and brutal of quadrupeds; its habits are gross, and such is its gluttony, that it devours every thing indiscriminately. But, though it be the most impure and filthy of animals, its sordidness is useful, inasmuch as it swallows with avidity refuse and offal of every kind, so that matters which would become a nuisance, are converted into the richest nutriment. Hence this quadruped becomes an object of attention in husbandry. Sows generally breed at the age of eighteen months, or two years, and bring forth from five to ten or more pigs, twice in the year, after a gestation of four months. As hogs, from their voracious nature, will eat almost every thing, they are very generally reared in all situations, being quickly and cheaply fattened. In miry and marshy grounds, where they delight to wallow, they devour frogs, fern, the roots of rushes, sedge, &c. In the drier countries, they feed on hips, haws, sloes, crabs, beech-mast, chesnuts, acorns, &c. on the last of which they thrive exceedingly. Of late years, however, the management of these animals has become an object of attention. Clover, potatoes, turnips, cabbage, and carrots, are, it is well known, articles with which they may be fed, and even fattened, at a small expence. Parsneps are of considerable utility for this purpose, and probably the roots of the white-beet, if it were fully tried, would be found still more useful; for experiments have shewn, that it contains a considerable proportion of saccharine matter, and may be cultivated with very little difficulty. Cos-lettuces are likewise eminently serviceable, especially four young pigs, which, when fed on them, may be weaned a fortnight earlier than is usual. Pease also afford an excellent food for fattening, and if duly mixed with salt, will render the animals fit for sale at the end of five weeks. In the vicinity of London, vast numbers of hogs are annually fattened with grains from the distilleries: such pork, however, does not take the salt so readily as the flesh of those pigs which have been fed with more substantial food, and are driven to the market from a considerable distance. Hogs may with great advantage be folded on wheat, where the soil is loose, light, and friable; for they will drop a considerable quantity of dung, and tread the looser parts of

the land so closely together, that it will not hove during summer; nor will the wheat be root-fallen. Particular care, however, ought to be taken, that these animals be well ringed; an operation that ought to be performed as early as possible. Hogs are very valuable quadrupeds, and their flesh furnishes at all times an agreeable meat. See BACON, and HAM. In a fresh state, it is called pork, and affords a wholesome and nourishing food to a sound stomach, when eaten in moderation, with sub-acid vegetables or sauces. Their lard, or fat, is applicable to various purposes, both culinary and medicinal. The blood, intestines, feet, and tongue, are all used in the kitchen; though the blood is indigestible. The fat of the bowels and web, which differs from common lard, is preferably employed for greasing the axles of wheels. The bristles are made into brushes, pencils, &c.; the skins into sieves; yet the latter might be more advantageously tanned, and converted into shoes, as is the practice in China, where all the shoes sold to the Europeans at Canton, are made of hog's-leather, the hair being previously burnt off with a red-hot iron. The dung of swine is reputed to be next in value to that of sheep, and is particularly useful in destroying that pernicious weed, the Common Coltsfoot. In purchasing lean hogs, the most certain method is to judge by weight. If, therefore, a farmer were to weigh a few lean pigs which are about the size of those he intends to purchase, he would obtain some standard on which to proceed, and will consequently be able to bid a fair price in the market. With respect to fat hogs, it has been proved from repeated experiments, that every 20lbs. live weight will yield, when killed, from twelve to fourteen nett weight. In those which do not exceed twelve stone (14lbs. to the stone,) the weight will be 12lb.; but, in larger animals, it will in general amount to about 14lb. If, therefore, a farmer weigh them alive, he will not only know the clear profitable weight when killed, and consequently its value, but he will also, by weighing the animal every week, be able to ascertain the proper time to slaughter, or dispose of it to the best advantage; for, when the hog ceases to acquire that daily increase which renders it profitable, the best course that can be followed is, to kill him immediately. Thus we have considered the leading branches which demand the husbandman's attention; and so complicated indeed are they, as to call forth every exertion and ingenuity, for the purpose of facilitating the different operations, and to promote their more or less important objects. Hence various societies, both public and private, have been instituted; which by judicious premiums, and other modes of encouragement, have advanced this interesting science to a high degree of perfection. We shall here subjoin a list of such works as will amply repay the time and attention which may be spent in perusing them, and which reflect lustre and credit on the country in which they have been published. The Communications to the Board of Agriculture, and the Transactions of the Society for the Encouragement of Arts, &c. possess the first place in the scale of merit. With these may also be classed the Letters and Papers of the Bath and West of England Society, and Mr. A. Young's Annals of Agriculture; works which have been carried on for a series of years, and which progressively become more interesting and useful. Beside these collective and national works, the perusal of the following cannot fail to be attended with considerable advantage. 1. Lord Somerville's System followed during the two last Years, by the Board of Agriculture, &c. 8vo. pp. 300, 2d edit. 2. Dr. Anderson's Essays on Agriculture, 8vo. 3 vols. 3. The same writer's Recreations in Agriculture. 4. Mr. Ellis's Husbandry Abridged and Methodized, 8vo. 2 vols. 5. Mr. Hartes's Essay on Husbandry, 8vo. 6. Mr. Parkinson's Experienced Farmer, 2 vols. 8vo. Much valuable information may also be collected from the New Farmer's Calendar, 8vo. p. 619, and likewise from Mr. Banister's Synopsis of Husbandry, 8vo. p. 471, which last-mentioned work is obviously written by a man of experience. Besides these there are many other works of merit published by English writers on Agriculture, which our limits will not permit us to specify. We cannot, perhaps, conclude this article better than in the words of the excellent Lord Somerville; "economy (says this enlightened nobleman) is the life and soul of husbandry: when we lost sight of it, plenty deserted us; and unless it be speedily recurred to, she will not return. May that period, when of necessity we must put in execution some plan for the relief of our poor, be far from us! May vigorous and economical husbandry prevail throughout the kingdom, without the aid of legislative interference!"

HUSK, in botany, the same with the calyx or cup of a flower. — See **CALYX** under **BOTANY**.

HUSK, or **COUGH**, a disease to which young bullocks are subject. In this disorder the wind-pipe and its branches are loaded with small taper worms. Farmers count the disease incurable; but fumigations with mercurials, as cinnabar, or with fetids, as tobacco, might prove serviceable.

HUSS. See **ACIPENSER**.

HUSS, JOHN, an eminent reformer and martyr, born at Huss, in Bohemia. He lived at Prague in the highest reputation, both on account of the sanctity of his manners and the purity of his doctrine. He was distinguished by his uncommon erudition and eloquence, and performed the functions of professor of divinity in the university, and pastor in the church of that city. He adopted the sentiments of Wickliff, and the Waldenses; and in 1407 began openly to oppose and preach against divers errors in doctrine, as well as corruption in point of discipline, then reigning in the church. He also endeavoured to withdraw the university of Prague from the jurisdiction of Gregory XII. whom the kingdom of Bohemia had hitherto acknowledged as the lawful head of the church. This occasioned a violent quarrel between the archbishop of Prague and our reformer, which the latter daily augmented by his pathetic exclamations against the court of Rome, and the corruptions that prevailed among the sacerdotal order. Several other circumstances contributed to inflame the resentment of the clergy against him. He adopted the philosophical opinions of the Realists, and vehemently opposed, and even persecuted, the Nominalists, whose number and influence were considerable in the university of Prague. He also multiplied the number of his enemies in 1408, by procuring, through his great credit, a sentence in favour of the Bohemians, who disputed with the Germans concerning the number of suffrages which their respective nations were intitled to, in all matters decided by election in this university. In consequence of a decree obtained in favour of the former, which restored them to their constitutional right of three suffrages, usurped by the latter, the Germans withdrew from Prague, and, in 1409, founded a new academy at Leipsic. This event no sooner happened, than Huss began to inveigh with greater freedom than he had before done against the vices and corruptions of the clergy, and to recommend, in a public manner, the writings and opinions of Wickliff, as far as they related to the papal hierarchy, the despotism of the court of Rome, and the corruption of the clergy. Hence an accusation was brought against him, in 1410, before the tribunal of John XXIII. by whom he was solemnly expelled from the communion of the church. Notwithstanding this sentence of excommunication, he proceeded to expose the Romish church with a fortitude and zeal that were almost universally applauded. This eminent man, whose piety was equally sincere and fervent, though his zeal was perhaps too violent, and his prudence not always circumspect, was summoned to appear before the council of Constance. Secured, as he apprehended, from the rage of his enemies, by the safe conduct granted him by the emperor Sigismund, for his journey to Constance, his residence in that place, and his return to his own country, he obeyed the order of the council, and appeared before it to demonstrate his innocence. But, by the most scandalous breach of public faith, he was cast into prison, declared a heretic, because he refused to plead guilty against the dictates of his conscience, and burnt alive in 1415; a punishment which he endured with unparalleled magnanimity and resolution. The same unhappy fate was suffered by Jerome of Prague, his intimate companion, who attended the council, to support his persecuted friend. John Huss's writings, which were numerous and learned, were burnt along with him; but copies of most, if not all, of them, were preserved and published after the invention of printing.

HUSSARS, the national cavalry of Hungary and Croatia. Their regimentals consist in a rough furred cap, adorned with a cock's feather, (the officers have either an eagle's or a heron's), a doublet, with a pair of breeches to which the stockings are fastened, and yellow or red boots: they also occasionally wear a short upper waistcoat edged with furs, and five rows of round metal-buttons; and in bad weather, a cloak. Their arms are a sabre, carbine, and pistols. They are irregular troops: hence, before beginning an attack, they lay themselves so flat on the necks of their horses, that it is hardly possible to discern their force; but being come within pistol-shot of the enemy, they raise themselves with such

surprising quickness, and begin the fight with such vivacity on every side, that unless the enemy is accustomed to their method of engaging, it is very difficult for troops to preserve their order. When a retreat is necessary, their horses have so much fire, and are so indefatigable, their equipage so light, and themselves such excellent horsemen, that no other cavalry can follow them. They leap over ditches, and swim over rivers, with surprising facility. They never encamp, and consequently are not burdened with any camp-equipage, except a kettle and a hatchet to every six men. They always lie in the woods, out-houses, or villages, in the front of the army. The emperor, and the king of Prussia, have the greatest number of hussars in their service.

HUSSINGABAD, a town of Hindostan, in Candeish.

HUSSITES, in ecclesiastical history, a party of reformers, the followers of John Huss. See **Hess**. They adhered to their master's doctrine after his death with a zeal which broke out into an open war, that was carried on with the most savage and unparalleled barbarity.

HUSTINGS, a court held in Guildhall before the lord mayor and aldermen of London, reckoned the supreme court of the city. Here deeds may be inrolled, outlawries sued out, and replevins and writs of error determined. In this court also is the election of the lord mayor and sheriffs, of the four members of parliament for the city, &c. This court is very ancient, as appears from the laws of Edward the Confessor. Some other cities have likewise had a court bearing the same name, as Winchester, York, &c.

HUSUM, a town of Denmark, in Sleswick. Lon. 9. 8. E. Lat. 54. 32. N.

HUTCHINSON, JOHN, an English philosopher, was born at Spennythorn, in Yorkshire, in 1674. He received a liberal education, after which he became steward first to a country-gentleman, and next to the duke of Somerset. Having a turn for natural history he made a large collection of fossils, which he put into the hands of Dr. Woodward, for him to digest and publish. The doctor deceived Hutchinson with fair promises, but never began the work, which induced him to rely on his own pen. He therefore quitted the duke's service, who being master of the horse to the king, made him his riding purveyor. He also gave him the presentation to the living of Sutton, in Sussex, which Hutchinson bestowed on his friend Mr. Julius Bate, a zealous defender of his doctrines. In 1724 he published the first part of his "Moses's Principia," in which he ridiculed Dr. Woodward's "Natural History of the Earth," and exploded the doctrine of gravitation established in Newton's "Principia;" in 1727, he published the second part of his "Moses's Principia," containing the principles of the Scripture Philosophy. From this time to his death, he published a volume every year or two; which, with the MSS. he left behind him, were published in 1743, in 12 volumes 8vo. An abstract of the whole has been published in one volume 12mo. However fanciful or extravagant many may consider his views of scripture, they deserve very great attention. He discovers great knowledge of the Hebrew language, of the eastern hieroglyphics, and prophetic allusions; and his writings are the result of intense study and application. He died August 28, 1737.

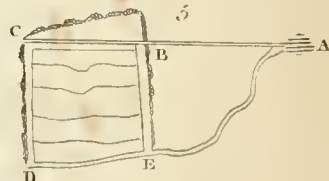
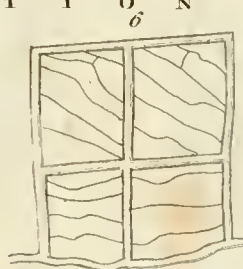
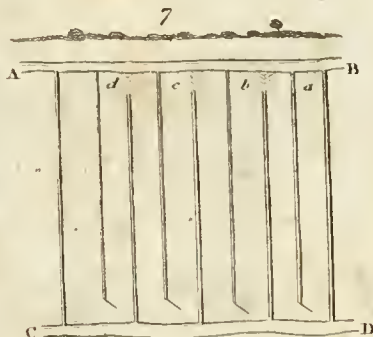
HUTCHINSONIANS, a name given to those who adopt the religious and philosophical principles of J. Hutchinson, Esq. The reader may find a distinct and comprehensive summary of the Hutchinsonian system in a book entitled "Thoughts concerning Religion," &c. printed at Edinburgh in 1743; and in a letter to a bishop, annexed to it, first printed in 1732, and written by president Forbes.

HUTTON, CHARLOTTE, a most extraordinary genius of the present age, youngest daughter of Dr. Charles Hutton, of Woolwich. She was born in 1778, and was only sixteen years of age, when she died, by the rupture of a vessel in her lungs, on the 24th December, 1794. Yet in the short period she had acquired more learning and knowledge, than many persons do who live to fourscore. She knew several languages, and almost all sciences in a considerable degree; and had acquired a knowledge of arithmetic, algebra, geography, astronomy, music, drawing, poetry, history, botany, and gardening, besides all the usual female accomplishments in a superior degree and style. Most of these were acquisitions chiefly made by her own talents and energy of mind, with little or no assistance from others. It was sufficient for

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I R R I G A T I O N



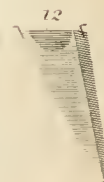
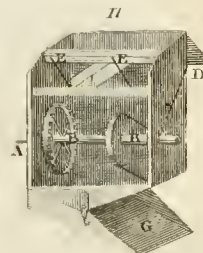
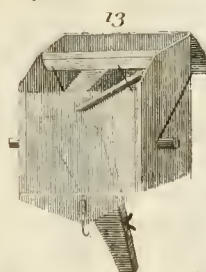
Somersetshire Plough



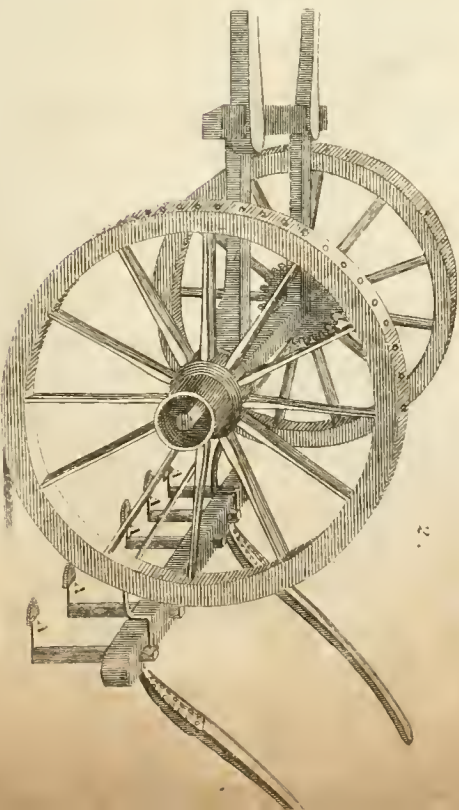
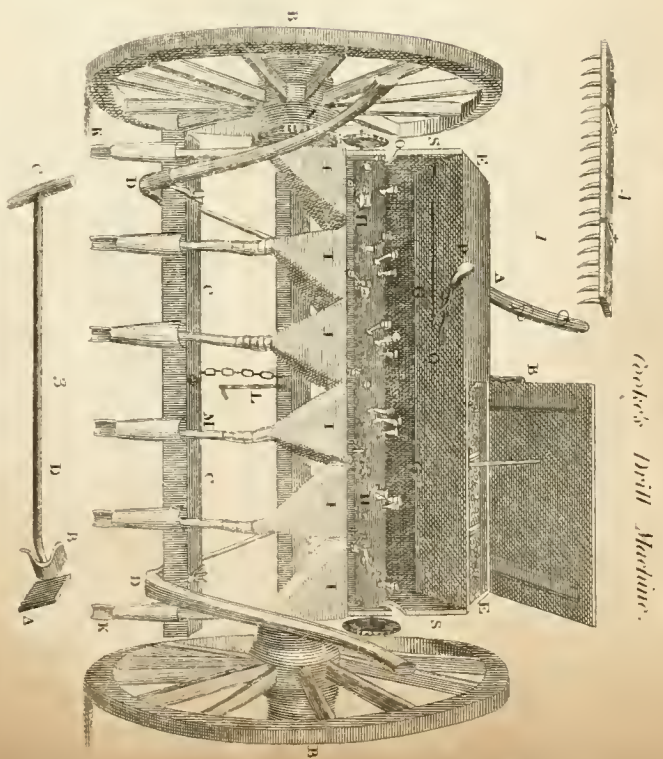
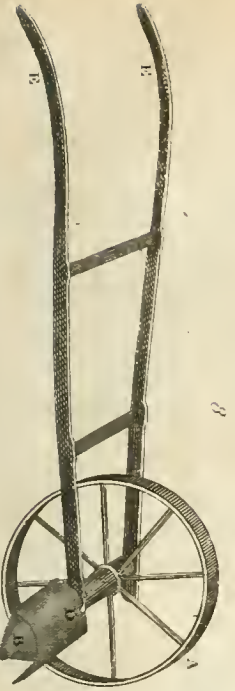
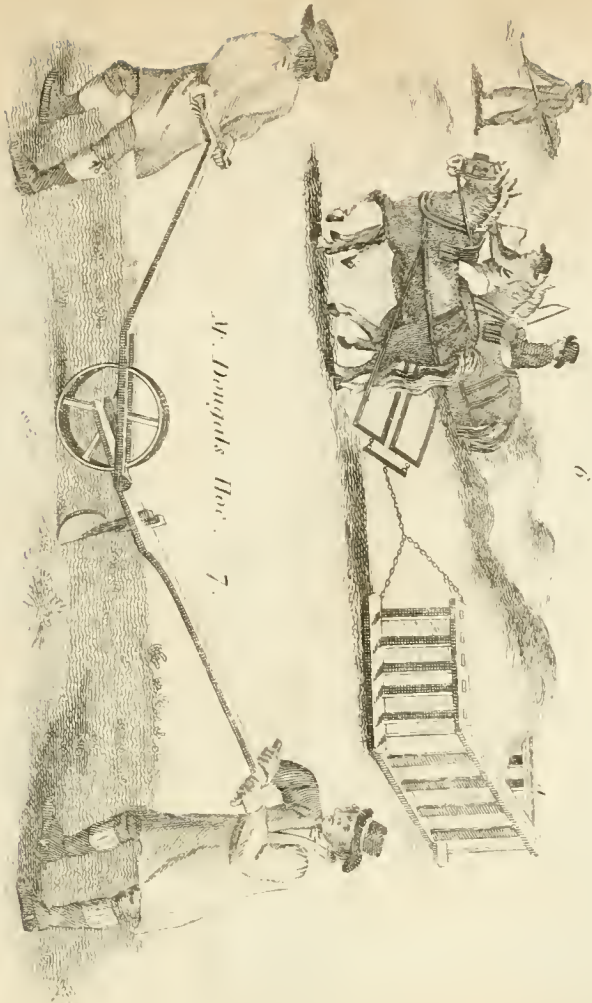
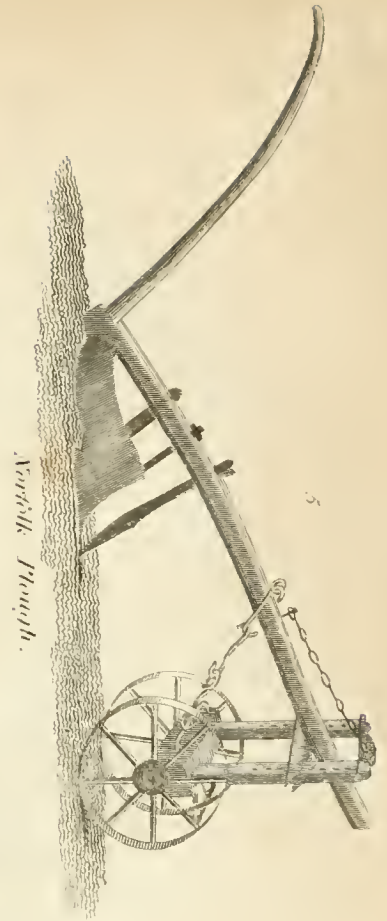
Double Furrow Plough



Hornes sowing Machine











Poa pratensis
Smooth stalked meadow grass.



Festuca duriuscula
Hard fescue grass.



Phleum nodosum
Buffy cat's tail grass.



Festuca pratensis
Meadow fescue grass.



Lolium perenne
Common Rye grass.



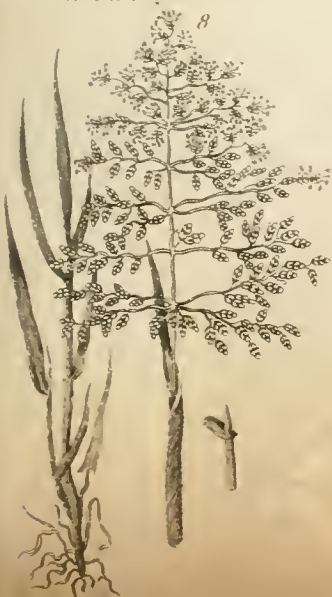
Stipeocarenum pratensis
Meadow foxtail grass.



Festuca ovina
Sheep's fescue grass.



Poa compressa
Compressed meadow grass.



Poa palustris
Marsh meadow grass.



Elymus cristatus
Crested dog's tail grass.



Anthoxanthum odoratum
Sweet vernal grass.

for her, once to see or hear any thing done. She soon made it her own. She was her father's amanuensis and assistant upon all occasions; she wrote for him, and read to him, in all languages and sciences; she made drawings for him of all kinds, astronomical, mathematical, mechanical, &c. She arranged and managed his library, and knew where every book stood, so that she could find them even in the dark. She was author of several ingenious compositions and calculations. She extracted the square roots of most of the second 1000 numbers, to 12 places of decimals, and proved the truth of them, by means of differences; arranging the whole in a table fit for publication. She drew elegant geographical maps, and only the second day before she died, began and completed the whole hemisphere of the earth. In composition, whether epistolary or scientific, her style was excellent. In the midst of all these literary acquisitions, she was so active in family-affairs, that she was no less useful to her mother, in her domestic concerns, than to her father in his scientific business. To all these qualifications, she added uncommon goodness, affability, cheerfulness, and sweetness of disposition, which made her as much beloved, as her extraordinary talents and acquirements made her admired.

HUXING, among fishermen, a particular method of catching pikes. For this purpose, they take thirty or forty as large bladders as can be got; blow them up, and tie them close and strong; and at the mouth of each tie a line, longer or shorter according to the depth of the water. At the end of the line is fastened an armed hook, artfully baited; and thus they are put into the water with the advantage of the wind, that they may gently move up and down the pond, till the bait is seized by the fish.

HUY, a town of France, 12 miles S. S. W. of Liege.

HUYGENS, CHRISTIAN, one of the greatest mathematicians and astronomers of the 17th century, was the son of Constantine Huygens, lord of Zuylichem, who had served three successive princes of Orange in the quality of secretary. He was born at the Hague, in 1629, and discovered from his infancy an extraordinary fondness for the mathematics; in which he soon made great progress, and perfected himself under the famous professor Schooten, at Leyden. In 1649, he went to Holstein and Denmark, in the retinue of Henry count of Nassau; and intended going to Sweden, to see Des Cartes, but the count's short stay in Denmark would not permit him. He travelled into France and England; was, in 1663, made a F. R. S. and, upon his return into France, M. Colbert, being informed of his merit, settled a considerable pension upon him to engage him to fix at Paris; to which Mr. Huygens consented, and staid there from 1666 to 1681, where he was admitted a member of the Academy of Sciences. He loved a quiet and studious life, and often retired into the country to avoid interruption, but did not contract that moroseness which is so frequently the effect of solitude. He was the first who discovered Saturn's ring, and a third satellite belonging to that planet, which had escaped the eyes of former astronomers. He discovered the means of rendering clocks exact, by applying the pendulum, and rendering all its vibrations equal by the cycloid. He brought telescopes to perfection, made many other useful discoveries, and died at the Hague in 1695. He was the author of several excellent works. The principal of these are contained in two collections; the first printed at Leyden in 1682, in 4to. entitled "Opera Varia;" and the second at Amsterdam in 1728, in two volumes, 4to. entitled "Opera Reliqua."

HUZZOOR, a Hindostan word signifying the presence; applied, by way of eminence, to the Mogul's court.

HUZZOOR NEVES, the secretary who resides at court, and keeps copies of all firmans, records, or letters.

HYACINTH, [*υακινθ*], in mineralogy, a species of the zircon genus: of a red colour, which passes through various shades into orange yellow, greenish grey, and greenish white. It occurs in grains, and likewise crystallized: specific gravity from 4 to 4.6. As these gems are of very different beauty and value in their several degrees and mixture of colours, jewellers divide them into four kinds: 1. When the stone is in its most perfect state, and of a pure and bright flame-colour, they call it hyacintha la belle. 2. When it has an over proportion of the red, and that of a dusky colour, they call it the saffron hyacinth. 3. Such stones as are of a dead whitish yellow, they call amber-hyacinths. And, 4. When the stone is of a fine deep red, blended with a dusky and very deep

yellow, they call it a rubacelle. A specimen from Ceylon contained:

Zircon.....	70
Silica.....	125
Oxide of iron.....	0.50
	95.50
Loss.....	4.50
	100

When exposed to the blow-pipe it loses its colour, but not its transparency: it is infusible, excepting with borax, which converts it into a white transparent glass. If exposed to heat made by oxygen gas, it melts into a greyish white glass-head. It is found chiefly in the sand at Ceylon, though some specimens have been obtained in various parts of the continent of Europe. It will take a fine polish, and when very pure is highly esteemed.

HYACINTHUS, **HYACINTH**, or **FLAREBELLS**; in botany, a genus of the hexandria monogynia class and order. Natural order, Lilia Roy, or Liliaceæ. Corolla bell-shaped, with three honied pores by the germ. There are seventeen species.

HYACINTHIA, in antiquity, feasts held at Sparta, in honour of Apollo, and in commemoration of his favourite Hyacinthus.

HYACINTHUS, the son of Amyclas king of Sparta, was beloved both by Apollo and Zephyrus. The youth shewing most inclination to the former, his rival grew jealous; and to be revenged, one day as Apollo was playing at the discus, with Hyacinthus, Zephyrus turned the direction of a quoit which Apollo had pitched full upon the head of Hyacinthus, who fell down dead. Apollo then transformed him into a flower of the same name; and as a farther token of respect instituted the feasts of Hyacinthia.

HYADES, in astronomy, are seven stars in the bull's head, famous among the poets for the bringing of rain. Whence their name *ῥαδεις*, from the Greek *εὖναι* "to rain." The principal of them is in the left eye, by the Arabs called Aldebaran.

HYADES, in the mythology, the daughters of Atlas and Pleione.

HYÆNA. See **CANIS**.

HYALINE, [*υαλιν*], glassy; crystalline; made glass; resembling glass.

HYALITE, in mineralogy, a species of the flint genus. Colour yellow and greyish white: it occurs in thin crusts on other minerals, it much resembles gum, and is nearly allied to opal.

HYALOIDES, [*υαλιν* and *ειδ*], in anatomy, the vitreous humour of the eye, between the tunica retina and the uvea.

HYBERNACULUM, in botany, that part of the plant which defends the embryo herb from injuries during the severities of winter; hence the name, hybernaculum or winter-quarters. See **BOTANY**.

HYBLA, in ancient geography, a town on the E. coast of Sicily, called also Hybla Parva, Galeotis, and Megara; which last name it took from the Megareans, who led thither a colony.

HYBLA MAJOR, in ancient geography, a town of Italy, in the tract lying between mount Ætna and the river Symethus.

HYBLA MINOR, or **HERÆ**, an inland town of Sicily, now Ragusa.

HYBLEI COLLES, small eminences at the springs of the Albus, near Hybla, famous for thyme and honey.

HYBRIDÆ PLANTÆ, or **HYBRID PLANTS**. See **BOTANY**. The seeds of hybrid plants will not propagate.

HYBRISTICA, [*of εβρις*, injury,] in antiquity, a solemn feast held among the Greeks, with sacrifices and other ceremonies: at which the men attended in the apparel of women, and the women in that of men, to do honour to Venus in quality either of a god or goddess, or both.

HYDATIDES, [*from δειμα*,] in medicine, little transparent bladders of water in any part: most common in dropsical persons, from a distention or rupture of the lymph ducts. They are sometimes found solitary, and sometimes in clusters, upon the liver and various other parts.

HYDATOIDES, [*δευα* and *ειδ*], the watery humour of the eye, between the cornea and the uvea.

HYDATOSCOPIA, [*δευα* and *σκοπεω*], a method of foretelling future events by water.

HYDE, THOMAS, D. D. professor of Arabic at Oxford, and one of the most learned writers of the 17th century, was born in 1636; and studied first at Cambridge, and afterwards at Oxford. Before he was eighteen years of age, he was sent from Cambridge to London to assist Mr. Brian Walton in the great work of the Polyglot Bible; and about that period undertook to transcribe the Persian Pentateuch out of the Hebrew characters, which archbishop Usher, who well knew the difficulty of the undertaking, pronounced to be an impossible task to a native Persian. After he had happily succeeded in this, he assisted in correcting several parts of Mr. Walton's work, for which he was perfectly qualified. He was made archdeacon of Gloucester, canon of Christ-church, head-keeper of the Bodleian library, and professor of Hebrew and Arabic, in the university of Oxford. He was interpreter and secretary of the Oriental languages, during the reigns of Charles II. James II. and William III.; and was well qualified to fill this post, as he could converse in all these languages. There never was an Englishman in his situation of life who made so great a progress; but his mind was so engrossed by his beloved studies, that he did not appear to advantage in common conversation. Of all his learned works (the very catalogue of which, as observed by Anth. Wood, is a curiosity,) his "*Religio Veterum Persarum*" is the most celebrated. Dr. Gregory Sharpe, the late learned and ingenious master of the Temple, has collected several of his pieces formerly printed, and republished them, with some additional dissertations, and his life prefixed, in two elegant volumes, 4to. He died on the 18th February, 1702. Among his other works are, 1. A Latin Translation of Ulug Beig's Observations on the Longitude and Latitude of the Fixed Stars; and, 2. A Catalogue of the printed Books in the Bodleian Library.

HYDE, a maritime county of North Carolina, in Newbern district.

HYDER ALY, or ALI, a famous Indian usurper, and for some time a formidable opponent of the British interest in the East Indies. He was the son of a killadar, or governor of a fort, to the king of Mysore, and acquired his skill in military tactics in the French army. In 1753, he distinguished himself as their auxiliary at Trichinopoly. In 1763, being commander of the Mysore army, he dethroned his sovereign, and governed the kingdom under the title of regent. In the wars with the British between 1767 and 1770, he displayed great spirit and abilities; but in 1771 he was totally defeated by the Marhattas. During the peace that followed he greatly improved his army and revenues. In 1780, he made an irruption into the Carnatic, and cut to pieces a British detachment under Col. Baillie; but his victorious career was soon stopped by Sir Eyre Coote, who, with a force scarcely exceeding 7000 men, gained a complete victory over Hyder Ali at the head of 150,000, and defeated him six times successively afterwards, the last of which victories was obtained on the 7th June, 1782. Hyder died in December 1782, five months before Gen. Coote.

HYDNUM, in botany, a genus of the natural order of fungi, and cryptogamia class of plants. The fungus is echinated or prickly on the under side, with awl-shaped fibres. There are six species, five with stems, and one without.

HYDRA, in fabulous history, was a serpent in the marsh of Lerna, in Peloponnesus, with many heads, one of which being cut off, another, or two others, immediately succeeded in its place, unless the wound was instantly cauterized. Hercules attacked this monster; and having caused Iolaus to hew down wood for flaming brands, as he cut off the heads he applied the brands to the wounds, by which means he destroyed the Hydra. This hydra is supposed to have been a multitude of serpents, which infested the marshes of Lerna near Mycenæ, and seemed to multiply as they were destroyed. Hercules, with the assistance of his companions, cleared the country of them, by burning the reeds in which they lodged.

HYDRA, in astronomy, a southern constellation, consisting of a number of stars, imagined to represent a water-serpent. See **ASTRONOMY**.

HYDRA, in geography, an island in the Grecian Archipelago.

HYDRA, a genus of the vermes zoophyta. The generic character is, animal fixing itself by the base; linear, gelatinous, naked, contractile, and furnished with setaceous tentacula, inhabiting

fresh waters, and producing its deciduous offspring, or eggs, from the sides. There are five species. They are also called polypes. The name of hydra was given them by Linnæus on account of the property they have of reproducing themselves when cut in pieces, every part soon becoming a perfect animal. Dr. Hill called them biota, on account of the strong principle of life with which every part of them is endowed. These animals were first discovered by Leeuwenhoek, who gave some account of them in the *Philos. Trans.* for 1703: but their wonderful properties were not known till 1740, when Mr. Trembley began to investigate them, or rather till March 1741, when he had satisfied himself that they were real animals. The surprise of Mr. Trembley and others, on discovering the true nature of these animals, was very great. When Mr. Reaumur saw, for the first time, two polypes formed from one which he had divided into two parts, he could hardly believe his own eyes; and even after having repeated the operation 100 times, he said that the sight was by no means familiar to him. The hydra, viridis, fusca, and grisea, inhabit stagnant waters and slowly running streams, generally on the surface of plants, and appear like a little transparent jelly, when contracted and transparent: when expanded the body is linear, fixed at one end, and surrounded at the other by tentacula, or arms placed in a circle round the mouth, and gradually producing its young from the sides, which at first seem small papillæ, increasing in length, till they assume the form of the parent, and then dropping off. These creatures are slender, pellucid, and capable of contracting themselves into a very small compass, or of extending to a considerable length. The arms are capable of the same contraction and expansion as the body, and with these they lay hold of minute worms and insects, bringing them to the mouth, and swallowing them. The indigestible parts are again thrown out by the mouth. The bodies of the viridis and grisea diminish almost insensibly from the anterior to the posterior extremity; but the fusca is for the most part of an equal size, for two-thirds of its length, from the anterior to the posterior extremities, from which it becomes abruptly smaller, and then continues of a regular size to the end. These three kinds have at least six, and at most twelve or thirteen arms. They can contract themselves till their bodies do not exceed one-fourth of an inch in length, and they can stop at any intermediate degree of expansion or contraction. They are of various sizes, from an inch to an inch and a half long. They can contract or expand one arm, or any number of arms, independently of the rest; and they can likewise bend their bodies or arms in all possible directions. They can also dilate or contract their bodies in various places, and sometimes appear thick set with folds, which, when carelessly viewed, appear like rings. Their progressive motion is performed by that power which they have of contracting and dilating their bodies. When about to move, they bend down their heads and arms, lay hold by means of them on some other substance to which they design to fasten themselves; then they loosen their tail, and draw it towards their head; then either fix it in that place, or stretching forward their head as before, repeat the same operation. They ascend or descend at pleasure in this manner upon aquatic plants, or upon the sides of the vessel in which they are kept; they sometimes hang by the tail from the surface of the water, or sometimes by one of the arms; and they can walk with ease upon the surface of the water. On examining the tail with a microscope, a small part of it will be found to be dry above the surface of the water; and, as it were in a little concave space, of which the tail forms the bottom; so that it seems to be suspended on the surface of the water, on the same principle that a small pin or needle is made to swim. The fusca has the longest arms, and makes use of the most curious manœuvres to seize its prey. They are best viewed in a glass seven or eight inches deep, when their arms commonly hang down to the bottom. When this or any other kind is hungry, it spreads its arms in a kind of circle to a considerable extent, inclosing in this, as in a net, every insect which has the misfortune to come within the circumference. While the animal is contracted by seizing its prey, the arms are observed to swell like the muscles of the human body when in action. Though no appearance of eyes can be observed in the polype, they certainly have some knowledge of the approach of their prey, and shew the greatest attention to it as soon as it comes near them. It seizes a worm the moment it is touched by one of the arms; and in conveying it to the mouth,

mouth, it frequently twists the arm into a spiral like a cork-screw, by which means the insect is brought to the mouth in a much shorter time than otherwise it would be; and so soon are the insects on which the polypes feed killed by them, that M. Fontana thinks they must contain the most powerful kind of poison; for the lips scarcely touch the animal when it expires, though there cannot be any wound perceived on it when dead. The worm, when swallowed, appears sometimes single, sometimes double, according to circumstances. When full, the polype contracts itself, hangs down as in a kind of stupor, but extends again in proportion as the food is digested, and the excrementitious part is discharged. The polypes produce young ones indiscriminately from all parts of their bodies, and five or six young ones have frequently been produced at once; nay, M. Trembley has observed nine or ten produced at the same time. Nothing like copulation among these creatures was ever observed by M. Trembley, though for two years he had thousands of them under his inspection. When a polype is cut transversely, or longitudinally, into two or three parts, each part in a short time becomes a perfect animal; and so great is this prolific power, that a new animal will be produced even from a small portion of the skin of the old one. If the young ones be mutilated while they grow upon the parent, the parts so cut off will be reproduced; and the same property belongs to the parent. A truncated portion will send forth young ones before it has acquired a new head and tail of its own, and sometimes the head of the young ones supplies the place of that which should have grown out of the old one. If we slit a polype longitudinally through the head to the middle of the body, we shall have one formed with two heads; and by again slitting these in the same manner, we may form one with as many heads as we please. A still more surprising property of these animals is, that they may be grafted together. If the truncated portions of a polype be placed end to end, and gently pushed together, they will unite into a single one. The two portions are first joined together by a slender neck, which gradually fills up and disappears, the food passing from the one part into the other; and thus we may form polypes not only from portions of the same, but of different animals; we may fix the head of one to the body of another, and the compound animal will grow, eat, and multiply, as if it had never been divided. By pushing the body of one into the mouth of another, so far that their heads may be brought into contact, and kept there for some time, they will at last unite into one animal, only having double the number of arms which it would otherwise have had. The fusca may be turned inside out like a glove, at the same time that it continues to live and act as before. The lining of the stomach now forms the outer skin, and the former epidermis constitutes the lining of the stomach. If previous to this operation the polype have young ones attached to it, such as are but newly beginning to vegetate turn themselves inside out, while the larger ones continue to increase in size till they reach beyond the mouth of the parent, and are then separated in the usual manner from the body. See Adams on the Microscope.

HYDRABAD, a province of Hindoostan, now called Golconda.

HYDRABAD, the capital of Golconda, and of the Deccan, 690 miles S. of Delhi.

HYDRABAD, a fort of Hindoostan Proper, in the province of Sindy, seated on the Indus, near Nusserpour.

HYDRAGOGUES, [from *ὕδωρ*, water, and *αγωγός*, to draw,] medicines used in dropsies; but the original use of the term proceeded upon a mistaken supposition, that every purgative had some particular humour which it would evacuate, and which could not be evacuated by any other. It is now, however, discovered, that all strong purgatives will prove hydragogues, if given in large quantity, or in weak constitutions. The principal medicines, recommended as hydragogues, are the juice of elder, the roots of iris, soldanella, mechoacan, jalap, &c.

HYDRANGÆA, in botany, a genus of the digynia order, and decandria class of plants; natural order, Succulentæ. Capsule two-celled, two-beaked; corolla five-petaled; calyx five-cleft, superior; seeds many.

HYDRACHNA, a genus of insects of the order aptera. Head, thorax, and abdomen, united or connate; feelers two, jointed; eyes two, four, or six; legs eight, formed for swimming. The genus hydrachna are allied in the closest manner to that of

acarus. There are about fifty species. Of all the hydrachna yet discovered, by far the most elegant is the hydrachna geographica, so named from the fancied map-like distribution of its variegations. It is one of the largest of the genus, and is occasionally seen in clear ponds and other stagnant waters, but is one of the rarer kinds: its shape is globular, and its colour a polished black, decorated with carmine-coloured spots and patches, which, in a certain light, are accompanied by a kind of gilded lustre.

HYDRARGYRUM, mercury, or quicksilver; so called from *ὕδωρ*, water, and *αργυρός*, silver; *q. d.* water of silver, on account of its resembling liquid or melted silver.

HYDRASTIS, in botany, a genus of the polygamia order, and polyandria class of plants. No calyx nor nectarium; petals three; berry composed of monospermous acini. It has but one species.

HYDRATE, in chemistry, a term lately introduced to denote the chemical compound of water with any substance, especially a metallic oxide.

HYDRAULICS, [*ὕδωρ*, water, and *αὐλός*, a pipe,] the science of the motion of fluids, and the construction of all kinds of instruments and machines relating thereto. See **HYDROSTATICS**.

HYDRAULICO-PNEUMATICAL, a term applied to engines, which raise water by means of air. See **HYDROSTATICS**.

HYDRENTEROCELE, [*ὕδωρ*, *εντῆρον*, and *κήλη*,] in surgery, a species of hernia, wherein the intestines descend into the scrotum, together with a quantity of water.

HYDROCELE, [*ὕδωρ*, *κρήλη*,] in surgery, a term denoting any hernia arising from water; but is particularly used for such a one of the scrotum, which sometimes grows to the size of one's head, without pain, but exceedingly troublesome. See **SURGERY**.

HYDROCEPHALUS, [*ὕδωρ* and *κεφαλή*,] a preternatural distension of the head to an uncommon size, by a stagnation and extravasation of the lymph; which, when collected in the inside of the cranium, is then termed internal; as that collected on the outside is termed external. See **MEDICINE**.

HYDROCHARIS, the **LITTLE WATER-LILY**; a genus of the enneandria order, and diœcia class of plants; natural order, Palmæ. Male, spathe two-leaved; calyx three-cleft; corolla three-petaled; filaments bearing stiles: female, calyx three-cleft; corolla three-petaled; styles six; capsules six-celled; seeds many. It has but one species.

HYDROCOTYLE, **WATER NAVELWORT**; a genus of the digynia order, and pentandria class of plants; natural order, Umbellifera. Umbel simple; involucrem tetraphyllous; petals entire; seeds half round and compressed. There are fifteen species.

HYDRODYNAMICS, [from *ὕδωρ*, water, and *δυναμις*, power,] a science which treats of the powers, force, and velocities, of fluids in motion. See **HYDROSTATICS**.

HYDRAULICON, **WATER ORGAN**; in music, an instrument acted upon by water, the invention of which is said to be of higher antiquity than that of the wind-organ.

HYDROGEN, [from *ὕδωρ*, water, and *γενναίω*, to become,] one of the simple combustibles, and one of the constituents of water; it is the base of hydrogen gas, formerly called inflammable air.

HYDROGEN GAS, an inflammable gas, remarkable for its levity. Its base is hydrogen. It has been long known under the name of fire-damp. Mr. Cavendish, first completely examined the properties of this gas, and shewed that it is permanently elastic, not absorbed by water; and that it is much lighter than atmospheric air. (Philos. Trans. vol. lvi. p. 141.) This substance forming water when combined with oxygen, and being therefore the radical of that compound, the name hydrogen was given to it, at the formation of the new nomenclature. It is always obtained from the decomposition of water, as it cannot, from other substances in which it exists, be easily disengaged in perfect purity. Some substance is made to act on water, which exerts an attraction to the oxygen, without combination with the hydrogen, when, of course, the hydrogen is disengaged, and passes into the elastic form. If a coil of iron-wire, or a quantity of iron-filings be put into an iron, coated glass, or earthen tube, which is placed across a small

a small furnace, and surrounded with burning fuel, so as to be brought to a red heat, on distilling water from a retort connected with it, the vapour, in passing over the surface of the ignited iron, is decomposed, the iron attracts its oxygen, and hydrogen gas issues from the extremity of the tube. This process is a troublesome one, and by the agency of an acid, water is decomposed as rapidly by iron or zinc, at a natural temperature. Zinc affords the hydrogen in the greatest purity. One part of it, in small pieces, is put into a retort, or a bottle with a bent tube adapted to it; two parts of sulphuric acid, previously diluted with five times its weight of water, are poured upon it, an effervescence is immediately excited, hydrogen gas escapes, and is to be collected in jars filled with water, and placed on the shelf of the pneumatic trough. Its disengagement continues until the zinc is dissolved. Iron may be employed in place of zinc, but containing generally a little carbon, which is dissolved by the hydrogen, it affords a gas less pure. Muriatic acid serves the same purpose as sulphuric acid, but must be diluted with only twice or three times its weight of water. In the experiment, the hydrogen gas is derived entirely from the decomposition of the water, the oxygen of which is attracted by the metal. That the acid suffers no decomposition, is proved by the liquor at the end of the experiment, being capable of saturating as much of an alkali as the quantity of acid employed would have done in a pure state. Hydrogen gas, when collected over water, is observed to have a peculiar smell, slightly fetid, which is not so perceptible when it is collected over quicksilver, and which is lost when the gas is exposed to substances which powerfully attract humidity. This is the lightest of the gases, and indeed the lightest substance whose gravity can be ascertained by weighing. Its specific gravity varies considerably, according to its state with regard to humidity. When it has been transmitted through water, or has remained for some time exposed to it, it is about ten times lighter than atmospheric air; when it has been received over quicksilver, and exposed to any substance which attracts water strongly, as quicklime, it is nearly 13 times lighter, or atmospheric air being 1,000, hydrogen is 84. Its specific gravity in this state, water being 1,000, is stated by Lavoisier at 0.0946, 100 cubic inches weigh 2.613 grains. From its levity, it is applied with success to the construction of balloons; a varnished silk or linen bag, filled with it, having a specific gravity so much less than atmospheric air, as not only to rise in the atmosphere, but also to elevate an additional weight. The chemical property by which hydrogen gas is most eminently distinguished, is its great inflammability. When an ignited body is approached to it, in contact with the atmosphere, it is immediately kindled, and continues to burn while the air is admitted; if previously mixed with atmospheric air, and a burning body approached to the mixture, or an electric spark sent through it, it instantly inflames with detonation; and when it has been mixed with oxygen gas, the detonation is more violent. When burning at the extremity of a capillary tube, on bringing a wide tube over the flame, a singular phenomenon, accidentally observed by Dr. Higgins, is produced, that of sounds of various tones, which vary in acuteness and strength, according to the width, the length of the tube, and the kind of substance of which it is formed, owing, apparently, as Picket and De la Rive have explained it, to the vibrations excited in the matter of the tube by the rapid expansion and condensation of the watery vapour near and around the flame, and which, regulated and equalized by regular reflections from the sides of the tube, constitute a musical sound. (Nicholson's Journal, 8vo. vol. i. p. 129; *ibid.* vol. iv. p. 23). Though hydrogen gas be inflammable, it is incapable of supporting the combustion of other inflammables. If a burning body be quickly immersed in it, it is immediately extinguished. This gas is incapable of supporting animal life by respiration. Small animals, when they are obliged to breathe it soon die; but large animals resist its action longer. Scheele found that he could breathe it for some time without much inconvenience; but Fontana, who repeated the experiment, affirmed that this was owing to the quantity of common air contained in the lungs when he began to breathe; for on expiring as strongly as possible before drawing in the hydrogen gas, he could only make three respirations, and even these three produced extreme feebleness and oppression about the breast. The ingenious Mr. Davy, professor of chemistry in the Royal Institution, after a complete exhaustion of his lungs, found great diffi-

culty in breathing this gas for so long as half a minute. It produced uneasy feelings in the chest, momentary loss of muscular power, and sometimes a transient giddiness. Pilatre de Rozier breathed hydrogen gas six or seven times from a bladder without inconvenience. If pure oxygen and hydrogen gas be mixed together, they remain unaltered; but if a lighted taper be brought into contact with them, or an electric spark be made to pass through them, they burn with astonishing rapidity, and produce a violent explosion. If these two gases be mixed in the proportion of 85 parts by weight of oxygen gas, and 15 of hydrogen gas, they explode over water without leaving any visible residuum; the vessel in which they were contained (provided the gases were pure) being completely filled with water. But if the explosion be made in a close vessel, there is always found instead of them a quantity of water exactly equal to them in weight. This water must be composed of these two gases; for it did not previously exist in the vessel, and no other substances besides the gases were introduced. Water then is composed of oxygen and hydrogen; and the combustion of hydrogen is nothing else but the act of its combination with oxygen. When two parts (in bulk) of hydrogen gas are mixed with six parts of common air, the mixture explodes with equal violence; and after the explosion, the bulk of the mixture is reduced to five parts. The whole of the hydrogen gas is consumed, and likewise all that part of the common air which consists of oxygen gas, and there is formed a quantity of water equal in weight to these two bodies. This experiment is often employed to ascertain the purity of hydrogen gas. Hydrogen gas is not sensibly absorbed by water, though left for some time in contact with it. But by artificial pressure water may be made to absorb about the third part of its bulk of that gas. The taste of the water is not sensibly altered. Mr. Paul, who first formed this compound, informs us, that it is useful in inflammatory fevers and in nervous complaints, but it is injurious in dropsy. The affinities of hydrogen are chiefly towards inflammable substances; it unites with sulphur, phosphorus, and carbon, forming sulphureted, phosphoreted, and carbureted hydrogen gas. United with nitrogen, it forms ammonia, and with oxygen, water. It also enters into the composition of most vegetable and animal substances. See CHEMISTRY and GAS.

HYDROGRAPHY, [*ὕδωρ* and *γραφω*], a description of the watery part of the terraqueous globe; or the science which describes the sea, rivers, canals, lakes, &c. See GEOGRAPHY.

HYDROLEA, in botany, a genus of the digynia order, and pentandria class of plants. Calyx pentaphyllous; corolla rotaceous; filaments at the base cordate; capsule bilocular, bivalved. It has four species.

HYDROLOGY, [*ὕδωρ*, water, and *λογος*, a discourse], a science which investigates and explains the nature and properties of water; comprehending Hydrostatics and Hydraulics. See HYDROSTATICS.

HYDROMANCY, [*ὕδωρ* and *μαντεία*], prediction by water; a method of divination by water, practised by the ancients. See DIVINATION.

HYDROMEL, [*ὕδωρ* and *μελι*], honey diluted in nearly an equal weight of water. When this liquor has not fermented, it is called simple hydromel; and when it has undergone the spirituous fermentation, it is called the vinous hydromel, or mead. Mead is an agreeable kind of wine; nevertheless it retains long a taste of honey, which is displeasing to some persons; but this taste it is said to lose entirely by being kept a very long time. See MEAD.

HYDROMETER, [*ὕδωρ* and *μετρον*], an instrument used to measure the gravity, density, velocity, force, &c. of water and other fluids. See HYDROSTATICS. Though it is incapable of determining the specific gravity of liquors with perfect accuracy, yet in the way of public business it has undoubtedly the advantage of every other, on account of the ease and expedition with which it can be used; and for this reason it has been adopted by government, in order to determine the strength of spirituous liquors. It consists of a hollow ball, either of metal or glass, capable of floating in any known liquid; from the one side of the ball proceeds a stem, which terminates in a weight, and from the side diametrically opposite proceeds another stem, most commonly of an equal thickness throughout. The weight is so proportioned that the instrument may float with the stem upright. In the less

accurate hydrometer this stem is graduated, and serves to shew the density of the fluid, by the depth to which it sinks; as the heavier fluids will buoy up the instrument more than such as are lighter. In this way, however, it is clear, that the stem must be comparatively thick, in order to possess any extensive range; for the weight of vitriolic ether is not equal to three-fourths of the same bulk of water, and therefore such an hydrometer, intended to exhibit the comparative densities of these fluids, must have its stem equal in bulk to more than one-fourth of the whole instrument. If this bulk be given chiefly in thickness, the smaller differences of weight will not be perceptible, and it cannot, with any convenience, be given in length. To remedy this imperfection, various contrivances have been proposed, for the most part grounded on the consideration, that a change in the ballast, or weight employed to sink the ball, would so far change the instrument, that the same short range of gradations, on a slender stem, which were employed to exhibit the densities of ardent spirit, might be employed in experiments upon water. Some have adjusted weights to be screwed upon the lower stem, and others, with more neatness and accuracy, have adjusted them to be slipped upon the extremity of the upper stem. But the method of Fahrenheit appears to be on all accounts the simplest and most accurate. The hydrometer of Fahrenheit consists of a hollow ball, with a counterpoise below, and a very slender stem above, terminating in a small dish. The middle, or half-length of the stem, is distinguished by a fine line across. In this instrument every division of the stem is rejected, and it is immersed in all experiments to the middle of the stem, by placing proper weights in the little dish above. Then as the part immersed is constantly of the same magnitude, and the whole weight of the hydrometer is known; this last weight, added to the weights in the dish, will be equal to the weight of fluid displaced by the instrument, as all writers on hydrostatics prove. And accordingly the specific gravities for the common form of the tables will be had by this proportion. As the whole weight of the hydrometer and its load, when adjusted in distilled water, is to the number 1,000, &c. so is the whole weight, when adjusted in any other fluid, to the number expressing its specific gravity. In this construction the stem is frequently marked in the middle on one side, and the other is graduated to shew the smaller differences without changing the weights. This instrument is represented in fig. 1, Plate XCV. It is chiefly employed in ascertaining the specific gravity of spirits. See SPECIFIC GRAVITY. In using the hydrometer, its stem should always be pressed down lower than the point at which it will ultimately rest, that by being wetted it may occasion no resistance to the fluid. The instrument itself should be of as regular a shape and with as few inequalities as possible, that all impediments to its motions may be avoided.

HYDROMETRY, [*ὕδωρ* and *μετρεῖν*,] the art of measuring the extent of water.

HYDROMPHALUS, [*ὕδωρ*, water, and *ομφαλός*, the navel,] a tumour in the navel, containing water.

HYDROPHILUS, a genus of insects, order, coleoptera. Antennæ clavate, club perfoliate; feelers, four, filiform; hind-legs

formed for swimming, fringed on the inner side. They inhabit ponds and stagnant waters, and swim with great dexterity. There are about thirty species. The most remarkable European species is the *H. piceus*, water-clock, frequently seen in our ponds. The larvæ of the *hydrophilus* are supposed to remain about two years before they change into pupæ or chrysalides. When the larvæ is arrived at its full growth, it secretes itself in the bank of the water it inhabits, and having formed a convenient cavity or cell, lies dormant for some time, after which it divests itself of its skin, and appears in the form of a chrysalis, in which state having continued for some time longer, it again delivers itself from its exuvie, and appears in its complete or beetle form. When first disengaged from the skin of the chrysalis, it is of a pale colour, and very tender: but in the space of a few hours the elytra, or wing-cases, acquire a degree of strength and colour, which gradually grows more and more intense, till the animal, finding itself sufficiently strong, comes forth from its retreat, and commits itself in its new form to the waters. The male is distinguished from the female by the structure of the fore-legs, which are furnished, near the setting on the feet, with a sort of horny concave flap or shield; the legs of the females being destitute of this part. The female of the *hydrophilus piceus* affords an example of a faculty which seems to be exercised by no other coleopterous insect, viz, that of spinning a kind of web or flattish circular case of silk, which it leaves floating on the water, and in which it deposits its eggs. This case is terminated on its upper surface by a lengthened conical process resembling a horn, of a brown colour, and of a much stronger or denser nature than the case itself, which is white. The young larvæ, as soon as hatched, make their escape from the envelopment of the case, and commit themselves to the water.

HYDROPHOBIA, [*ὕδωρ* and *φοβία*,] dread of water. A symptom of madness caused by the bite of a mad animal.

HYDROPHOBIA has likewise been sometimes found to take place in violent inflammations of the stomach, and in hysteric fits. See MEDICINE.

HYDROPHYLAX, in botany, a genus of the monogynia order, and tetrandria class of plants. Calyx tetrapartite; corolla funnel-shaped; fruit two-edged, one-seeded. It has one species, a native of the East-Indies.

HYDROPHYLLUM, WATER-LEAF; a genus of the monogynia order, and pentandria class of plants. Corolla campanulated, with five melliferous longitudinal stria on the inside; stigma bifid; capsule globose, bivalved. It has two species.

HYDROSCOPE, [*ὕδωρ* and *σκοπεῖν*,] an instrument anciently used for the measuring of time. It was a kind of water-clock, consisting of a cylindrical tube, conical at bottom: the cylinder was graduated, or marked out with divisions, to which the top of the water becoming successively contiguous, as it trickled out, the vertex of the cone pointed out the hour.

HYDROSTATIC BALANCE, an instrument for finding the specific gravities of bodies, both liquid and solid. It is also an engine for extinguishing fires. See BALANCE and HYDROSTATICS.

HYDROSTATICS.

HYDROSTATICS, [from *ὕδωρ*, water, and *στασις*, the art of weighing,] the science which treats of the gravity and equilibrium of non-elastic fluids. The term is also frequently applied to the science which explains the nature and properties of fluids in general, particularly their pressure, gravity, equilibrium, and motions: and hence it includes Hydraulics and Pneumatics. However, since this last treats on a distinct kind of fluids, viz. elastic fluids, it is more properly considered apart. Non-elastic fluids, which make the object of Hydrostatics, are generally denominated liquids.

OF THE EQUILIBRIUM AND PRESSURE OF FLUIDS.

By Hydrostatics, properly so called, in contradistinction from
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Hydraulics, we are taught how to determine the gravity or pressure of fluids upon solids, or upon each other, in vessels where water is not allowed to escape or run off, but remains at rest. Sir Isaac Newton defines a fluid to be a body whose parts are so loosely connected together, that they easily yield to any force impressed upon them, and move freely amongst each other. It is to be understood, that the force is applied to one part of the fluid, and not equally on every part. In this sense, fire, air, &c. are considered as fluids. In almost every physical speculation, where experiment can reach, the subject admits of some illustration; where that is denied, the reasonings are in general vain and conjectural. We do not know the form of the parts of which fluids are composed, and can make no experiments to reduce them into
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their primary particles. There is nothing more different in accuracy and truth, than that apprehension which is adequate to the purposes of human life, and that which ought to satisfy the investigation of a philosopher. Thus there is nothing more obvious to common observers, than fluidity, yet the philosopher finds it a property difficult to be conceived, and which he could not give credit to, if it were not rendered familiar to him by custom and experience. It is a physical phenomenon which has not yet been explained, and of which it is very difficult to give a clear account. It is, indeed, impossible to comprehend, how a material and incompressible substance can be composed of parts so elementary, so moveable among themselves, and yet with so little adherence, as to assume immediately the form of any vessel into which it is poured; that its surface is always parallel to the horizon, or perfectly level; that, in syphons, or when agitated by the wind, it makes isochrone vibrations, or undulations like a pendulum; that it runs off where favoured by the smallest descent; &c. &c. Yet all these facts, being common and familiar, occasion no surprise to mankind in general. However, the cause of fluidity appears to be heat, or caloric, acting in some way or other on the component parts of fluids, probably by a repulsive force, by means of which the cohesion is destroyed. See *PHYSICS*. Although no one finds any difficulty in allowing that water and other fluids are really ponderous, and do actually gravitate when considered as a whole body, being convinced by their own senses, that a vessel weighs less when empty, than when it is filled with any fluid, and weighs heavier the more it contains; yet, in the early times of philosophy, there were persons who believed fluids did not gravitate in proprio loco, as they termed it; that is, when immersed in the same, or a different fluid. A simple experiment will show that they were mistaken, and that fluids lose nothing in their weight in proprio loco. Take a glass-vessel or bottle furnished with a brass-stop-cock, and made so heavy as to sink in water. Exhaust it of its air, and then shut the cock. Suspend it now from the end of a balance, so that the bottle and the stop-cock may be under the surface of the water, and then counterpoise it by a weight in the opposite scale. If we now open the cock, the water will run into the bottle, which then will preponderate, and bear down the beam on which it hangs; clearly proving, that the parts of water retain their gravity in water, so as to press and bear down upon the parts beneath them, otherwise the phial would not become heavier upon the admission of the water; and it will appear that the vessel overbalances the counterpoise, as much as the weight of the quantity of water in the vessel. To facilitate the explanation of hydrostatic phenomena, it has been usual for the writers on this subject to consider the fluid in a vessel as cut into several horizontal planes, or imaginary surfaces, and to consist of a vast number of small, equal, lubricous, spherical globules. See fig. 1, Plate XCIII. And though we are ignorant of the true figure of the constituent particles, yet, because we know that they easily glide one among another, this supposition will not affect the argument, being only made by way of illustration. *ABCD* may represent a vessel consisting of such globules. Besides this imaginary horizontal division of a fluid, they often consider it as divided into perpendicular columns, from the top to the bottom of the fluid, as at figs. 1, 2. Though fluids are subject to the laws of gravity as well as solids, yet their fluidity occasions some peculiarities necessary to be noticed. The parts of a solid are so connected together as to form but one whole; their effort is as if it were concentrated in a simple point, called the centre of gravity. This is not the case with fluids; the particles here are all independent of each other, are extremely moveable, yielding to the least effort that tends to separate the one from the other. The parts of a fluid gravitate independently of each other, and this is a natural consequence of their fluidity, or their not adhering together; whereas the particles of a solid cohere together, and gravitate as one mass.

PROP. 1. Any particle of a fluid, at rest in any vessel, presses equally in every direction. For if an aperture be made in the vessel on any side, the fluid will run out, and that in whatever direction the aperture be made, whether horizontally, as at *G*, fig. 5, or perpendicularly, as at *B*, and the same would take place, if the aperture proceeded by means of a tube from any point within the vessel; hence there is a pressure on every particle of the fluid, and on every side of it; and since the fluid is at rest, the pressure is equal on every side; otherwise motion would ensue, (def. of a fluid) hence then each particle by its re-action presses equally in

every direction. Hence, if tubes, open at both ends, and bent in any direction, be immersed in water, it will rise to the same height in each, which is an ocular demonstration of the proposition.

PROP. 2. The surface of a fluid at rest, which is contained in an open vessel, and free from all external impediments, will be level, or parallel to the horizon. For let the surface *BB*, fig. 3, not be horizontal, then the particle *a* is pressed perpendicularly downward by its own weight, as is every other particle; it is also pressed by means of the particles above it, on the side towards *BF*, and has not a counterbalancing pressure on the other side, since the particle *b* is lower than it, and is pressed downward by gravity; therefore, when the surface is not horizontal, the fluid will be in motion, and therefore when it is at rest, the surface will be horizontal.

PROP. 3. The pressure on any part of an uniform fluid will be as the perpendicular distance from its surface. For, let *ABCD*, fig. 1, be a vessel filled with such a fluid. Then, since the pressure is occasioned by the gravity of the incumbent particles, the pressure on any particles, as *s* and *r*, will be as the number of particles lying upon them, that is, since the fluid is uniform, as the perpendicular distances from the surface, *3s* and *3r*. The same will hold good if the sides of the vessel, be not perpendicular to the horizon; for the pressure on *s*, fig. 4, is as *AS*, or its equal *mn*; and since the pressure is entirely caused by gravity, the particles will not be affected by it in the direction *Sn*, and the pressure on a particle at *n* will be the same as that on *s*; hence the pressure on *r* will be as *mn + nr*; that is, *mr*, the perpendicular distance from the surface.

COR. Hence all the parts of a fluid, at equal distances from the surface, produce every where an equal pressure. This also appears from experiment; for if the fluid be made to spout perpendicularly, as through *Bm*, fig. 5, it will rise nearly to the level of the surface of the fluid in the vessel, the small difference being occasioned by the resistance of the air.

PROP. 4. If a column of a fluid extend from the bottom of the vessel containing it to the surface of the fluid, its pressure on the base of the column will be equal to the weight of the column. For let *a*, fig. 1, be a column extending to the surface *AB*, and having an indefinitely small base; then the pressure of the highest particle is that of its own weight; also the pressure of the next particle is that of its own weight added to the weight of the first; and in like manner it may be shewn that the pressure of any particle in the column is that of its own weight together with the weight of all the incumbent particles, and therefore the pressure of the column on *a* is equal to the weight of the whole column. And since any column may be conceived to be made up of such small columns the proposition is manifest.

COR. 1. The whole pressure of a fluid downwards, against the bottom and sides of a vessel is equal to the whole weight of the fluid, if over every part of the bottom and sides a perpendicular column extends to the surface. For the fluid in such a vessel may be conceived to be made of an indefinite number of small columns *mr*, *ns*, *ob*, fig. 15, and the pressure of each downward is equal to its weight; hence the whole pressure downwards is equal to the whole weight.

COR. 2. Hence the whole pressure has the same effect as the whole gravity, if it had been solid, and therefore the same as if the whole had been concentrated in the centre of gravity.

COR. 3. Since the effect of *abc*, any part *G*, fig. 16, of a fluid is the same as if it took place at its centre of gravity; and since it is kept in equilibrium by the remaining part of the fluid *H*, the reaction of the part *H* must be the same as if it took place at the same point.

COR. 4. The pressure on any surface downward is equal to a column of the fluid having that surface for its base, and its top coinciding with the plane of the surface of the fluid. This was shewn above when the column extends to the surface of the fluid; thus the pressure downward on *GH*, fig. 21, is equal to the weight of the column *GHrs*, *EBCD* being the vessel; but the pressure on *GH* is the same if *AC* be the side of the vessel, since its depth is the same; hence the corollary is manifest.

COR. 5. The same is true of the pressure on any surface upward. For since the pressure of the fluid on the surface *GH* downward is exactly sustained by the pressure upward, these pressures are equal.

PROP. 5. The pressure of a fluid against any surface, in a direction

tion perpendicular to it, is proportional to the area of that surface multiplied into the distance of its centre of gravity from the surface of the fluid. Conceive lines drawn from every part of the given surface perpendicular to the surface of the fluid, as mr, ns, ob , &c. fig. 15, then the pressure at m, n, o , &c. is as the depth mr, ns, ob , &c. and since the pressure is equal in every direction, the perpendicular pressure is as $m \times mr, n \times ns$, &c. Now each of the surfaces m, n, o , &c. may be considered as weights proportional to their magnitudes, and the whole surface to make a weight equal to that of their sum. Hence, if GH be the distance of the centre of gravity, by mechanics, $m \times mr + n \times ns + o \times ob + \&c. = ACB \times GH$; hence the whole pressure perpendicular to the surface varies as the area $ABC \times GH$.

Cor. 1. The pressure against the sides of a cubical vessel filled with a fluid is equal to half the pressure against the bottom; for the areas pressed are equal, and the distance of the centre of gravity of the side from the surface is half that of the bottom.

Cor. 2. The pressure on the bottom of a cylinder filled with a fluid, is to the pressure on the side, as the diameter of the base to twice the altitude. Let d be the diameter, a the altitude, and p equal to $3 \frac{1}{2} 14159$, &c. then the area of the base = $\frac{1}{2} p d^2$, and the area of the side = $p d a$, and multiplying each by the distance of the centres of gravity, a and $\frac{1}{2} a$, the pressure on the bottom is to the pressure on the side :: $\frac{1}{2} p d^2 a : \frac{1}{2} p d a^2 :: d : 2 a$.

Cor. 3. The pressures of different fluids against different surfaces are proportional to the areas multiplied into the depth of the centre of gravity, and multiplied again into the specific gravity. For if only the surface vary, the pressure is as the area $\times$ the depth of the centre of gravity; if only the fluid vary the pressure is as the specific gravity; hence, when both vary, the pressure will be as stated in this corollary.

Prop. 6. If two fluids meet in a bent tube, their altitudes above the common surface are inversely as their specific gravities. Let ACB , fig. 17, be the tube; mxy the plane of the common surface of the fluids; mr and nt the altitudes above it; and S, s , the specific gravities: then since the surface or area xy is common, the pressure of each fluid at the surface xy will be as the altitude $\times$ the specific gravity (Prop. 5.-Cor. 3.) but since the fluids are at rest their pressures are equal; hence $S \times mr = s \times nt$, therefore $S : s :: nt : mr$. We shall here further exemplify the foregoing propositions. It is evident, that the bottom and sides of a vessel containing a fluid (and the top also, when the fluid is raised above it in a tube) are pressed by the parts of the fluids which immediately touch them, and since action and re-action are equal, the bottoms and sides of the vessels are pressed as much as the neighbouring parts of the fluid; but it has been shewn that this action increases in proportion to the height of the fluid, and is every way equal at the same depth: therefore the pressure on the bottom and sides of vessels is as the depth of the fluid. This pressure depends on the height, not the quantity, of the fluid; consequently, when the height of the fluid, and the area or surface pressed, remain the same, the action upon this surface will always be equal, however the figure of the vessel be changed. In other words, the pressure which the bottom of the vessel sustains from the fluid contained in it, whatever be the shape of the vessel, is equal to the weight of a pillar of the fluid, whose base is equal to the area of the bottom, and whose height is the same with the perpendicular height of the fluid. That this is the case, in vessels that are equally wide from top to bottom, is obvious, because the bottom of such a vessel does actually sustain such a column of fluid, a column in this case equal to the whole weight of the fluid. Here the whole weight of the fluid contained in the vessel, and no other force besides, presses upon the bottom, and is consequently proportional to the quantity of matter contained in the vessel, which quantity is as the surface of the bottom, and the perpendicular height above it. But that the case should be the same in irregular vessels, is not so easy to conceive; for instance, that in a vessel which, from a large bottom, grows narrower as it rises, the bottom should bear the same pressure when the vessel is filled, as it would were the vessel equally wide throughout from bottom to top, seems strange, yet is what necessarily follows from the nature of fluidity. Thus, in the vessel ABC , fig. 6, the bottom BC sustains no more of the fluid, than a column whose base is BC and altitude CE the same with that of the fluid; but GH , fig. 7, sustains as great a pressure as if the vessel were as wide at the top as bottom, which is evident

from the foregoing proposition. Hence also, if FD and AB , fig. 8, communicate, the liquid will stand at the same level in the wide part AB , as in the small tube FD . On these principles also depend the hydrostatical paradox which is that any quantity of fluid may be made to counterbalance any other quantity however great. It may be thus illustrated. Let $ABCD$, fig. 9, be a cylindrical vessel, having a sliding cover or piston C , carrying a tube CF open throughout. The cylinder being filled with water, and the cover put on; then if a weight be put on the cover it will be depressed, and the water will rise in the tube to E , and the weight will be sustained. If another weight be added, the water will rise to F , and the weight sustained, and so on, according to the weight added, and the length of the tube. Now the weight of the water in the tube is but a few grains, yet its lateral pressure serves to sustain as much as the weight of a column of water whose base is equal to that in the tube. Thus the column CE produces a pressure in the water contained in the cylinder, equal to what would have been produced by the column $AadD$; and as this pressure is exerted equally every way, the cover will be pressed upwards with a force equal to the weight of $AadD$; consequently if $AadD$ weigh a pound, EC will sustain a pound: and the like of any other heights and weights. This paradox is easily proved by the following experiment. The apparatus, fig. 10, consists of two large thick boards, CD, EF , connected together by leather, like a pair of bellows; hence it is usually called the hydrostatic bellows. A long pipe is fixed to the bottom-board; so that water being poured in at the top, will pass between the two boards. We will suppose the boards of the apparatus oval; and that the longest diameter is eighteen inches, the shorter one sixteen. Having poured water enough into the bellows to keep the boards asunder, and put six half-hundred weights on the top of the boards, we next pour water into the tube, to the height of three feet, and find it will push up all the weights. Thus the water in the pipe, which weighs but a quarter of a pound, sustains 300 pound weight. If we take off the weights, and try, by pressing upon the upper board, to force the water out at the upper tube; our strength will be scarcely sufficient for the purpose. Thus we clearly see how great a pressure upwards is exerted by the water. Another instrument has been invented, for proving that the pressure of fluids is in proportion to their perpendicular heights, without any regard to their quantity. $ABCD$, fig. 11, is a box, at one end of which, as at a , is a groove from top to bottom, for receiving the upright tube l , which is bent to a right angle at the lower end, as at fig. 12; and to that end is tied the end of a large bladder K , fig. 12, which lies in the bottom of the box. Over this bladder is laid the moveable board M , fig. 13, in which is fixed an upright wire. Leaden weights NN , fig. 11, to the amount of sixteen pounds, with holes in the middle, are put upon the wire, over the board, and press upon it with all their force. The bar P is then put on, to secure the tube from falling, and keep it upright; and then the piece EFG is to be put on, to keep the weights in a horizontal position, there being a round hole at e . Within the box are four upright pins, to prevent the board at first from pressing on the bladder. Pour water into the tube at top; this will run into the bladder: and after the bladder has been filled up to the board, continue pouring water into the tube, and the upward pressure of the fluid will raise the board with all the weight upon it, even though the bore of the tube should be so small that less than an ounce of water would fill it. Upon this principle mathematicians assert, that the same quantity of water, however small, may produce a force equal to any assignable one, by increasing the height and base upon which it presses. Dr. Goldsmith mentions having seen a strong hogshead split by this method. A strong, though small, tube of tin, twenty feet high, was inserted in the bung-hole; water was poured in this to fill the hogshead, and continued till it rose within about a foot of the top of the tube; the hogshead then burst, and the water was scattered about with incredible violence. As the bottom of a vessel bears a pressure proportional to the height of the liquor, so likewise do those parts of the sides which are contiguous to the bottom, because the pressure of fluids is equal every way; and as the pressure, which the lower parts of a fluid sustain from the weight of those above them, exerts itself equally every way, and is likewise proportional to the height of the incumbent fluid, the sides of a vessel must every where sustain a pressure proportional to their distance from the upper surface of the liquor. Whence it follows, that

that in a vessel full of liquor, the sides bear the greatest stress in those parts next the bottom; and that the stress upon the sides decreases with the increase of the distance from the bottom in the same proportion; so that in vessels of considerable height, the lower parts ought to be much stronger than the upper, to be able to withstand the greater degree of pressure to which they are exposed. Upon the principle of the upward pressure of fluids, a piece of lead may be made to swim in water, by immersing it to a proper depth, and keeping the water from getting above it. Let *CD*, fig. 14, be a glass-tube open throughout, and *G* a flat piece of lead half an inch thick, fitted exactly to the lower end of the tube, but not to go within it. By means of the packthread *L*, the lead is held close to the bottom of the tube, and in this situation it is immersed in the water of the vessel *K* to somewhat more than eleven times its own thickness, because lead is more than eleven times heavier than water; then the thread *L* may be let go, but the lead will not fall, but be sustained by the upward pressure of the water below it. If some water be poured upon the lead, or if the tube be raised a little, the lead will fall by its own weight, which will then be too heavy for the pressure of the water round the tube, upon the column of water below it. The curious effects of the syphon depend on the pressure of the air upon the surface of a liquid. If the short end of a syphon, *ABDC*, fig. 18, be immersed in a liquid, and the other end without be lower, and the air drawn out, the liquid will begin and continue to run till its surface descend to the extremity *A* of the syphon. For the air being drawn out, the liquid will rise to the top *B*, by the pressure of the air, and descend to *C* by its gravity. Now the pressure of the air on the liquid to force it up the syphon is very nearly equal to the pressure at *C* to force it back, but the latter pressure is opposed by a greater column of the liquid than the former, hence the liquid will flow in the direction *ABC*. And thus the water in the syphon continues to flow without intermission; because the resistance of the air in *C* is as much exceeded, as the length of the branch *BC* of the syphon exceeds that of the branch *AB*. In order to prove this by experiment, suppose there is added at *C* a tube to lengthen that branch, then it will plainly appear that in a given time more water will flow than would have been discharged without that augmentation to the branch *BC*. Since it is the pressure of the air which elevates the fluid in the short branch *BA*, it follows, that the height of this branch is limited to thirty-two feet when the fluid is water, because the pressure of the atmosphere cannot elevate water higher; but when the liquor is mercury, the height of the short branch should not exceed thirty inches, because the atmosphere cannot sustain mercury at a greater height. A syphon may be disguised in a cup, fig. 19, from which no liquor will flow, until it be raised above the bend of the syphon; but when the efflux once begins, it will continue to flow till the vessel be emptied. This has been called *Tantalus's cup*, because it is usual to place a hollow figure over the inner tube of such a length, that when the fluid is got nearly up to the lips of the figure, the syphon may begin to act, and empty the cup. Intermitting springs, which puzzled philosophers formerly, are found to be natural syphons, which may be thus explained: let *A*, fig. 20, be part of a hill, within which there is a cavity *BB*, and from this cavity a vein, or channel, running in the direction *BCD*. The rain that falls upon the side of the hill will sink and strain through the small pores and crevices in the hill, and fill the cavity *BB* with water. When the water rises to the level of *C*, the vein *BCD* will be full, and the water will run through it as a syphon, and will empty the cavity *BB*. It must then stop, and when the cavity is again filled, it will begin to run again. The principles delivered in the foregoing propositions, will be found exceedingly useful in explaining such hydrostatical phenomena as relate to the pressure of fluids, and several of them extend to elastic fluids. See *PNEUMATICS*, where these subjects are further exemplified.

OF THE PRESSURE OF FLUIDS ON BODIES IMMersed IN THEM.

It follows, from what has been already demonstrated, that when a solid is immersed in a fluid, it is pressed by that fluid on all sides; and that pressure increases in proportion to the height of the fluid above the solid. We may also prove this directly by experiment. Thus, tie a leathern bag to the end of a glass-tube, and fill it with mercury; immerse the bag in water, but so that the upper or open end of the tube may be always above the sur-

face of the water; the pressure of the water against the bag will raise the mercury in the tube, and the ascent of the mercury will be in proportion to the height of the water above the bag. When a solid is immersed in a fluid to a great depth, the pressure against the upper part differs very little from the pressure against the under part, whence bodies very deeply immersed are, as it were, equally pressed on all sides; but a pressure which is equal on all sides may be sustained by soft bodies without any change of figure, and by very brittle bodies without their breaking. Take a piece of soft wax of an irregular figure, and an egg, and inclose them in a bladder full of water; place it in a square box, and put on a moveable cover, which will bear on the bladder; there may be placed on this cover a weight of a hundred, or even a hundred and fifty pounds without breaking the egg, or any way altering the figure of the wax. It has been shewn that fluids press upon bodies to which they are contiguous every way, and on all sides, but the pressure upon each part is not the same; the altitude of the fluid is every where the measure of its force, and the several parts of the same body, being at different depths, must thus be differently affected, as we shall proceed to state in the following propositions.

PROP. 7. If a body float on a fluid, the weight of the body is equal to the weight of the fluid which it displaces. For the body *S + R*, fig. 22, is sustained by the very same pressure which exactly counterpoises the fluid which is displaced by the part *S* immersed; hence the proposition is manifest.

PROP. 8. If a floating body be at rest on a fluid, the centres of gravity of the body and of the fluid displaced are in the same vertical line. For the effect of the pressure upward is the same as if it took place at the centre of gravity of the fluid displaced (*Prop. 4, cor. 3*); hence, if the centre of gravity of the body be not in the same vertical line, it will not be supported, and a rotatory motion will be produced; hence the proposition is manifest.

PROP. 9. If a body be immersed in a liquid, the pressure on it upward is greater than the pressure downward, by the weight of the quantity of water displaced. Let *R* be the body, fig. 23, then the pressure upward is equal to the weight of a column, whose top is the surface of the fluid, and base the lower surface of the body; but the pressure downward is equal to the weight of the column having the same top, the base being the upper surface of the body; thus the pressure upward is equal to the weight of the column *GP₁lmn*, and that downward to the column *G₂llmn*, (*Prop. 4, cor. 4 and 5*); but the difference of these two columns is the quantity of fluid displaced, hence the former is greater than the latter pressure by the weight of that fluid.

Cor. From this it appears that it depends on the specific gravity of a body, whether it ascend or descend, in a fluid.

PROP. 9. If a body immersed in a fluid have a greater specific gravity than the fluid, it will descend; if a less specific gravity, it will ascend; if the same specific gravity, it will remain stationary. A body immersed in a fluid will sink if it be specifically heavier than that fluid; for it endeavours to descend by its own weight, and is supported by a force equal to the weight of an equal bulk of fluid, or of as much fluid as will fill the space taken up by the body. (*Prop. 8.*) If, therefore, the body be specifically heavier than the fluid, *i. e.* bulk for bulk heavier than the fluid, its weight will be greater than the pressure upwards of the fluid which is to support it; and, consequently, this pressure will not so support as to keep it from sinking. If we throw a stone into the water, it sinks; for it is specifically heavier than the water; that is, where the bulks are equal, the weight of the stone is greater than the weight of water; therefore the force with which it endeavours to descend is greater than the excess of pressure upwards, which is all there is to support it; which being too weak to support it, the stone sinks to the bottom. A body that is immersed in a fluid will rise to the surface, and swim upon it, if it be specifically lighter than the fluid. A piece of cork, when it is immersed in water, is pressed by the water both upwards and downwards; but the pressure upwards exceeds the pressure downwards, and this excess is equal to the weight of as much water as is of the same bulk with the piece of cork; therefore, as far as the action of the water is concerned, the cork ought to rise to the top; and the cork itself being also specifically lighter than water, the force with which it endeavours to sink is less than the force which buoys it up; it must, therefore, on this account rise till it comes to the surface. Hence the reason

is plain, why fir, oak, and elm, that are specifically lighter than water, will swim in it; while ebony and guaiacum, that are specifically heavier, will sink. A body that has the same specific gravity with the fluid into which it is immersed, will rest in any part of the fluid wherever it happens to be placed. For the body endeavours to descend by its own weight, and is prevented from descending by a force equal to the weight of an equal bulk of fluid; but when the body and the fluid are of the same specific gravity, equal masses of each are of the same weight, and consequently the force with which the body endeavours to descend, and the force which opposes the descent, are equal to each other; and as they act in contrary directions, the body will rest between them, so as neither to sink by its own weight, nor to ascend by the pressure of the fluid upwards.

Scholium. From these propositions the following useful conclusions are easily deduced. Balloons are properly hydrostatic machines, and derive their property of ascending from the earth into the upper part of our atmosphere entirely to the difference between the specific gravity of the air, or gas, with which they are filled, and the exterior, or atmospheric, air in which they float. The weight of the materials must be taken into consideration; for unless the specific gravity of the interior be so much less than that of the exterior air, as to allow for the weight of the materials as a counterpoise, the balloon cannot be made to float in the air. See *EROSTATION*. If by any contrivance the specific gravity of any solid can be varied so as to be one while greater, another less, and then equal to the specific gravity of the fluid wherein it is immersed, the body will sink, or rise, or remain suspended, according to the variations of its specific gravity. And this is the case in the experiment of the little glass-images that some philosophers exhibit, which are made to ascend or descend, or remain suspended, at pleasure. The image being set to float on the water, the top of the vessels must be covered with a bladder closely bound about the neck of the vessel, that the air which lies on the surface of the water may not force its way out when it is condensed by the hand. The images themselves are nearly of the same specific gravity with the water, but rather a little lighter, and consequently float near the surface: the images being hollow are full of air, which, by means of small holes in their heads, communicates with the air without. When the air which lies beneath the bladder is pressed by the hand, it presses on the surface of the water; and as the pressure is propagated through all the water, those portions which are contiguous to the heels of the images are thereby forced into the holes; by which means the air within is condensed, and at the same time the weight of the images is increased by the weight of the influent water; and when so much water is forced in as to render the specific gravity of the images greater than that of the water, the images descend to the bottom, where they remain as long as the pressure above continues; but when that is taken off by the removal of the hand, the condensed air in the images dilates and expands itself, and in so doing drives out the water, upon which account the images become specifically lighter than water, and of course ascend. As the pressure on the bladder is greater or less, so must the quantity of water be which is forced into the images; and, therefore, whenever it happens, that during the ascent or descent of an image, such a pressure is made as suffices to force in just as much water as is requisite to reduce the image to the same specific gravity with the water, the image stops, and remains suspended; upon increasing the pressure it descends, and ascends if it be lessened. Some of the images begin to descend sooner or rise later than others, either because they are specifically heavier, or because the cavities in their legs are greater in some images in proportion to their magnitudes, than they are in others. This is but an experiment of mere amusement; many and important uses are the result of our being able to determine the specific gravities of bodies; which depends on these principles. All bodies, when immersed in a fluid, lose the weight of an equal bulk of that fluid; in other words, every body immersed in a fluid loses a part of its gravity equal to the weight of the fluid, which would fill the space taken up by the body. A piece of lead, or of any other substance, when it is immersed in water, is not so heavy as when it is out of water; for the water presses it more upwards than downwards, and the excess of the pressure upwards will support part of the weight. But this excess was shewn to be equivalent to the weight of as much water as has the same bulk with the lead; and consequently

since the body immersed must lose as much of its weight as the fluid can support, the lead will lose the weight of an equal bulk of water. Thus a cubic foot of lead, r, s, m, n , hanging by a string will in a vessel of water be found to weigh less in the water than it does out of it; because the water by its pressure upward against the lead will support a cubic foot of water, or 1000 ounces avoirdupois; for so much a cubic foot of water weighs, and consequently so much of its weight the lead must lose. Again, a body endeavours to descend by its whole weight; when it is immersed in a fluid, it is supported by a force equal to the same bulk of that fluid; and since these two forces act in contrary directions, the weight which the body retains in the fluid will be the difference between them, or it loses the weight of an equal bulk of the fluid. The following experiment will render the position self-evident: the apparatus for it consists of a beam, a small hollow cylindric bucket AB, and another cylinder CD, which precisely fits the capacity of the bucket AB, Plate XCIV. fig. 1. Only a portion of one arm EF of the beam is represented in this figure. First, suspend the bucket by one end of the beam. At the bottom of the bucket is fixed a strong thread of silk with a loop on the lower end; to this loop the close cylinder is suspended. It is necessary to counterpoise these by a weight at the other end of the beam. Then set a jar of water under the cylinder, and gently lower the beam, and it will become lighter and lighter upon the beam as the cylinder descends. When it is quite immersed, the equipoise is destroyed by the descent of the weight of the other arm. To shew how much weight is lost by the cylinder, add the weight of a quantity of as much water as is equal in bulk to the cylinder; that is, fill the bucket, which is exactly of the same size; and by doing it gradually, the equipoise will be restored by degrees till the bucket is full; and then the beam becomes truly horizontal as at first, the loss of weight being restored by the equal cylinder of water in the bucket. It is evident from what has been said, whence the loss of weight proceeds. It is no otherwise lost than as it is sustained by the action of a contrary force; and it becomes, therefore, obvious why the weight of a bucket of water is not perceived while it is in the water, not because that weight is destroyed, but because it is supported; not because fluids do not gravitate when they are in fluids of the same sort, but because there is a pressure in a contrary direction which is exactly equal to their gravity. As the weight which a body loses, when it is immersed in a fluid, is always the weight of as much of that fluid as is equal in bulk to itself, it follows, that the weight lost by its body cannot at all depend either on the depth of the fluid itself, or the depth to which it is immersed therein. An anchor loses no more of its weight when it is at the bottom than when it is just below the surface; for in either case it loses the weight of as much water as is equal in bulk to itself. It is not more easy to swim in deep than in shallow water, provided the water is not so shallow as to prevent one from striking freely; for whatever is the depth of the water, a man loses the weight of as much water as is equal in bulk to his own body; for which reason shallow water will buoy him up with as great force as deep water. Indeed, it is easier to swim in the sea than in a river, because salt-water is specifically heavier than fresh; and as a man loses the weight of as much salt-water as is equal in bulk to his body, and in the river loses only the weight of an equal bulk of fresh water, the weight lost here being greater, salt-water will buoy him up with the greatest force. There are very few, if any, animals that are specifically heavier than common water. The substances, indeed, of both animals and vegetables are specifically heavier; the floating of either, is, therefore, to be attributed to the cells or receptacles interspersed within them, which are filled with air, oil, &c. substances lighter than water; so that, taken together, they form a mass specifically lighter than a comparative bulk of common water. The bulk of the body is also increased by distending the chest in inspiration. This has been proved by an experiment on a fat man of an ordinary size, by finding what weight he could support so as to have the top of the head just above water. When his chest was full of air, he was found to rise with fourteen pounds of lead without striking out in the least, and two ounces more would have kept him under; but when his breast was not thus distended, he could only bring up eleven pounds. All equal solids, though of different specific gravity, when immersed into the same fluid, lose an equal weight. The weight which gold,

silver, lead, stones, or any other body, loses in water, does not at all depend upon the sort or figure of a body, but upon its bulk or size. The stone loses the weight of an equal bulk of water, so does the lead; when, therefore, they are of the same size, they each of them lose the weight of the same quantity of water, that is, they lose an equal weight; but if two bodies of the same sort differ in size, they will lose different weights in proportion to their size. To prove that the loss of weight is not affected by the absolute weight of the body, but depends on its size, it is only necessary to alter the weight of the cylinder, by adding to or diminishing the number of shot contained in it, and then repeat the experiment with it and the bucket as before, and the event will be the same. In the same manner, too, it may be shewn, that all bodies, however different their specific gravity may be, if their magnitudes be equal, do suffer an equal loss of weight in the same fluid. Thus a cylinder of block tin, equal in dimensions to the brass-cylinder, but specifically lighter, being immersed in water, will lose the same weight. Bodies of the same weight, but of different specific gravities, lose unequal parts of their weights when immersed in the same fluid. Thus suppose a piece of gold in one scale to weigh just as much in air as a piece of copper in the other scale. Now hang each by a horse-hair on the hooks of the balance, and let them down into the glass-vessels; and as soon as they are immersed in the water the equilibrium will be destroyed, and the gold will outweigh the copper; for, as they are of equal weight, their bulks are as their specific gravities; that is, the gold will be as much less than the copper as the specific gravity of the gold is greater than that of copper: the gold, therefore, because it is the smaller of the two bodies, will lose less of its weight in water than the copper does, and will consequently outweigh the copper. On the other hand, if the gold and copper are made of the same weight, when they are under water, then by drawing them out of the water the copper will become the heavier; for when they were under the water, each of them lost as much of their weight as the water could sustain, that is, each of them lost a weight in proportion to its bulk: but the copper being the bigger of the two, lost the greater weight; and as the weight which they lost in water is recovered upon their being drawn up in the air, the copper recovers more weight than gold, and will therefore outweigh the gold. The weight lost by a solid immersed in a fluid is communicated to the fluid. Though a solid loses part of its weight when immersed in a fluid, we are not to suppose that the weight so lost by the solid is actually destroyed, but that it is imparted to the fluid, the fluid constantly gaining what the solid loses; for if we put the vessel with the water wherein the cylinders were immersed into the scale, and counterpoise it, it will appear upon the immersion of the cylinder that it will preponderate with exactly the same weight that the cylinder loses. From the principles above-mentioned, it is easy to shew in what manner the specific gravities of different bodies, whether solid or fluid, may be estimated. The specific gravity of a body is the weight of that body, under a known and determinate magnitude; as a cubic inch, a foot, &c. To acquire this knowledge, the body is to be weighed hydrostatically; that is, first in air; second in water. We know that a body immersed in water displaces a volume of water exactly equal to its own, and that it loses a portion of its weight exactly equal to the volume displaced; we therefore obtain by this mode, 1. the weight of the body; 2. the weight of a volume of water perfectly equal in bulk to that of the body. These two weights, compared together, give the relation between the specific gravity of water, which we suppose to be known, and that of the given body, by making the following proportion, in which 1000 represents the specific gravity of water. (In hydrostatic calculation, water, as the standard from which all the respective gravities are taken, is reckoned as unity, or 1, 10, 100, 1000, &c. as the case requires.) The weight of the volume of water displaced by the body, is to the weight of this body, as 1000 is to a fourth term representing the specific gravity of this body: for the specific gravities are as the weights of equal bulks; therefore the specific gravity of the fluid is to that of the body, as the weight lost in the fluid is to the whole weight. Let us suppose a piece of gold to weigh thirty-eight grains in air, and only thirty-six grains when weighed in water; it has therefore lost two grains. Reasoning therefore from what has been already proved, we say the gold has lost the weight of as much water as is equal in bulk

to itself. But the gold itself weighs thirty-eight grains; consequently, bulk for bulk, the weight of water is to that of gold, or the specific gravity of the fluid to that of the solid, as two to thirty-eight; that is, as the weight of the fluid is to the whole weight. Thus the whole art of comparing the specific gravity of bodies, consists in finding out what the body weighs in air, and how much of that weight is lost in water; and then dividing the first weight by the difference between the first and second weight, and the quotient shews how many times the body is heavier than water. The specific gravity of a given bulk of distilled water is nearly at all times the same; and by comparing this with other substances, the ratio of their specific gravities may be discovered; and denoting the specific gravity of water, by any number taken at pleasure, the numbers expressing the specific gravities of other bodies are hence given. As the weight of one cubical foot of pure distilled water is equal to 1000 ounces avoirdupois, if its specific gravity be denoted by 1, or 1000, the weight of one cubic foot, or other measure, of other substances, is hence found, and tables of the specific gravities of bodies are formed. One ounce avoirdupois is equal to 437.5 grains, and an ounce troy to 480 grains; consequently, one avoirdupois pound is to one troy pound, as 437.5×16 to 480×12 , or as 1750 to 1440. A cubic foot of water is equal to 1000 ounces avoirdupois, or 62.5 pounds avoirdupois; whence we find it to be equal to 75.95 pounds troy. A cubic inch of water is equal to 25.318 grains, or 57.869 parts of an avoirdupois ounce; and 253.18 grains, or 5274 parts of one troy ounce. The balance for determining the weight of the bodies in air and water is called the hydrostatic balance. A particular description of this instrument is already given under the article BALANCE. The beam of the hydrostatic balance is, in general, made from eight to ten inches long, and with the perfections necessary to a good balance-beam. It either rests upon a stand or fulcrum, as at fig. 2, or is pendent, as at fig. 3, Plate XCIV. To this beam are adjusted a pair of scale-pans, which may be taken off at pleasure. There is also another smaller pan, of equal weight with one of the others, furnished with shorter strings, so as to admit a vessel of water to be placed under it. When the balance is used for hydrostatic purposes, this pan is to be suspended at one end of the beam, and one of the common scale-pans at the other end. The glass-bucket is to hold any solid body to be weighed in water, and is to be suspended by the horse-hair to the hook at the bottom of the small scale. There is a weight to be placed in the opposite scale, to balance the bucket exactly in water. The brass-tongs are for the same purpose, and to hold such substances as cannot conveniently be put into the bucket. The small brass-nipper is intended for weighing gold-coin; which may be more accurately weighed by this than in the bucket, which is principally designed for such things as cannot well be placed in the nipper or tongs: the beam will turn much easier with either of these than with the other. A scale-beam, loaded at each end with a considerable weight, is insensible of the addition of a small one: besides, the resisting medium of water, through which the whole surface of the bucket and its contents must pass, lessens the vibration of the beam, and renders the operation both tedious and uncertain. The glass-solid is made use of to determine the specific gravity of fluids. Each of these appendages has a respective weight, for a balance in water, which are distinguished by different marks. These weights are intended to balance them exactly; but their correctness may be injured by different circumstances, for water varies considerably in its density, according to the temperature of the air; in hot weather it is lighter, in cold it is heavier; in the former case the balance may appear rather too light, and in very cold weather rather too heavy. Whenever this happens, we restore the equilibrium by a small weight, dropped into the scale that requires it, before any hydrostatic experiments can be performed with accuracy. Hence it is natural to conclude, that the specific gravity of the same substances will be different at different times: this variation is, however, so small, particularly in the weight of gold, as not to be regarded in common experiments. For easier computation, it is best to use tenths of grains for the subdivisions in these experiments. Being able to determine the specific gravities of bodies, we are thence enabled, by weighing metals in water, to discover their adulterations or mixtures, with greater exactness than by any other method whatsoever. Counterfeit coin, offered as gold, may thus be easily distinguished, and known to be a baser metal. The principal

principal and distinguishing qualities of pure gold are, the simplicity, minuteness, and close cohesion, of its parts; whereby a greater number of those parts is contained in a less space. To determine the precise quantity of alloy compounded with gold, gold must be weighed with some other mass as a standard, and their relative gravities be computed. It has been already shewn, that water is the most convenient standard. Weigh a piece of gold first in air, weigh it then in water, subtract its weight in water from the weight in air, and the difference shews the loss it has sustained by being weighed in a denser medium. Divide the weight in air by the loss in water; the quotient shews the specific gravity, or how many times gold is heavier than water. On the contrary, the specific gravity of sterling gold being known, if the weight in air of any piece of gold-coin be divided by the specific gravity of sterling gold, the quotient shews what ought to be its loss in water; and if it be found to lose more, the gold is bad, or has too great a quantity of alloy. Gold is about eighteen times as heavy as common water; the specific gravity of sterling gold being to the weight of water as 17.793 to 1. If therefore a guinea weighs in air 129 grains, when weighed in water it must lose 7.25, or $7\frac{1}{4}$ grains of its weight; because as 7.250 is to 129, so is 1 to 17.793; so that a quantity of water equal in bulk to a sterling guinea weighs $7\frac{1}{4}$ grains. The following general rules for finding the specific gravity of bodies will be found very convenient.

1. "When the body is heavier than water." Weigh it both in water, and in the atmosphere, and the difference between the results will shew the quantity lost in water; then, as the weight lost in water, is to the weight in air; so is the gravity of water to the gravity of the body.
2. "When the body being specifically lighter, will not sink in water." Render the body heavy enough to sink by means of some appendage, as a small piece of lead, &c.; weigh the denser body, and the compound mass, both in the air, and in the water: find out how much each loses in the water, and subtract those losses from the whole weight of each in air. Then, as the last remainder is to the weight of the light body in air; so is the specific gravity of water to the specific gravity of the body.
3. "When a fluid is to be weighed." Weigh the fluid in a cup, which is to be deemed an appendage, and treated according to the foregoing rule, observing, that as the whole weight is to the loss of weight; so is the gravity of the solid to the gravity of the fluid. We may ascertain the respective weights of two known ingredients in a given compound, thus: take the differences of every pair of the three specific gravities; (viz. the specific gravities of the compound, and of each ingredient): multiply each quantity by the difference of the other two; then, as the greatest product is to the whole weight of the compound; so is each of the other two products to each respective weight of the two ingredients. If a piece of glass, or of metal, be immersed by suspension in different fluids, it will lose in weight; that is, it will require an equipoise, according to the weight of the fluids respectively: observing, that in the lightest fluid it will lose least weight. On this principle the hydrometer acts, and by means of this instrument the specific gravity of liquids are more readily determined than by the hydrostatic balance, with an accuracy sufficient for all practical purposes, though not for philosophical precision. For further particulars respecting this subject, and for tables of the specific gravities of bodies, see SPECIFIC GRAVITY. From what has been said we may discover the rationale of sinking and swimming. Thus, when a body is heavier than the fluid, by being immersed it loses only the weight of an equal bulk of the fluid, and consequently the remaining gravity must make it sink. But when the solid has less weight in the same bulk than the fluid, then it can only raise so much of the fluid as is equal to its own weight; and therefore will be only partly immersed, and will therefore swim upon the upper part of the fluid. Of all animals, man, when thrown into the water is the most helpless. Brutes swim naturally, while man can only acquire the art by practice; the one escapes without danger, the other sinks to the bottom. Some think that this arises from the different sensibilities each have of the danger; the brute, unterrified at his situation, swims, while his very fears sink the lord of the creation. But much better reasons may be assigned for this impotence of man in water, when compared to other animals; and one is, that he has actually more specific gravity, or contains more matter within the same surface, than any other animal.

OF HYDRAULICS, OR THE MOTION OF FLUIDS IN GENERAL.

The second branch of Hydrostatics, called Hydraulics, has for its object the motion of fluids; and teaches to estimate the force or velocity of fluids in motion. Upon the principles of this science many machines are constructed; several engines used in the mechanic arts; and various kinds of mills, pumps, and fountains, are the result of hydraulics judiciously applied. The most essential principles relating to this subject may be derived from the following propositions:

PROP. 10. If a fluid run through a pipe or canal, varying in width, always filling it, the velocity in the different parts will be as the transverse section in those parts. For the columns of fluid which pass through CD and AB, (fig. 24, Plate XCIII.) in the same time, are equal; hence the section CD $\times$ into the length of its column, is equal to AB $\times$ the length of its column: hence the section CD : AB :: length of the column CD : length of the column AB. But these lengths passed over in a given time are as the velocities, therefore CD : AB :: velocity at CD : velocity at AB. If the channel be not a close pipe kept full, but some river, &c. the velocities towards the bottom and sides will be diminished by means of the friction of the fluid against those parts.

PROP. 11. The velocity with which any fluid runs out of an orifice in the bottom or side of the vessel, is as the square root of the depth of the orifice. For since the momentum of the spouting fluid is as the pressure, it being the moving force, and the pressure as the depth, the momentum is as the depth; hence the quantity of matter and velocity is as the depth; but the quantity of matter, or the fluid discharged from a given orifice, is as the velocity; hence the square of the velocity is as the depth, or the velocity is as the square root of the depth.

PROP. 12. The velocity by which a fluid runs through an orifice in the bottom or side of a vessel, is equal to that acquired by a body in falling freely by the force of gravity through a space equal to the depth of the orifice. Let AB, (fig. 10, Plate XCIV.) be a column of the fluid, and let the bottom be removed at B, then the whole will begin to descend by the force of gravity; and because the particles below the upper one A are not pressed more upward than downward, and are each acted on by gravity as much as A, the effect of gravity in moving A will not be impeded by them: hence its velocity in any part of its descent will be the same as that generated by gravity in the same time: now, if, when the particle A commences its motion, its place be supplied by another particle C, the particle C cannot fall with a greater velocity than that generated by gravity, and therefore it cannot accelerate the motion of A; the same may be said of the next particle D which succeeds C, &c.; hence the particles A, C, D, &c. when they arrive at B, will move with the velocity generated by gravity in a body moving freely from A to B; that is, if the fluid be kept to the level AE, its velocity through an orifice at the bottom B, and consequently through an orifice at the same depth in the side of the vessel, will be as stated in the proposition. It must be here observed that the fluid is supposed to be free from tenacity, and to move without friction; but as this is not the case with any fluids we are acquainted with, the velocity will be lessened on that account; also the oblique motion of the fluid through the aperture from the sides of it, will, by striking against each other, impede the velocity. Hence the velocity determined by experiment will be less than that deduced from the theory.

PROP. 13. A stream of any fluid which spouts in any direction, not perpendicular to the horizon, forms a parabola. For each drop in the stream is a body projected from the aperture, its path is therefore a parabola. See PROJECTILES.

PROP. 14. When a fluid spouts horizontally from an aperture in the side of a vessel kept always full, if a line equal to the height of the fluid, passing through the aperture, and perpendicular to the horizon, be made the diameter of a circle, and a line perpendicular to it be drawn from the aperture to the circumference; the fluid will spout to a distance double of this perpendicular. Let FH, (fig. 5, Plate XCIII.) be the perpendicular; then since the fluid is projected horizontally from F with a velocity equal to that produced by gravity in a body falling through CF, (Prop. 12,) it will by the laws of projectiles, meet the horizon at K, so that NK shall be double FH. See PROJECTILES.

COR. If the fluid spout from the middle of the vessel as at D,

it will flow to the greatest distance. For DE is the greatest perpendicular. Also, since the perpendiculars are equal at equal distances above and below D, the fluid flowing from those points, as from F and G, will reach to the same horizontal distance NK.

PROP. 15. The quantities of a fluid proceeding in the same time through different apertures, at equal depths, (supposing that the vessels are kept equally full,) are to each other as the product of the areas of the apertures by the square root of the heights. For the quantities discharged are as the areas and velocity, and the velocity is as the square root of the depth, (Prop. 11,) therefore the quantities are as the areas and square root of the depth. Thus it has been proved by experiment, that a circular aperture of one inch diameter, in a thin vessel, gives in one minute of time, the water being four feet high, 5436 cubic inches of water. To know what will be furnished in the same time by an aperture two inches in diameter, the altitude of the water nine feet (French measure,) use the following proportion (observing that the aperture of two inches is four times as large as that of one, because the areas of circles are as the squares of the diameters): as $1 \times \sqrt{4}$ is to $4 \times \sqrt{9}$, so is 5436 to x : or, as 2 is to 12, so is 5436 to 32,616 cubic inches of water, the quantity that will be furnished by an aperture of two inches diameter from a reservoir whose surface is always kept at nine feet from the aperture. If you fill with water a prismatic vessel, and let the water run out by an aperture in the bottom, observing the time employed by the water in running out; and then fill the vessel again, keeping the surface of the water at the same height; you will find in this last case, that in the same interval of time that the water was running out of the vessel in the first instance, nearly double the quantity of water is expended in the second. In practice the water often issues from lateral openings, which, although but small in comparison with the size of the reservoirs, cannot be considered as having all their points at an equal distance from the surface of the fluid. In these cases, the usual method of determining the quantity of water flowing through the aperture depends on the following principles: Imagine the whole to be stopped by a plate, and this plate to be pierced with a great number of holes through which the water escapes; now, considering each of these holes as a single insulated aperture, the velocity for each will be according to the correspondent height of the fluid. If the number of these holes be infinitely augmented, or, what comes to the same thing, if the plate be taken away, the velocity of each point of the given aperture will be as the height corresponding thereto; and in determining the quantity of effluent water, regard must be had to this inequality of velocity. This mode of reasoning, however, is not conclusive; for though it may be just as far as relates to the number of insulated holes, it does not appear that the water will flow exactly in the same manner when the threads thereof are united, as when they proceed from small separate apertures. As the results of theory, however, upon this plan differ little from experiments, it may be useful to adhere to it till some better method is discovered. The quantity of water flowing through holes in a given time is not so great as might be expected, because the water does not flow in a compact parallel stream, but contracts in diameter on coming out of the aperture, and this contraction extends to a distance nearly equal to half the diameter of the aperture. The diameter of the contracted stream is to the diameter of the aperture as 3 to 4, or as $3\frac{1}{2}$ to 4, or as 19 to 24, so that its area to that of the aperture is as 10 to 16: it is nearly the same thing when the water flows from lateral apertures. This contracted stream is a proof that within-side the vessel the lateral particles are directed towards the hole, with different degrees of obliquity, which obliquity may be decomposed into two forces, one parallel to the plane of the hole, which contracts the fluid; the other perpendicular to the same plane, which occasions the efflux. This contraction takes place also when water passes through tubes, and the contraction is at the entrance of the water into the tube, not at its going out, where it preserves its cylindric form. This contraction sensibly diminishes the quantity of water that should be furnished by the tubes. To ascertain these facts, M. Bossut made a great number of experiments, the results of which are as follows. The apertures for the efflux of the water were all pierced perpendicularly in plates about half a line thick, and the time of each experiment was reduced to one minute.

Constant Height of the Water, Eleven Feet Eight Inches Ten Lines from the Centre of each Aperture.

N^o of cubic inch. disc. in 1 min.

Exp.

1. With a circular horizontal aperture, six lines diameter.....	2311
2. With ditto, one inch diameter.....	9281
3. With ditto, two inches diameter.....	37203
4. With a rectangular horizontal aperture, one inch by three lines.....	2933
5. With a square horizontal aperture, the side one inch.....	11817
6. With two ditto, the sides two inches.....	47361
<i>Constant Height Nine Feet.</i>	
7. Lateral circular aperture, six lines diameter.....	2018
8. Ditto, one inch diameter.....	8135
<i>Constant Height Four Feet.</i>	
9. Lateral circular aperture, six lines diameter.....	1353
10. Ditto, one inch diameter.....	5436
<i>Constant Height Seven Lines.</i>	
11. Lateral circular aperture, one inch diameter.....	623

From the above experiments M. Bossut draws the following deductions:

1. 'The quantities of fluid discharged in equal times from different sized apertures, the altitude of the fluids being the same, are nearly to each other as the areas of the apertures.' Thus in the second and third experiments the areas of the apertures are as 1 to 4, and the water discharged 9,281 cubic inches; 37,203 is nearly in the same ratio.

2. 'The quantities of water discharged, in equal times, by the same aperture, with different altitudes of the reservoir, are nearly as the square roots of the corresponding altitude of the water in the reservoir above the centre of the aperture.' Compare the eighth and tenth experiments, in which the respective altitudes of the reservoir were 9 and 4 feet, of which the square roots are 3 and 2; and we find the water discharged by the first was 8135 cubic inches, the second 5436 cubic inches; nearly in the proportion of 3 to 2.

3. 'That in general, the quantities of water discharged in the same time, by different apertures, and under unequal altitudes of the reservoirs, are to each other in a compound ratio of the areas of the apertures and the square roots of the altitudes.'

4. 'That on account of the friction, the smallest apertures discharge less water than those that are larger and of a similar figure, the water in the respective reservoirs being at the same height.'

5. 'That of several apertures whose areas are equal, that which has the smallest circumference will discharge more water than the others, the water in the reservoirs being at the same altitude,' and this because there is less friction. Hence circular apertures are most advantageous, as they have less rubbing surface under the same area.

The quantities of water, we find, expended in the foregoing experiments are not nearly so much as they ought to be, considering the size of the apertures and the altitude of the reservoirs. The quantity discharged is diminished considerably by the friction, and by the contraction of the stream; and probably on account also of the circular motion of the fluid: for the velocity which depends on the altitude of the reservoir is not sensibly altered. The difference in the discharge of water, supposing, 1. That the area of the stream is the same with that of the aperture; 2. That this stream is contracted; is as 16 to 10: in other words, by supposing the area of the orifice to be diminished in the proportion of 16 to 10, we may determine with sufficient exactness the efflux of fluids from vessels where the surfaces are maintained at the same height. If the water, instead of flowing through an aperture pierced in a thin substance, passes through the end of a vertical tube of the same diameter as the aperture, there is a much greater discharge of water, because the contracted stream is greater in the first instance than in the second. In the following experiments,

the

the constant height of the water in the reservoir, above the upper aperture of the tube, was eleven feet eight inches ten lines, the diameter of the tube one inch.

Length of the Tube, in Lines.		No of cubic inch. disc. in 1 min.
Exp.		
1	48	12274
2	24	12188
3	18	12168
4	18	9282

On comparing the three first experiments, it appears, that the longer the vertical tube is, the greater is the discharge of the water, because the contraction of the stream is less; it is, however, always somewhat contracted, even when it appears to fill the tube. By comparing the quantities of water discharged in the third and fourth experiments, we find the two discharges 12168, and 9282, are to each other nearly in the proportion of 13 to 10; but we have seen, that the water discharged through a thin aperture without any contraction in the stream, would be to the same aperture with a contracted stream as 16 to 10. Hence we may conclude, that the altitude in the reservoir and the apertures being the same, the discharge through a thin aperture without any contraction in the stream, the discharge through an additional tube, and the discharge through a similar aperture with a contracted stream, are to each other nearly as the number 16, 13, and 10; these proportions are sufficiently exact for practice. Hence it is plain that an additional tube only destroys in part the contraction of the stream, which contraction is greatest when the water passes through a thin aperture from a large reservoir. If the additional tube, instead of being vertical, or placed at the bottom of the reservoir, were horizontal or placed in the side, it would furnish the same quantity of water, provided it was of the same length, and that the exterior aperture was at the same distance from the surface of the water in the reservoir. If the additional tube, instead of being cylindrical, were conical, having its largest base nearest the reservoir, it would discharge a greater quantity of water. The most advantageous form that can be given, to obtain the greatest quantity of water in a given time by a given aperture, is that which the stream assumes in coming out of the aperture; i. e. the tube must be of the form of a truncated cone, whose smallest base should be of the same diameter as the aperture; the area of the small base should be to that of the larger base as 10 to 16; and the distance from one base to the other should be the semidiameter of the largest base. The efflux of water will then be as abundant as it would be through a thin aperture equal to the smallest base, and where the stream was not contracted. This form may be applied where it is necessary to obtain a certain quantity of water from a river, an aqueduct, &c. by a canal or lateral tube. On comparing the efflux of water through additional tubes of different diameters, and with different altitudes of the water in the reservoirs, the following results were obtained; the additional tubes were two inches long, and were vertical and placed at the bottom of the reservoir.

Constant Altitude of the Water above the Tubes.		Diameter of the Tubes in Lines.		Cubic inc. in 1 min.
Ex.				
1	3 feet 10 inches.....	6	Water filling the	1689
2		10	tube	4703
3	3 feet 10 inches.....	6	Do. not filling the	1293
4		10	tube	3598
5	2 feet	6	Do. filling the tube	1222
6		10		3402
7	2 feet	6	Do. not filling it...	935
8		10		2603

From these experiments it results, 1. "That the discharge by different additional tubes, with the same altitude of the reservoir, are nearly in proportion to the area of the apertures, or to the squares of the diameters. 2. That the discharge of water by additional tubes of the same diameter, with different altitudes of water in the reservoir, are nearly proportional to the square root of the altitude of the reservoir. 3. That in general the discharge of water in the same time, through different additional tubes, with

different altitudes of water in the same reservoir, are to each other nearly as the product of the square of the diameters of the tubes by the square root of the altitude of the reservoir." So that, additional tubes, transmitting water, follow (amongst themselves) the same laws as through the thin orifice. The following table was formed from the foregoing experiments:

Constant Altitude in the Reservoir above the Aperture.	Water discharged in One Minute through		
	a hole one inch diameter, the stream not contracted.	An additional Tube of One Inch Diam. 2 Inches long.	A Hole 1 Inch Diam. with a contracted Stream.
Feet.	Cubic Inches.	Cubic Inches.	Cubic Inches.
1	4381	3539	2722
2	6169	5002	3846
3	7589	6126	4710
4	8703	7070	5456
5	9797	7900	6075
6	10732	8654	6654
7	11592	9340	7183
8	12392	9975	7672
9	13144	10579	8135
10	13855	11151	8574
11	14530	11693	8990
12	15180	12205	9384
13	15797	12699	9764
14	16393	13197	10130
15	16968	13620	10472

Water made to issue from a pipe into the air is called a fountain or jet d'eau, and perhaps there are few things that give more pleasure to the eye than a diversity in the play of water from a fountain: but these machines give still greater pleasure in sultry climates, where they contribute to cool the air, as well as to enliven the prospect. Whatever be the direction of the jet, the discharge of water is always the same; provided the ajutage, and the altitude of the reservoir above it, be the same. This is a necessary consequence of the equal pressure of fluids in all directions. Water, spouting from a small ajutage, has sufficient velocity to carry it to the same height as the water in the reservoir; but it never attains entirely to this height, being prevented by various concurring causes; as, 1. The friction in the tubes between the reservoir and the ajutage: 2. The friction against the circumference of the aperture: 3. The resistance of the air to the weight of the water at the top of the spout; for this, having lost its motion, rests on the part below, and by its weight obstructs the motion of the column. The resistance from this cause is so great, that the jet is frequently destroyed, the rising water being by fits and starts pressed down to the very orifice from which it spouts: but this inconvenience is remedied, by giving the jet a little inclination; for then the particles which have lost their motion upwards do not fall back as before, but fall off from the rest, and thus do not incumber the rising fluid; hence such jets as are a little inclined will rise higher than those that are vertical. To make large jets rise higher than small ones, the conduit-pipe must be large enough to furnish a sufficient quantity of water; for if these are narrow, small jets will rise higher than those that are larger. The diameter of the conduit-pipe should therefore bear a certain proportion to that of the ajutage, to make a jet rise to the greatest possible height. If we compare two different jets, and desire that each should attain its greatest altitude, the squares of the diameters of the conduit-pipes must be to each other, in the compound ratio of the ajutages, and the square root of the altitude of the reservoir. Thus, if we know the diameter that ought to be given to a conduit-pipe, to furnish water for the discharge of a given ajutage, with a reservoir of a given altitude, we may determine the diameter of another tube, to feed a given ajutage with a reservoir of a given altitude. Experience has shewn, that, for an ajutage six lines diameter, with a reservoir of 52 feet, the conduit-pipe should be about 39 lines; for an ajutage six lines diameter, and a reservoir 16 feet, the conduit-pipe must be 23½ lines. There is no inconvenience in giving a conduit-pipe a greater diameter than the

above, but there would be a considerable one in giving it smaller. Conduit-pipes should never be fixed at right-angles to each other. The application of these principles has afforded a great variety of amusing contrivances. We shall give an instance in what is called the Circulating Fountain. See Plate XCIV. fig. 4. In this fountain, the air being compressed by the concealed fall of water, makes a jet, which, after some continuance appears to be a perpetual motion; because the same water which fell from the jet seems to rise again. The boxes CE and DYX being close, we see only the bason ABW, with a hole at W, into which the water spouting at B falls; but that water does not come up again; for it runs down through the pipe WX into the box DYX, from whence it drives out the air through the ascending pipe YZ, into the cavity of the box CE, where, pressing upon the water that is in it, it forces it out through the spouting pipe OB, as long as there is any water in CE; so that this whole play is only whilst the water contained in CE, having spouted out, falls down through the pipe WX into the cavity DYX. The force of the jet is proportionable to the height of the pipe WX, or of the boxes CE and DY above one another: the height of the water, measured from the bason ABW to the surface of the water in the lower box DYX, is always equal to the height measured from the top of the jet to the surface of the water in the middle cavity at CE. Now as the surface CE is always falling, and the water in DY always rising, the height of the jet must continually decrease, till it is shorter by the height of the depth of the cavity CE, which is emptying, added to the depth of the cavity DY, which is always filling; and when the jet is fallen so low, it immediately ceases. The air is represented by the points in this figure. To prepare this fountain for playing, which should be done unobserved, pour in water at W, till the cavity DXY is filled; then invert the fountain, and the water will run from the cavity DXY into the cavity CE, which may be known to be full when the water runs out at B held down. Set the fountain up again, and, to make it play, pour in about a pint of water into the bason ABW; and as soon as it has filled the pipe WX, it will begin to play, and continue as long as there is any water in CE. Then pour back the water into the bason ABW, into any vessel, and invert the fountain, which, being set upright again, will be made to play by putting back the water poured out into ABW; and so on as often as you please. When water is to be conveyed from one place to another in long pipes or tubes, it must be observed, that the friction of these lessens considerably the velocity of the water. On this part of our subject, we need only to relate the result of the various experiments that have been made. In those of M. Boscut, the tubes were straight; one of them was sixteen lines inside diameter, the other two inches; and the tubes were successively lengthened from 30 to 180 feet. The constant altitude of the water in the reservoir, above the axis of each tube, was in some cases one foot, in others two feet. This is a branch of hydrostatics, in which theory is necessarily imperfect, and the only means of arriving at truth must be from experiment.

Constant Altitude of the Water in the Reservoir above the Axis of the Tube, expressed in it.	Distance to which the Water was conveyed expressed in it.	No. of Cubic Inches of Water discharged by the Tube of 16 Lines Diameter in a Minute.	No. of Cubic Inches of Water discharged by the Tube of Two Inches Diameter in a Minute.
1	30	2778	7680
1	60	1957	5564
1	90	1587	4534
1	120	1351	3944
1	150	1178	3486
1	180	1052	3119
2	30	4066	11219
2	60	2888	8190
2	90	2352	6812
2	120	2011	5885
2	150	1762	5232
2	180	1583	4710

From these experiments it appears, that great accuracy is not necessary in practice; and perhaps we may adopt for a general rule, "that the discharges made in equal times by an horizontal tube, with the same altitude of reservoir, but at different distances from the first aperture of the tubes, are to each other nearly in the inverse ratio of the square roots of the distances." The discharge is more in proportion from the larger tube than from the smaller one; because there is less rubbing surface in proportion in the larger tube. If the tubes are curved instead of being straight, the discharge will be somewhat diminished. This diminution in the discharge appears to arise from the impact of the water against the angular parts of the tube, whereby its velocity is diminished. This diminution will therefore vary with the degree of curvature. When the plane of the curvature of the tube is in a vertical direction, there will be portions of the tube where the air will fix itself, so as to lessen the velocity, or even stop the course, of the water. Let ABCDE, (fig. 25, Plate XCH.) be a tube, whose upper end A is joined to the reservoir that furnishes the water, G the end by which the fountain is supplied. When the communication at A is open, the tube is filled with air; the water will fill the tube AB, drive out the air, and rise to C. Here experience has shewn, that the water runs down the lower part of the curvature, and fills up the neck D, leaving behind it the column of air CD; which will remain there, notwithstanding the pressure of the common air AB. The water continuing to flow, runs down the lower part of EF, and fills the neck F, leaving the second column of the air at FE; so that the water will be only raised to I, and will not run out at G. It is a known fact in mechanics, that the vibrations of a pendulum are isochrone, or of the same duration, though the arches it describes are unequal. It is also acknowledged, that in their duration, the vibrations of two unequal pendulums are to each other as the square root of their respective lengths. The motion of water vibrating in a syphon follows the same laws. To illustrate this, let us suppose *lnom*, (Plate XCIV. fig. 5,) to be a syphon consisting of three parts, or legs; two, *ln*, *mo*, vertical, and one, *no*, horizontal; and that it be of an equal diameter throughout its whole extent. Let us further suppose, that the fluid, while at rest, occupies the space *anod*, the two surfaces, *ab*, *cd*, will be level. Now if by any means the fluid be forced to descend to *gh* in the leg *mo*, it will rise to *cf* in the leg *ln*; and as soon as this cause ceases to act, the fluid is left alone to the action of its gravity. The excess in length of the column *en* over the column *ho* will force the fluid to descend even below the level of the other, on account of the acceleration it acquires in descending, which will raise the fluid in the other leg; and it will thus continue rising and falling alternately, forming oscillations similar to those of a pendulum; and the duration of each vibration will be precisely the same as the vibration of a pendulum, whose length is half the length of the column *pqr* of the fluid. As the oscillations of water follow the same laws as those of a pendulum, if the length of the column of water be increased or diminished, the duration of the oscillations will be also augmented or diminished, and will be in a subduplicate ratio of this length. Sir Isaac Newton, in his "Principia," compares the undulatory motion of the waves to the vibratory motion of water in a syphon. Let ABCDEF, (fig. 26, Plate XCH.) represent a stagnant water, whose surface is elevated and depressed by successive waves. Let A, C, E, be the convex, and B, D, F, the concave part of the waves. As waves are formed by the successive ascent and descent of the water, so that those parts which were the highest become the lowest alternately and successively; and as the moving force which makes the lowest parts rise, and the highest sink, is the weight of the elevated water, this ascent and descent may be considered as analogous to the vibratory motion of water in a syphon, and observes the same laws. If, therefore, we have a pendulum, whose length is equal to half the transversal distance between the most convex point A, and the most concave point B, that is, equal to the half of *Ab*; the highest part will become the lowest during the vibration of such a pendulum, and in another vibration they will become the highest, going through its whole space while the pendulum performs two vibrations. For the purpose of raising, diffusing, and otherwise employing, that useful fluid, water, various machines have been at different periods invented; they are denominated hydraulic machines. Of these we shall here describe the following. Archi-

medes' screw, (fig. 6, Plate XCIV.) deserves consideration, not only for its antiquity, but its usefulness in raising water. It consists of a long cylinder, with a hollow pipe-tube, or groove, coiled about it, as represented in the figure. It is placed in a position oblique to the horizon, with the lower end in the water, the other being supported on the lower part of the winch I, by which the screw and cylinder are turned round. As soon as the screw is immersed in water, it immediately rises in the machine by the orifice C, to the level of the surface of the water E; and if the point of the helix, or spiral, which in the beginning of the motion is coincident with the surface of the water, happens not to be on the lower side of the cylinder, the water will, upon the motion of the screw, move on in the helix, until it comes to the point which is on the under side, and coincident with the watery surface: when it is arrived at that point, it cannot afterwards possess any other part of the spiral than that which is upon the lowest part of the cylinder, for it cannot move towards H, because H is situated higher; and since this will ever be the case, after the surface of the water in the helix has attained the point E, it is plain that it must always be on the under side of the cylinder. But since the cylinder is in motion, every part of the spiral screw from EF, will by degrees succeed to the under part of the cylinder; the water therefore in the helix must succeed to every part from E to F, as it comes to the lower side; that is, it must ascend on the lower part of the cylinder through all the length of the pipe, until it comes to the orifice at top, where it will run out. The horn-drum, so called from a number of segments passing from the circumference of a large flat cylinder to its centre, is an easy mode of raising water. The scoops, or mouths, by turns dip into the water, and as they rise cause it to pass up the horn, or segment, until it is discharged into a trough placed under the end of the axis, which is hollow, and has its pintle fastened to a cross, as seen in fig. 7. Such wheels usually work with water (or float) boards; and some of them have projecting fins, from which rectangular buckets are suspended: these dip into the water as the wheel turns, and successively discharge into a trough, by means of a pin at A, which causes every bucket as it passes to turn to a horizontal instead of an erect position. The latter invention is ascribed to the Persians. The reader will, no doubt, readily perceive that a strong current, or other force, is needful to move machines so laden as the Persian wheel, it sometimes raising near a ton of water in each revolution; and that nothing but the necessity for raising water could induce to so great a loss of power. Mr. H. Serjeant, of Whitehaven, contrived a very cheap engine for raising water, for which the Society for the Encouragement of Arts awarded him a silver-medal in the year 1801. A sketch of this simple invention is given in fig. 8. This engine was erected at Irton-hall, which is situated on an ascent of 60 or 61 feet perpendicular height: at the foot of this elevation, about 140 yards distant from the offices, there runs a small stream of water, and in order to procure a constant supply of that necessary fluid, the object was to raise such stream to the house for culinary and domestic uses. With this view, a dam was formed at a short distance above the current, so as to cause a fall of about four feet: the water was then conducted through a wooden trough, into which a piece of leaden pipe, two inches in diameter, was inserted, and part of which is delineated at A. The stream of this pipe is directed in such a manner as to run into the bucket B, when the latter is elevated; but, as soon as it begins to descend, the stream passes over it, and flows progressively to supply the wooden trough or well, at the foot of which stands the forcing-pump C, being three inches in diameter. D, is an iron-cylinder, attached to the pump-rod, which passes through it: such cylinder is filled with lead, and weighs about 240lbs. This power works the pump, and forces the water to ascend to the house, through a pipe, one inch in diameter, and which is 420 feet in length. At E, is fixed a cord, which, when the bucket approaches to within four or five inches of its lowest projection, extends, and opens a valve in the bottom of the vessel, through which the water is discharged. The machine, here described, had at the time of Mr. Serjeant's communication to the Society above mentioned, been six months in use, and fully answered the purpose for which it was designed. The artisans employed were a plumber, blacksmith, and carpenter: the whole expence, exclusive of the pump and pipes, did not exceed 5*l*. The machine, represented in fig. 9, Plate XCIV. was executed at Oulton, in Cheshire, by Mr. White-

hurst, for the service of a brewhouse, and other offices, belonging to Philip Egerton, Esq. Its design is, to raise water by the momentum, or force which fluids acquire when confined. A represents the original reservoir, or spring; the upper surface of which corresponds with the horizontal line B C, and also with the bottom of the reservoir, K. D, the main-pipe, which is $1\frac{1}{2}$ inch in diameter, and nearly 200 yards in length. E, is a branch-pipe of similar dimensions, for the use of the kitchen-offices. Mr. Whitehurst observes, that these offices are situated eighteen or twenty feet, at the least, beneath the surface of the reservoir, A, and that the cock, F, is about sixteen feet below it. G, represents a valve-box; in which is fixed a valve. H, is an air-vessel. o, o, represent the ends of the main-pipe, which are inserted in the air-vessel, and are bent downwards, to prevent the air from being driven out, when the water is forced into it. W, denotes the surface of the water. Mr. Whitehurst remarks that, as water discharged from an aperture, beneath a pressure of sixteen feet perpendicular height, moves at the rate of 32 feet in one second of time, its velocity from the cock, F, will be in a similar ratio. And, though the aperture of such cock be not nearly equal to the diameter of the pipe, D, yet the pressure of the fluid contained in the pipe will be very considerable: so that if a column of water, 200 yards high, be thus set in motion, and then suddenly stopped by the cock, F, its great force will open the valve, at G; and condense the air in the box, H, as often as the water is drawn from the cock. This condensation was sufficient to force the water into the reservoir, K, and even to burst the vessel, H, within a few months after its first construction; though it was made of sheet-lead, in the proportion of nine or ten pounds to one square foot; and was apparently very firm. Hence it may be rationally concluded, that the impetus of the water is far superior to the simple pressure of the column, I, K; and is therefore equal to a greater resistance (if it were required) than a pressure of four or five feet perpendicular height. This ingenious contrivance is now applied to a variety of machinery, by the patriotic Mr. Boulton, who obtained a patent in December 1797, for an improved machine of this kind. Pumps are very general instruments for raising water: there are various constructions of these useful instruments. They are made to act by removing the pressure of the air from the surface of the water within an open pipe, by means of a piston and valves. The principles on which the action takes place are partly derived from hydrostatics, and partly from pneumatics. See PNEUMATICS, and PUMP.

OF THE RESISTANCE OF FLUIDS.

One of the important problems in hydrostatics, is to determine the resistance that a body in motion meets from a fluid at rest; and to know the effort necessary to keep a body at rest in a fluid in motion. Water and air are two of the great inanimate agents in nature, and they are those which man renders most easily subservient to his purposes. Necessity first pointed out the use of those agents, and philosophy engaged him to investigate their properties. The resistance of fluids to bodies moving in them, or against which bodies move, arises from the inertia, the tenacity, and the friction, of the fluid. A body cannot move forward in water or any other fluid, without removing the parts of the fluid which lie before it out of the way; but as these particles possess that general property of matter which is called its inertia, this resistance will be made by the most perfect as well as the most imperfect fluid. For if a body move in a fluid, it must give motion to a certain quantity of that fluid, and the reaction of that quantity will destroy part of the motion of that body. But by displacing the fluid, and communicating motion, it loses an equal quantity of its own motion, from whence we obtain some idea of the resistance of the fluid; much here will, however, depend on the form, magnitude, &c. of the moving body, and the velocity of its motion; for a greater body will displace a greater quantity of the fluid than a smaller one, every thing else being the same; and the greater the velocity wherewith a body moves in a fluid, the more motion will be communicated thereto, and consequently lost to the body. Another cause of resistance arises from the tenacity of the parts of a fluid; for, as a body cannot move forward in a fluid till the parts that lie before it are removed out of the way, the adhesion or tenacity must necessarily resist its motion. A third cause of resistance is, the friction of the body against the particles of a fluid; but this, from the nature of fluids, is deemed to be very inconsiderable. The resistance

resistance also depends on the density of the fluid, every thing else being the same; for it is manifest, that it will require more force to displace a given quantity of mercury than the same quantity of water, and a quantity of water than an equal quantity of air. But the principal resistance, which fluids give to bodies in motion, is supposed to arise from the inertia of the particles, which will be according to the number of them, that is, as the quantity of matter, and it is this only which is considered in the following propositions. Two suppositions are generally taken for granted, in proving the propositions on the resistance of fluids: 1. That the fluid in which the body moves is so compressed, that its pressure on every part of the moving bodies shall be the same as when they are at rest: 2. That the hinder part of the solids contribute nothing to the resistance, which will be the same as if the anterior part only were exposed to the fluid. This last supposition, however, is not exactly true, for the hinder part of most solids contributes to lessen the resistance by the power it receives from the returning curves of the fluid: hence in many cases the following propositions will not exactly correspond with experiments.

PROP. 16. If a body move through different fluids, the resistance will be as the density of the fluid and square of the velocity. For the resistance is as the quantity of matter and velocity, (by Mec.) and the quantity of matter or the particles struck in a given time, is as the velocity and density of the fluid; therefore, the resistance is as the density and square of the velocity.

PROP. 17. If different planes move in directions perpendicular to their surfaces in fluids, the resistance will be as the areas multiplied continually into the density and square of the velocity. For the resistance is as the density and square of the velocity when the area is given, and as the area when the density and velocity are given; therefore it is as the area $\times$ the density $\times$ the square of the velocity, when they all vary.

COR. If the motion be oblique to the plane, or face of the body, the resistance when moving in the direction perpendicular to its face is to the resistance when moving in the oblique position, as the cube of radius to the cube of the sine of the angle of inclination of the plane. Let AC, fig. 11, Plate XCIV. be the plane, AB the direction of the motion, and BC perpendicular to AB. Draw DE at right angles to AC, DF to BC, and EF to DE, and let DF represent the force of a particle on BC, this is equivalent to DE and EF, of which EF has no effect on the oblique plane, being parallel to it, and the force DE is equivalent to the two EG, GD, of which only DG acts in the direction of the motion; therefore the force acting on BC is to the force on CA,

as FD:GD, or as $FD^2:DE^2$; because by sim. triangles $FD:DE::DE:GD$. Again by similar triangles $FD^2:DE^2::AC^2:BC^2$, hence the force on BC is to the force on CA as $AC^2:BC^2$. But there is the same number of particles acting on BC and BA, therefore the number of particles acting on CA in a perpendicular position, is to the number acting in its present position, as AC is to BC; and their effect has been shewn to be as $AC^2:BC^2$, therefore the resistance of AC in a perpendicular position, is to its resistance in the position AC, as $AC^3:BC^3$, that is, as the cube of radius to the cube of the sine of the angle of inclination BAC.

PROP. 18. The resistance to a plane, by a fluid acting perpendicular to its face, is equal to the weight of a column of the fluid, whose base is the plane and altitude equal to the space through which a heavy body must fall to acquire the velocity of the motion. For the force of the fluid in motion, which is equal to the resistance of the plane, is equal to the weight of a column of the fluid whose base is the plane and altitude, equal to the space which a body moves through by the force of gravity to acquire that velocity; (Prop. 13;) hence the proposition is manifest.

PROP. 19. The resistance to a sphere is only half the resistance to its great circle, or to the end of a cylinder of equal diameter, and moving with an equal velocity. Let AFEB, fig. 12, be half the sphere, moving in the direction CEG, ALMB a cylinder, and AIEKB a paraboloid on the same base. Let any particle of the fluid meet the sphere in F, and draw the tangent FG, the radius FC, and ordinate FHI, which produce to D. Then, as shewn in Cor. to Prop. 12, the force of any particle on the surface at F is to the force at D or H as the square of the sine of the angle FGE to the square of radius, that is, as $HF^2:CF^2$. But, by the nature of the parabola, $HF^2:CF^2::HI:CE$, or its equal HD: therefore the force on F is to the force on D, or H, as HI to HD, and since this is true for every point of the spherical surface, the force on the whole spherical surface is to the force on the great circle or end of the cylinder as the content of the paraboloid to the content of the circumscribing cylinder, that is as 1 to 2. We having here noticed the general principles and phenomena which relate to non-elastic fluids, and described a few hydrostatic and hydraulic inventions, for further information we refer the reader to the articles PNEUMATICS, SPECIFIC GRAVITY, WATER-WORKS, &c. Also, several other instruments which belong to this subject will be found described in their order. See BALANCE, HYDROMETER, HYGROMETER, &c.

HYDRO-SULPHURET, in chemistry, sulphuretted hydrogen combined with an alkali or an earth. These substances are soluble in water, and crystallizable; the solution is colourless, while the action of the air is excluded, but when that is admitted, a yellow colour is soon acquired, owing to the oxygen of the atmosphere combining with a portion of hydrogen, while the remaining portion of it is retained by the sulphur forming a super-sulphuretted hydrogen, in union with the base. Mr. Murray observes, that "the knowledge which we have acquired of sulphuretted hydrogen, and of its combinations, has thrown light on the composition of the mineral sulphureous waters, and of the changes which they suffer. As sulphur is by itself insoluble in water, and, as frequently no traces of an alkali, by which it might be rendered soluble, could be discovered in them, chemists found it difficult to conjecture by what means its solution was effected. The discovery of sulphuretted hydrogen, and of its solubility in water, solved the difficulty; and the mutual action exerted between it and the oxygen elucidate the changes these waters suffer from exposure to the air." The affinities of the alkalies and earth for sulphuretted hydrogen appear from the experiments of Berthollet to be as follows:

Barytes,	Ammonia,
Potass,	Magnesia,
Soda,	Zirconia.
Lime,	

HYDROTHORAX, [from *hydro*, water, and *thorax*, the chest,] a collection of water in the breast. See MEDICINE.

HYDRUNTUM, in ancient geography, a noble and commodious port of Calabria, now called Otranto.

HYDRUS, in astronomy, the Water-Snake, a new constellation. See ASTRONOMY.

HYEMAL, [from *hyems*, winter, Lat.] of or belonging to winter. It is chiefly used of the winter-solstice. See SOLSTICE.

HYEMANTES, in the primitive church, offenders guilty of such enormities that they were not allowed to enter the porch of the churches with other penitents, but were obliged to stand without, exposed to the inclemency of the weather, even in winter.

HYENA. See CANIS.

HYGEIA, or HYGIEA, [*Ἑγία*,] in the mythology, the daughter of Æsculapius, and the goddess of Health, among the ancient Greeks, called by the Romans Salus.

HYGIENE, [*Ἑγίαν*, of *ὑγις* healthy,] that branch of medicine which respects health, and discovers proper means for its preservation. Its objects are the non-naturals.

HYGIENE, in a more extensive sense, is divided into three parts; prophylactice, which foresees and prevents diseases; syneritice, which preserves health; and analeptice, which cures diseases, and restores health.

HYGROMETER, HYGROSCOPE, or NOTIOMETER, [*υγρο*, moisture, and *μετρον*, to measure;] an instrument used for measuring the degrees of dryness and moisture of the atmosphere, as the barometer and thermometer measure its different degrees of gravity

gravity and warmth, although this instrument is far from being yet so perfect as those. There are three general principles on which hygrometers have been constructed: 1. The lengthening and shortening, or twisting and untwisting, of strings by dryness and moisture; 2. The swelling and shrinking of solid substances by moisture or dryness; and, 3. By the increase or decrease of the weight of particular bodies, which absorb the humidity of the atmosphere. There are various kinds of Hygrometers; for whatever body either swells by moisture, or shrinks by dryness, is capable of being formed into a Hygrometer. Such are woods of most kinds, particularly deal, ash, poplar, &c. Such also is catgut, the beard of a wild goat, and twisted cord, &c. The best and most usual contrivances for this purpose are as follow: 1. Stretch a common cord, or a fiddle-string, ABD, Plate XCV. fig. 2, along a wall, passing it over a pulley B; fixing it at one end A, and to the other end hanging a weight E, carrying a style or index F. Against the same wall fit a plate of metal HI, graduated, or divided into any number of equal parts; and the Hygrometer is complete. For it is constantly observed, that moisture sensibly shortens cords and strings; and that, as the moisture evaporates, they return to their former length again. The same is observed of a fiddle-string: and hence such strings are apt to break in damp weather, when not slackened by the screws of the violin. Hence it follows, that the weight E will ascend when the air is more moist, and descend again when it becomes drier; by which means the index F will be carried up and down, and, by pointing to the several divisions on the scale, will shew the degrees of moisture or dryness. 2. For a more sensible and accurate Hygrometer, strain a whipcord, or catgut, over several pulleys B, C, D, E, F, fig. 3, and proceed as before for the rest of the construction. Nor does it matter whether the several parts of the cord be parallel to the horizon, as expressed in the annexed figure, or perpendicular to it, or in any other position; the advantage of this over the former method being merely the having a greater length of cord; for the longer the cord, the greater is the contraction and dilatation, and consequently the degrees of variation of the index over the scale, for any given change of moisture in the air. 3. Fasten a twisted cord, or fiddle-string, AB, fig. 4, by one end at A, sustaining a weight at B, carrying an index C round a circular scale DE described on a horizontal board or table. Hence, upon an increase or decrease of the humidity of the air, the index will shew the quantity of twisting, and consequently the increase or decrease of moisture or dryness. 4. Those Dutch toys called weather-houses, where a small image of a man, and one of a woman, are fixed upon the ends of an index, are constructed upon this principal. For the index, being sustained by a cord or twisted catgut, turns backwards and forwards, bringing out the man in wet weather, and the woman in dry. 5. A Hygrometer may be made of the thin boards of ash or fir, by their swelling or contracting. But this, and all the other kinds of this instrument, above described, become in time sensibly less and less accurate; till at last they lose their effect entirely, and suffer no alteration from the weather. But the following sort is much more durable, serving for many years with tolerable accuracy. To the extremity of a nice balance, fig. 5, fix at B a sponge, or other body, that easily imbibes moisture. To prepare the sponge, it may be proper first to wash it in water very clean; and, when dry again in water, or vinegar, in which there has been dissolved sal-ammoniac, or salt of tartar; after which let it dry again. Now, if the air become moist, the sponge will imbibe it and grow heavier, and consequently will preponderate, and turn the index, and when the air becomes drier, the sponge becomes lighter, and the index turns the contrary way; thus shewing the state of the air. This balance may be contrived in two ways; by either having the pin in the middle of the beam, with a slender tongue a foot and a half long, pointing to the divisions on an arched plate; or the scale may be hung to the point of the beam near the pin, and the other extremity made so long, as to describe a large arch on a board placed for the purpose; as in fig. 5. Mr. Arderon directs the sponge to be so cut, as to contain as large a superficies as possible, and to hang by a fine thread of silk upon the beam of a balance B, and exactly balanced on the other side by another thread of silk at D, strung with the smallest lead-shot, at equal distances, so adjusted as to cause an index E to point at G, the middle of a graduated arch FGH,

when the air is in a middle-state between the greatest moisture and the greatest dryness. Under this silk so strung with shot, is placed a little table or shelf I, for that part of the silk or shot to rest upon which is not suspended. When the moisture imbibed by the sponge increases its weight, it will raise the index, with part of the shot, from the table, and vice versa, when the air is dry. Philos. Trans. vol. 44. p. 96. 9. From a series of Hygroscopical observations, made with an apparatus of deal-wood, described in the Philos. Trans. No. 480, Mr. Coniers concludes, 1st, that the wood shrinks most in summer, and swells most in winter, but is most liable to change in the spring and fall. 2d, That this motion happens chiefly in the day-time, there being scarcely any variation in the night. 3d, That there is a motion even in dry weather, the wood swelling in the morning, and shrinking in the afternoon. 4th, That the wood, by night as well as by day, usually shrinks when the wind is in the north, north-east, and east, both in summer and winter. 5th, That by constant observation of the motion and rest of the wood, with the help of a thermometer, the direction of the wind may be told nearly without a weather-cock. He adds, that even the time of the year may be known by it; for in spring it moves more and quicker than in winter; in summer it is more shrunk than in spring; and has less motion in autumn than in summer. See an account of a method of constructing these and other hygrometers, in Phil. Trans. Abr. vol. 2. p. 30, &c. and plate 1 annexed. (See also Philos. Trans. vol. 11, p. 647, and 715; vol. 15, p. 1032; vol. 43, p. 6; vol. 44, p. 95, 169, and 184; vol. 54, p. 259; vol. 61, p. 198; vol. 63, p. 404, &c.) 10. Drs. Hales and Desaguliers contrived another form of Sponge Hygrometer, on this principle. They made an horizontal axis, having a small part of its length cylindrical, and the remainder tapering conically with a spiral thread cut in it, after the manner of the fusee of a watch. See fig. 6. The sponge is suspended by a fine silk-thread to the cylindrical part of the axis, upon which it winds. This is balanced by a small weight W, suspended also by a thread, which winds upon the spiral fusee. When the sponge grows heavier, in moist weather, it descends and turns the axis, and so draws up the weight; which coming to a thicker part of the axis it becomes a balance to the sponge, and its motion is shewn by an attached scale; and vice versa, when the air becomes drier. Salt of tartar, or any other salt, or pot-ashes, may be put into the scale of a balance, and used instead of the sponge. (Desaguliers. Exper. Philos. vol. 3, p. 230.) 11. Mr. Ferguson made an hygrometer of a thin deal pannel; and to enlarge the scale, and to render its variations more sensible, he employed a wheel and axle, making one cord pass over the axle, which turned a wheel ten times as large, over which passed a line with a weight at the end of it, whose motion was therefore ten times as much as that of the pannel. The board should be changed in three or four years. See Philos. Trans. vol. 54, art. 47. 12. Mr. Smeaton gave also an ingenious and elaborate construction of an hygrometer; which is described in Philos. Trans. vol. 61, art. 24. The best hygrometer upon the principle, of the alteration of the weight of substances, by attracting the moisture of the air; and for ascertaining the quantity as well as the degree of moisture in the variation of the hygrometer, is that of Mr. Coventry of Southwark, London. The account he gives of it is as follows: "Take two sheets of fine tissue paper, such as is used by batters; dry them carefully at about two feet distance from a tolerably good fire, till after repeatedly weighing them in a good pair of scales no moisture remains. When the sheets are in this perfectly dry state, reduce them to exactly 50 grains; the hygrometer is then fit for use. The sheets must be kept free from dust, and exposed a few minutes in the open air; after which may be always known by weighing them the exact quantity of moisture they have imbibed. For many years (adds he) the hygrometer has engrossed a considerable share of my attention; and every advantage proposed by others, either as it respected the substances of which the instrument was composed, or the manner in which its operations were to be discerned, has been impartially examined. But I have never seen an hygrometer so simple in itself, or that would act with such certainty or so equally alike, as the one I have now described. The materials of which it is composed being thin, are easily deprived wholly of their moisture; which is a circumstance essentially necessary in fixing a datum from which to reckon, and which, I think, cannot be said of any substance hitherto employed

ployed in the construction of hygrometers; with equal facility they imbibe or impart the humidity of the atmosphere, and shew with the greatest exactness when the least alteration takes place." For easier weighing the paper, take a piece of round tin or brass the size of a crown-piece, through the centre of which drill a hole, and also three others round it at equal distances: then cut about 100 papers; and after putting them under the tin or brass, drive through each hole a strong pin into a board, in order to round them to the shape of the plate: the papers must then be separated and exposed to the air a few hours with that already weighed, and so many of them taken as are equal to the weight already specified. This done, thread them together through these holes made by the pins, putting between every paper on each thread a small bead, to prevent the papers from touching each other, and also that the air may be more readily admitted. The top of the hygrometer is covered with a card cut to the same size; and which, by its stiffness, supports all the papers, and keeps them in proper shape. Before the papers are threaded, the beads, silk, card, and a thin piece of brass about the size of a sixpence, which must be placed at the bottom, and through which the centre-string passes, must be weighed with the greatest exactness, to bring them to a certain weight, suppose 50 grains; now the paper in its driest state being of equal weight, they will weigh together 100 grains; consequently what they weigh more at any time is moisture. To obviate the difficulty of trying experiments with weights and scales, Mr. Coventry contrived a machine or scale by which to determine at one view the humidity or dryness of the atmosphere. This, with its case, is represented by fig. 7, Plate XCV. The front and back of the case are glass; the sides fine gauze, which excludes the dust, and admits the air; the case is about 10 inches high, eight inches broad, and four inches deep. A, a brass-bracket in front, behind which, at about $3\frac{1}{2}$ inches distance, is another; these support the axis of the index E, also of the beam D, and another which supports the stem B, to which the ivory-scale of divisions C is fixed. G, a brass-scale suspended in the usual manner to the end of a beam D, and weighing exactly 100 grains. This scale is an exact counterpoise to the paper I and the different apparatus. The manner of suspension is as follows: the axis of the beam g, which is made of brass, instead of hanging on pivots as in common scales, turns with two steel-edges *h k*, fixed in the extremities of the brass-axis: these edges are shaped like the edge of a knife, and act on two steel concave edges *l l*, in order to render the friction as small as possible. D is a fine scale-beam fixed at right angles with the axis g. E, the steel-index fixed to the under side of the same axis. F, a brass sliding weight: *h* is the axis that holds the stem B to which the scale of divisions C is fixed. AA, the brass-brackets which support the whole by four screws, two of which are seen at *i i*, that screw the brackets to the top of the case. The axis of the scale of divisions is hung on pivots, one of which is seen at *m*, that, should the case not stand level, the stem B may always be in a perpendicular situation. The hygrometer, before use, should be thus adjusted: to the end of the beam where the hygrometer is suspended, hang a weight of 100 grains, which is equal to the weight of the scale; then move the sliding weight F up or down the index E, till one grain will cause the index to traverse neither more nor less than the whole scale of divisions; then add half a grain to the scale, in order to bring the index to 0; and the instrument, after taking off the 100 grain-weight, and hanging on the papers, is fit for use; then put grain-weights in the scale till the index is brought within compass of the scale of divisions. Example: If is three grains on the brass-scale, and the index points at 10: consequently there is three grains and 10 hundredths of a grain of moisture in the papers. If four grain-weights are kept, viz. 1, 2, 4, and 5, they will make any number from 1 to 9, which are as many as will be wanted. Sometimes the index will continue traversing within the scale of divisions for many days without shifting the weights; but if otherwise, they must be changed as occasion may require. "One great advantage, (says Mr. Coventry,) of this hygrometer, above all others that have attracted my notice, is that it acts from a certain datum, namely, the dry extreme; from which all the variations towards moist are calculated with certainty: and if constructed with that precision represented by the drawing, it will afford pleasure to the curious in preserving the almost perpetual alteration of the atmosphere, even

in the most settled weather. In winter it will be constantly traversing from about 8 A. M. till 4 or 5 P. M. towards dry; and in summer, from about 4 A. M. till 6 or 7 P. M. when the weather is hot and gloomy, the hygrometer discovers a very great change towards moisture; and when clear and frosty, that it contains a much greater quantity of moisture than is generally imagined."

HYGROMETRY, [*υγρ* and *μετρω*], the art or science of measuring the moisture of the atmosphere. See **HYGROMETER**.

HYGROSCOPE, [*υγρ* and *σκοπεω*; *hygroscope*, Fr.] an instrument to shew the moisture and dryness of the air, and to measure and estimate the quantity of either extreme. It is commonly used in the same sense with hygrometer, but Wolfius properly makes a difference from the etymology of the words. The hygroscopic (he says) only shews the changes of humidity or dryness in the air, but the hygrometer measures them.

HYLAS, in fabulous history, son of Theodamus, and favourite of Hercules.

HYLOPATHIANS, ancient Greek philosophers, who derived all things from dead and stupid matter, in the way of qualities and forms, general and corruptible.

HYLOZOISTS, [*υλη*, matter, and *ζωη*, life,] a sect of atheists among the ancient Greek philosophers, who maintained that matter had some natural perception, without animal sensation, or reflection in itself considered; but that this imperfect life occasioned that organization, whence sensation and reflection afterwards arose.

HYMEN, or **HYMENÆUS**, in ancient mythology, the son of Bacchus and Venus, and the god of marriage. He was invoked in epithalamiums, and other matrimonial ceremonies.

HYMEN, [*υμην*], in anatomy, is a thin membrane or skin, sometimes circular, of different breadths, more or less smooth, and sometimes semilunar, formed by the union of the internal membrane of the great canal with that on the inside of the *alæ*, resembling a piece of fine parchment.

HYMENÆA, the **BASTARD LOCUST TREE**; a genus of the nogynia order, and decandria class of plants; natural order Lomentaceæ. Calyx five-parted; petals five, almost equal; style twisted inwards; legume filled with farinaceous pulp. There is only one species, *H. courbaril*, locust-tree. The wild bees are fond of building their nests in this tree, which grows to a considerable size in the West-Indies.

HYMENOPTERA, [from *υμην*, membrane, and *πτερον*, a wing,] in the Linnaean system of zoology, an order of insects, having four membranaceous wings; the tails of the females are furnished with stings, which in some are used for instilling poison, and in others for merely piercing the bark and leaves of trees, and the bodies of other animals, in which they deposit their eggs. The wasp and the bee are insects of this order. It consists of the following genera:

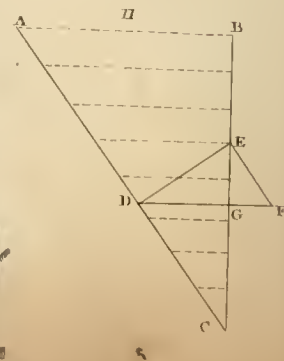
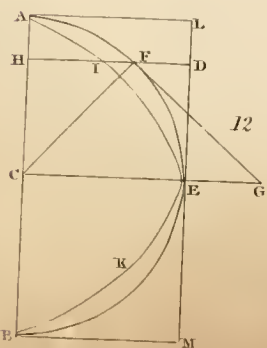
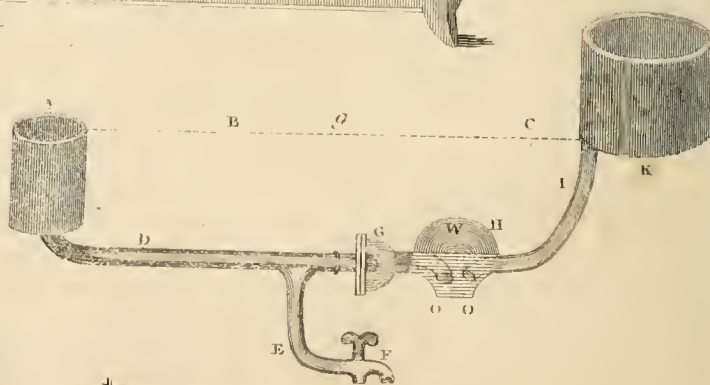
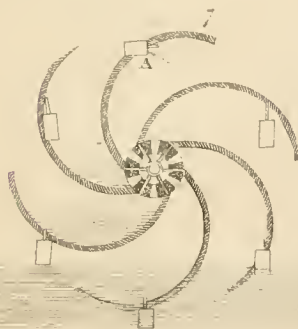
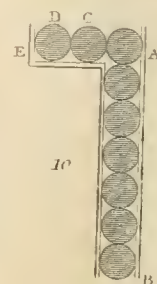
Ammophila	Mutilla
Apis	Solia
Chalcis	Sirex
Chrysis	Sphex
Cynips	Tenthredo
Formica	Thynnus
Ichneumon	Tiphia
Leucopsis	Vespa.

HYMETIUS, or **HYMETTUS**, in ancient geography, a mountain of Attica near Athens, famous for its marble-quarries, and for its excellent honey.

HYMN, [*υμν*], a song of joy, full of the praises of God, distinguished from Threna, which is mourning-song, full of lamentation. St. Hilary, bishop of Poitiers, is said to have been the first that composed hymns to be sung in churches, and was followed by St. Ambrose. In the Greek Liturgy there are four kinds of hymns; but the word is not taken in the sense of a praise offered in verse, but simply of a laud or praise. The angelic hymn, or Gloria in excelsis, makes the first kind; the trisagion, the second; the Cherubic hymn, the third; and the hymn of victory and triumph, called *σανα*, the last. The hymns of the ancients generally consisted of three sorts of stanzas; one of which, called strophe, was sung by the band as they walked from E. to W. another, called antistrophe, was performed as they returned from W. to E. the third part, or epode, was sung before the altar. The

Jewish





Jewish hymns were accompanied with trumpets, drums, and cymbals, to assist the voices of the Levites and people.

HYOBANCHE, in botany, a genus of the angiospermia order, and didynamia class of plants. Calyx seven-leaved; corolla ringent, without any lower lip; capsule two-celled, many-seeded. There is but one species, viz. *H. sanguinea*, a native of the Cape of Good Hope, and is parasitical at the roots of shrubs.

HYOIDES, [*υ* and *ειδης*, likeness,] in anatomy, a bone at the root of the tongue. See **ANATOMY**.

HYOSCYAMUS, **HENBANE**: a genus of the monogynia order, and pentandria class of plants; natural order, *Luridæ*. Corolla funnel-shaped, obtuse; stamina inclining to one side; capsule covered, bilocular. It has eight species.

HYOSERIS, in botany, a genus of the polygamia æqualis order, and syngenesia class of plants; natural order *Compositæ*. Receptacle naked; calyx nearly equal; pappus hairy, or scarcely perceptible. It has ten species.

HYO-THYROIDEUS, [*υ* and *ειδης*, the hyoid bone, and *θυροειδης*, the thyroid cartilage,] in anatomy, one of the muscles belonging to the os hyoides. See **ANATOMY**.

HYPALLAGE, [*υπαλλαγη*,] a figure by which words change their cases with each other. It is a species of Hyperbaton. Virgil affords several examples: *e. g.* *Dare classibus austros, for Dare classes austris*.

HYPANTE, or **HYPERTANTE**, a name given by the Greeks to the feast of the presentation of Jesus in the temple.

HYPATIA, a learned and beautiful lady of antiquity, the daughter of Theon, a celebrated philosopher and mathematician, and president of the famous Alexandrian school, was born at Alexandria about the end of the fourth century. Her father, encouraged by her extraordinary genius, had her not only educated in all the ordinary qualifications of her sex, but instructed in the most abstruse sciences. She made such great progress in philosophy, geometry, astronomy, and the mathematics, that she was esteemed the most learned person of her time. At length she was thought worthy to succeed her father in that distinguished and important employment, the government of the school of Alexandria; and to teach out of that chair where Ammonius, Hierocles, and many other great men, had taught before; and this at a time too, when men of great learning abounded at Alexandria, and in many other parts of the Roman empire. Her fame was so extensive, and her worth so universally acknowledged, that she had a very crowded auditory. But although the flower of Europe, Asia, and Africa, sat at the feet of this very beautiful instructress, greedily swallowing learning and philosophy from her mouth, and many of them, doubtless, love from her eyes; yet we are not sure that she ever listened to any solicitation, as Suidas, who talks of her marriage with Isidorus, relates that she died a maid. Her scholars were as eminent as they were numerous; one of them was the celebrated Synesius, afterwards Bishop of Ptolemais. This ancient Christian Platonist every where bears the strongest and most grateful testimony to the virtue of his tutress. He never mentions her without the most profound respect, and sometimes in terms of affection little short of adoration. But it was not Synesius only, and the disciples of the Alexandrian school, who admired Hypatia for her virtue and learning; never was woman more caressed by the public, and yet never woman had a more unspotted character, or more tragical end. She was held as an oracle for her wisdom, which made her consulted by the magistrates in all important cases; and this often drew her among the greatest concourse of men, without the least censure of her manners. In a word, when Nicephorus intended to pass the highest compliment on the princess Eudocia, he thought he could not do it better than by calling her another Hypatia. But while Hypatia reigned the brightest ornament of Alexandria, a kind of civil war which broke out between Orestes the governor, and Cyrill the Patriarch, proved fatal to the lady. In 415, about 500 monks attacked the governor, and would have killed him, had he not been rescued by the townsmen; but the respect which Orestes had for Hypatia causing her to be traduced among the mob, they dragged her from her chair, tore her to pieces, and burned her limbs. Cyrill has been suspected of fomenting this tragedy. Cave endeavours to remove the imputation of such a horrid action from the patriarch; and lays it upon the Alexandrian mob, whom he calls *levissimum hominum genus*, "a very trifling inconstant people:" but though

Cyrill should neither have been the perpetrator, nor the contriver, of it, yet he did not discountenance it as he ought; for he was so far from censuring the outrage, that he received the dead body of Ammonius, one of the most forward in that riot (who was justly punished with death,) and even made a panegyric upon the ruffian, as if he had died a martyr for truth. Hypatia published Commentaries on Apollonius's Conics, Diophantus's Arithmetic, and other works.

HYPECOUM, **WILD CUMEN**; in botany, a genus of the tetrandria digynia class and order. Natural order, *Corydalis*. Calyx two-leaved; petals four, the two outer broader, and trifid; fruit a silique. It has three species.

HYPELATE, in botany, a genus of the polygamia monœtia class and order. Calyx five-leaved; corolla five-petaled; stigma bent down, three-cornered; drupe one-seeded. It has only one species, viz. *H. trifoliata*, a native of Jamaica.

HYPER, [*υπερ*,] a Greek preposition frequently used in composition, where it denotes excess; its literal signification being above or beyond.

HYPERBATION, in grammar, a figurative construction inverting the natural and proper order of words and sentences. The several species of the hyperbaton are, the anastrophe, the hysteronproteron, the hypallage, synchysis, tmesis, parenthesis, and the hyperbaton strictly so called. See **ANASTROPHE**, &c.

HYPERBATON, strictly so called, is a long retention of the verb, which completes the sentence, as in the following example from Virgil.

Interea reges: ingenti mole Latinus
Quadrijugo vehitur curru, cui tempora circum
Aurati bis sex radii fulgentia cingunt,
Solis avi specimen: bigis it Turnus in albis,
Bina manu lato crispans hastilia ferro:
Hinc pater Æneas Romanæ stirpis origo,
Sidereo flagrans clypeo & cœlestibus armis;
Et juxta Ascanius magnæ spes altera Romæ:
Procedunt castris.

HYPERBOLA, [*hyperbole*, Fr. *υπερ* and *βουλλα*,] in geometry, a section of a cone made by a plane, which if continued would pass through the opposite cone. See **CONIC SECTIONS**.

HYPERBOLÆON, in ancient music, the upper or last tetrachord or fourth. It was thus called from its being high or shrill, when compared with the other fourths.

HYPERBOLE, [*υπερβολη*, *superlatio*; formed of the verb *υπερβαλλειν*, *exsuperare*, to surpass by far,] in rhetoric, a figure, whereby the truth and reality of things are excessively either enlarged, or diminished. The character of an hyperbole is to exaggerate or extenuate the idea of the things spoken of, beyond the bounds of truth, or even probability. As, he ran swifter than the wind: he went slower than a tortoise, &c. Hyperboles, says Seneca, lie without deceiving; they lead the mind to truth by fictions; they convey the sentiment intended, though by expressing it in terms which render it incredible. The hyperbole promises too much, in order to make you conceive enough. Lord Kames, in his "Elements of Criticism," observes, that "An object uncommon with respect to size, either very great of its kind or very little, strikes us with surprise; and this emotion forces upon the mind a momentary conviction that the object is greater or less than it is in reality: the same effect, precisely, attends figurative grandeur or littleness, and hence the hyperbole, which expresses this momentary conviction. A writer, taking advantage of this natural delusion, enriches his description greatly by the hyperbole: and the reader, even in his coolest moments, relishes this figure, being sensible that it is the operation of nature upon a warm fancy. A writer is generally more successful in magnifying by a hyperbole than in diminishing. The reason is, that a minute object contracts the mind, and fetters its power of imagination: but that the mind, dilated and inflamed with a grand object, moulds objects for its gratification with great facility. Longinus cites the following ludicrous instance of a diminishing hyperbole from a comic poet: "He was owner of a bit of ground not larger than a Lacedæmonian letter." But, for the reason now given, the hyperbole has by far the greater to do in magnifying objects. It is unnecessary to quote examples. Homer, Virgil, Shakespeare,

and all our best poets abound with them. (See *Iliad*, iv. 308. *Æn.* iii. 421, 571, 619. *vn.* 808. *Ilen.* V. act. 1. sc. 1. &c.) Some are found in the sacred writings. See *Gen.* xiii. 13, 16; and *John* xxi. 25. Quintilian is sensible that the hyperbole is natural: "For (says he), not contented with truth, we naturally incline to augment or diminish beyond it; and for that reason the hyperbole is familiar even among the vulgar and illiterate;" and he adds, very justly, "That the hyperbole is then proper, when the object of itself exceeds the common measure." But it is a capital fault to introduce a hyperbole in the description of an ordinary object or event; for in such a case, it is altogether unnatural, being destitute of surprise, its only foundation. Nor can a hyperbole ever suit the tone of any dispiriting passion: sorrow in particular will never prompt such a figure. Shakespeare himself sometimes errs in this respect. See *Richard II.* act. 1. sc. 1. And *Jul. Cæs.* act. 1. sc. 1. A writer who uses hyperboles ought always to have the reader in his eye: he ought never to venture a bold thought or expression, till the reader be warned and prepared. For this reason, a hyperbole in the beginning of a work is not in its place. See *Hor. Carm.* lib. 2. ode 15. The nicest point of all, is to ascertain the natural limits of a hyperbole, beyond which being overstrained, it has a bad effect. A hyperbole, after it is introduced with all advantages, ought to be comprehended within the fewest words possible: as it cannot be relished but in the hurry and swelling of the mind; a leisurely view dissolves the charm, and discovers the pre-scription to be extravagant at least, if not ridiculous. Instances of this in modern poetry are numerous. See **ORATORY**.

HYPERBOLIC, or **HYPERBOLICAL**, something relating either to any hyperbole, or an hyperbola.

HYPERBOLIC CYLINDROID, is a solid figure, whose generation is given by Sir Christopher Wren, in the *Philosophical Transactions*. Thus, two opposite hyperbolas being joined by the transverse axis, and through the centre a right line being drawn at right angles to that axis; and about that, as an axis, the hyperbolas being supposed to revolve; by such revolution, a body will be generated, which is called the hyperbolic cylindroid, whose bases, and all sections parallel to them, will be circles. In a subsequent volume of the *Transactions* the same author applies it to the grinding of hyperbolic glasses; affirming, that they must be formed this way or not at all.

HYPERBOLIC LEG OF A CURVE, is that which approaches infinitely near to some asymptote. Sir Isaac Newton reduces all curves, both of the first and higher kinds, into those with hyperbolic legs, and those with parabolic ones.

HYPERBOLIC LINE, is used by some authors for what we call the hyperbola itself. In this sense, the plane surface, terminated by the curve-line, is called the hyperbola, or hyperbolic space; and the curve-line that terminates it the hyperbolic line.

HYPERBOLIFORM, [*hyperbola* and *forma*,] having the form, or nearly the form, of the hyperbola.

HYPERBOLOID, a hyperbola of the higher kind, whose nature is expressed by this equation, $ay^{\frac{m+n}{m}} = bx^{\frac{m+n}{n}}$ if n or m be greater than one.

HYPERBOREAN, in ancient geography, was applied to those people and places which were situated to the N. of the Scythians.

HYPERCATALECTIC, in Greek and Latin poetry, is applied to a verse that has one or two syllables too much, or beyond the regular and just measure; as,

Musæ sorores sunt Minervæ:

HYPERDULIA, in the Romish theology, [from *ὑπερ*, above, and *δουλέω*, worship,] the worship rendered to the holy virgin. The worship offered to saints is called dulia; and that to the virgin, hyperdulia, as being superior.

HYPERIA, in ancient geography, the seat of the Phæacians near the Cyclops. Some take it to be Camarina in Sicily; according to others, it is supposed to be Melita, an adjoining island.

HYPERICUM, **St. JOHN'S WORT**: a genus of the polyandria order, and polyadelphia class of plants; natural order, *Rotacæ*. Calyx five-parted; petals five; filaments many, connected at the base in five bundles. It has fifty-seven species, chiefly shrubs, or under-shrubs, with cylindrical, ancipital, or quadrangu-

lar stems; leaves frequently with pellucid dots; flowers sometimes in cymes, frequently in corymbs.

HYPERION, a name of Apollo.

HYPERION, the son of Cælus and Terra, and the father of Sol, Luna, and Aurora, by Thea.

HYPERMETER, [*ὑπερ* and *μετρον*,] any thing greater than the standard requires.

HYPERMNESTRA, in fabulous history, one of the fifty daughters of Danaus, King of Argos, the only one who refused to obey her father's bloody order. See **DANAIRES**, and **DANAUS**.

HYPERSCARCOSIS, [*ὑπερσκαρσισ*, from *ὑπερ*, and *σκαρσος*,] the growth of fungous or proud flesh.

HYPERTHYRON, [*ὑπερ* and *θυρον*,] in architecture, a sort of table, usually placed over gates or doors of the Doric order, above the chambranle, in form of a frieze.

HYPETHRE, in ancient architecture, two rows of pillars surrounding, and ten at each face of a temple, &c. with a peristyle within, of six columns.

HYPHEN, [*ὑφεν*,] a character in grammar, implying that two words are to be joined, or connected, into one compound word, and marked thus -; as five-leaved, &c. It also serves to connect the syllables of such words as are divided by the end of the line. This character is often misapplied. Thus frequently substantives and adjectives are joined together by a hyphen, and consequently made into one compound word, in opposition to one of the first and plainest rules of Syntax. Also two nouns are not uncommonly met with, even in elegant works, improperly connected by the hyphen 1. No adjective and substantive, retaining their original or ordinary signification, ought ever to be joined by the hyphen, because it is an infringement upon the first and plainest rule of syntax. 2. All adjectives and substantives, which, in composition, lose either a part, or the whole, of their original or usual signification, ought to be joined by the hyphen, unless their use as compounds has been so universally established, that the hyphen is thrown out. Thus, though in "grandfather, grandson," &c. the hyphen is usually dropt, yet "great-grandfather, great-grandson, great-grandmother, great-great-grandfather," and all the other ascending and descending degrees of consanguinity above and below these, require hyphens; because neither greatness nor grandeur is intended to be expressed by them, but merely the degree of relationship. In like manner "father-in-law, mother-in-law, son-in-law," and the other degrees of affinity, require hyphens, although the original meaning of the primitives is in a considerable degree retained. 3. To adjectives, or an adjective and participle, expressing one complex idea, though the usual meaning of both is preserved, ought always to be joined by a hyphen, unless established usage has thrown it out: thus "high-lying, high-minded, high-seasoned, middle-aged," and all similar compounds, ought to retain the hyphen. 4. When a participle, or participial adjective, or any word with a participial termination, is preceded by a noun, and compounded to express a complex idea, they ought to be joined by hyphens: thus, "ash-coloured, long-faced, wry-necked, right-angled, rough-leaved," &c. ought to be with hyphens, without which indeed there can be no proper grammatical construction, the latter part of most of these compounds not being used as distinct words. 5. For the same reason all compound words, the first part of which are derived from the Latin or Greek, but retain their original terminations, ought uniformly to have hyphens; such as "Anglo-Americans, Anglo-Saxons, Crypto-Calvinists, Pseudo-Christians, Demi-Arians, contra-indication, plano-convex, &c. as their first parts are not words. 6. Many cases occur in literary composition, in which an adjective and substantive are used adjectively, as a kind of temporary compound, expressing one complex idea, and are followed by a substantive: in all such cases, they ought to be conjoined by a hyphen. Thus, though fresh and water are distinct words, and ought not to be conjoined, when speaking of a river or spring affording fine fresh water, yet when used adjectively, of a "fresh-water lake," a "fresh-water fish," or a "fresh-water sailor," they form a temporary adjective, and ought to be conjoined by a hyphen. Authors and printers, by not attending to this distinction, have introduced much confusion in the use of this character. 7. The numeral adjectives are often used in this manner, in conjunction with nouns and participles, to express particular complex ideas, and to save circumlocution: thus a "one-horse chaise," a "two-year-

old lamb," the "three-coloured flag," a "four-wheeled" coach, a "five-fold treatise," a "six-pounder, twelve-pounder," &c. ought never to be written without hyphens. 8. All English names of plants and minerals fancifully composed of several words taken out of their obvious meaning, such as "Jack-by-the-hedge," &c. ought to be joined by hyphens, and not printed separately, as is often absurdly done. 9. Another very proper use of the hyphen is much neglected, though if uniformly attended to, it would be of considerable use. When a gentleman or lady, either by baptism or acquisition of fortune, or both, has acquired more than one name and surname, they ought to be distinguished by hyphens. Thus when one, unacquainted with the persons or characters, reads such names as, "Charles-James Fox," "Lady Winifred Maxwell-Halkerston-Constable," &c. without hyphens, he is at a loss to know which is the Christian name, and which the surname; but if all such names were uniformly distinguished by the hyphen, connecting the Christian names together, and the surnames together, as above, no person could mistake the one for the other. 10. Another important use of the hyphen is also much neglected in modern printing, viz. to separate the two primitives in all compound words where the junction of certain letters either makes an awkward appearance, or leads to a false pronunciation. Thus the triple e does not look well without a hyphen, such as "beeeater," &c. in Dr. Ash's Dictionary.

HYPNOTICS, [*ὑπνός*,] any medicines that induce sleep. See NARCOTICS, OPIATES, Soporifics, &c.

HYPNYDRA, in botany, a genus of the monœcia gynandria class and order. Male, calyx one-leaved, three-parted; corolla none; stamens six, inserted above the germ; female, calyx and corolla none; style triangular, with three stigmas; capsule one-celled, three-valved; seed single. There is but one species, viz. *H. fluviatilis*, a little plant of Guiana, which grows under water.

HYPNUM, in botany, a genus of the cryptogamia musci class and order. Natural order, Musci or Mosses. Capsule oblong; peristomium double, outer with sixteen broadish teeth, inner membranaceous, equally lacinated; segments broadish, with capillary ones interposed. Males germaceous on different plants. It has about fifty species.

HYPO, a Greek particle, retained in the composition of divers words, literally denoting under; in which sense it stands opposed to Hyper.

HYPOBOLE, or **SUBJECTION**, [from *ὑπο*, and *βάλω*, I cast,] in rhetoric, a figure, when several things are mentioned, that seem to make for the contrary side, and each of them are refuted in order. When complete, it consists of three parts; a proposition, an enumeration of particulars with their answer, and a conclusion. Thus Cicero, upon his return from banishment, vindicates his conduct in withdrawing so quietly, and not opposing the faction that ejected him. See ORATORY.

HYPOCATHARSIS, [*ὑπο*, under, and *καθαίρω*, I purge,] a too feeble purgation.

HYPOCAUSTUM, [from *ὑπο*, and *καίω*, to burn,] among the ancient Greeks and Romans, a subterraneous place, where was a furnace to heat the baths. Hypocaustum was also a kind of kiln to heat their winter-parlours.

HYPOCHLERIS, **HAWK'S-EYE**: in botany, a genus of the polygamia æqualis order, and syngenesia class of plants; natural order, Compositæ. Receptacle chaffy; calyx a little imbricated; pappus glumy. There are five species.

HYPOCHONDRIA, [*ὑπο*, under, and *χόνδρος*, a cartilage,] in anatomy, that part of the body on both sides, which lies under the cartilages of the spurious ribs, and is extended to the ilia. See ANATOMY.

HYPOCHONDRIAC PASSION, a disease in men, similar to the hysteric affection in women. See MEDICINE.

HYPOGÆUM. See **HYPOGEUM**.

HYPOGASTRIC, [*ὑπο*, and *γαστήρ*,] an appellation given to the internal branch of the iliac artery. See ANATOMY.

HYPOGEUM, [*ὑπο* and *γῆ*, the earth,] a name which the ancient architects gave to all the parts of a building that were under ground, as cellars and vaults.

HYPOGEUM, in astrology, a name given to the celestial houses below the horizon: especially the *imum cæli*, or bottom of heaven.

HYPOGLOSSI, **EXTERNI**, or **MAJORES**, in anatomy,

the ninth pair of nerves, called also *linguales* and *gustatorii*. See ANATOMY.

HYPOGLOSSIS, or **HYPOGLOTTIS**, [*ὑπο*, under, and *γλῶττα*, tongue,] in anatomy, a name given to two glands of the tongue, situated under it, near the *venæ ranulares*. There are other two, one on each side of it. They serve to filtrate a kind of serous matter of the nature of saliva, which they discharge into the mouth by little ducts near the gums.

HYPOGLOTTIS, or **HYPOGLOSSIS**, in medicine, an inflammation or ulceration under the tongue; called also *ranula*.

HYPOLITE, *St.* a town of France, in the department of Doubs, twelve miles S. W. of Porentui.

HYPOLITE, *St.* a town of France, in the department of Gard, and late province of Languedoc. A canal crosses it, turns several mills, and supplies many fountains with water. Lon. 0. 4. E. Lat. 43. 58. N.

HYPOMOCHLION, [from *ὑπο*, under, and *μυχλίον*, a lever,] in mechanics, the fulcrum or prop of a lever, or the point which sustains its pressure, in raising or lowering bodies. It is also used for a roller set under a lever, or under stones, timber, &c. to assist in removing them.

HYPOPOON, in medicine, a collection of purulent matter under the corner of the eye.

HYPOSCENIUM, in antiquity, a partition under the logeum, or pulpit, of the Greek theatre, appointed for the music.

HYPOSTASIS, literally signifies substance, or subsistence, but is used in theology for person. Thus there is but one nature or essence in God, but three hypostases or persons. This term is of a very ancient standing in the church. St. Cyril repeats it several times, as well as the phrase union according to hypostasis. The first time it occurs is in a letter from that father to Nestorius, where he uses it instead of *προσωπον*, the word we commonly render person, which did not seem expressive enough. This term occasioned great dissensions in the ancient church; both among the Greeks and the Latins. In the council of Nice, hypostasis was defined to denote the same essence or substance; so that it was heresy to say that Jesus Christ was of a different hypostasis from the Father; but custom altered its meaning. In the necessity they were under of expressing themselves strongly against the Sabellians, the Greeks used the word hypostasis, and the Latins persona; which proved the occasion of endless disagreement. The phrase *τρεῖς υποστάσεις*, used by the Greeks, offended the Latins, who translated *υποστάσεις* by substantia. The barrenness of the Latin tongue in theological phrases allowed them but one word for the two Greek ones, *υπη* and *υποστάσεις*; and thus disabled them from distinguishing essence from hypostasis. They therefore chose rather to use the term *tres personæ*, and *tres hypostases*. An end was put to these logomachies, in a synod held at Alexandria about A. D. 362, at which St. Athanasius assisted; after which the Latins made no scruple of saying *tres hypostases*, nor the Greeks of three persons.

HYPOTENUSE, [*ὑποτένυσις*,] the line that subtends the right angle of a right-angled triangle; the subtense. See TRIGONOMETRY.

HYPOTHEC, or **HYPOTHECA**, [*ὑποθήκη*, Gr. a thing subject to obligation,] in the civil law, an obligation, whereby the effects of a debtor are made over to his creditor, to secure his debt. As the hypotheca is an engagement for the security of the creditor, various means have been made use of to secure to him the benefit of the convention. The use of the pawn or pledge is the most ancient, which is almost the same with the hypotheca; all the difference consisting in this, that the pledge is put into the creditor's hands in a simple hypotheca, the thing remained in the possession of the debtor. To hypothecate a ship, is to pawn the same for necessities; and a master may hypothecate either ship or goods for relief, when in distress at sea; for he represents the traders as well as owners; and in whose hands soever a ship or goods hypothecated come, they are liable. But it has been recently held in the Court of King's Bench, that if the master pay for the repairs himself, and do not hypothecate the ship, he has no lien upon the ship for his debt.

HYPOTHENUSE. See **HYPOTENUSE**.

HYPOTHESIS, [from *ὑπο*, under, and *θεσις*, position, or *πρῆξις*, I place,] in astronomy, is more particularly applied to the several systems in the heavens; or the different ways in which

astronomers

astronomers have supposed the heavenly bodies to be arranged, moved, &c. The principal hypotheses are the Ptolemaic, Copernican, and Tychonic. The Copernican is now so well warranted by observation, that it should no longer be called a hypothesis. See ASTRONOMY.

HYPOTHESIS, in logic, that which is supposed to be true. False hypotheses are often made in order to draw the antagonist into absurdities; and even in geometry truths are often deducible from false hypotheses. Every hypothetical proposition may be distinguished into hypothesis and thesis: the first rehearses the conditions under which any thing is affirmed or denied; and the latter is the thing itself affirmed or denied. Thus, in the proposition, a triangle is half a parallelogram, if the bases and altitudes of the two be equal; the latter part is the hypothesis, "if the basis," &c. and the former the thesis, "a triangle is half a parallelogram." In strict logic, we are never to pass from the hypothesis to the thesis; that is, the principle supposed must be proved before we require the consequence to be allowed.

HYPOTHESIS, in physics, &c. denotes a system formed to account for some phenomenon or appearance of nature; such as gravity, magnetism, the deluge, the tides, &c. The real causes of natural things generally lie very deep; observation and experiment are in most places extremely slow, and the human mind is very impatient: hence we often invent something that may seem like the cause, and which appears calculated to answer the several phenomena, so that it may possibly be the true cause. Philosophers are divided as to the use of such hypotheses, which are much less current now than formerly. The latest and best writers are for excluding hypotheses, and depending wholly on observation and experiment. Whatever is not deduced from phenomena, says Sir Isaac Newton, is an hypothesis; and hypotheses, whether metaphysical, or physical, or mechanical, or of occult qualities, have no place in experimental philosophy. Those who, like the Cartesians, found their speculations on hypotheses, even though they argue from them regularly, according to the strictest laws of mechanics, may be said to compose an elegant fable; but it is still only a fable. However, hypotheses, if not considered as established facts, have their use; for by means of them we often discover the truth sooner than by random experiments; they also afford a regular arrangement and classification of the facts already known. The chief danger of hypotheses is, that of placing too much dependence on them.

HYPOTRACHELION, [from *ὑπο*, under, and *τραχήλιον*, the neck,] in architecture, denotes a little freize in the Tuscan and Doric capitals, between the astragal and annulets.

HYPOXES, in botany, a genus of the monogynia order, and hexandria class of plants; natural order, Coronariae. Corolla divided into six parts, persisting, superior; capsule narrowing at the base; calyx a bivalved glume. It has fourteen species.

HYPICLES, an ancient mathematician of Alexandria, who flourished under Marcus Aurelius. He wrote a work entitled, "Anaphoricus, or the Book of Ascensions," printed in Greek and Latin, at Paris, in 1680.

HYPICRATES, an ancient Phœnician historian, who wrote a History of Phœnicia, in his native tongue, which was saved from the flames of Carthage, when that city was destroyed; it was translated into Greek.

HYPISPYLE, in fabulous history, the daughter of Thoas, and queen of Lemnos.

HYPISSTARII, [from *ὑψιστος*, highest,] a sect of heretics in the fourteenth century; so called from the profession they made of worshipping the most high God. Their doctrine was a compound of Paganism, Judaism, and Christianity.

HYPTIS, in botany, a genus of the didynamia gymnospermia class and order; natural order, Verticillatae. Calyx turbinate; corolla with a very spreading border; lower lip semibifid; anthers hanging down. There are two species.

HYRAX, the *SAPHAN*, or *ASHKOKO*, in zoology, a genus of the mammalia class of animals, and order glires. Generic character, two broad and distant fore-teeth above; four contiguous, broad, flat, notched, fore-teeth below; and four large grinders on each side in both jaws. The fore-feet have four toes, the hind-feet only three. Tail, none; clavicles wanting. There are two species.

H. CAPENSIS, or the *CAPE HYRAX*, is about as large as a rab-

bit, and abounds in the mountainous districts near the Cape of Good Hope, leaping from rock to rock with extreme agility, feeding by day, and retreating at night to the clefts and holes of the mountains. Its sound is a reiterated squeak. It subsists entirely on vegetable food, and prepares a bed for its repose and comfort in its favourite recess. See Plate LXIX.

H. SYRIACUS, or the *BRISTLY HYRAX*, is found in Ethiopia and Abyssinia. It is about seventeen inches long. These animals are called by the natives of these countries *Ashkokos*. They are gregarious, and occasionally seen in companies of several scores basking before the clefts of the rocks in the open sunshine. They are gentle, weak, and fearful; but if handled with roughness will bite with great severity. They are supposed to live on grain, fruits, and roots, and when kept in confinement, they will live upon bread and milk.

HYRCANIA, in ancient geography, a country of the farther Asia, lying south-east of the Mare Hyrcanum; with Media on the east, Parthia on the south, and Margiana on the west, famous for its tigers, vines, figs, and olives. (*Virg. Strabo.*) It is now called Chilan, or Kilan.

HYRCANIA, the metropolis of the above country, thought to be the Tape of Strabo, the Syriax of Polybius, the Zeudracarta of Arrian, and the Asac of Isidorus Characenus.

HYRCANIA, an ancient town of Lydia, in the campus Hyrcanus, near Thyatira; destroyed by an earthquake in the reign of Tiberius.

HYRCANIA, a strong town of Judea, built by Hyrcanus.

HYRCANIAN SEA, or **HYRCANUM MARE**, called also the Caspian Sea. See CASPIAN SEA.

HYRCANUS I. prince and high-priest of the Jews, succeeded his father Simon Maccabæus, about A. M. 3815, and after reigning thirty-one years, died B. C. 106.

HYRCANUS II. king and high-priest of the Jews, was murdered by his son-in-law, Herod the Great, B. C. 30, after reigning near twenty-three years.

HYRTIA, a country of Bœotia, near Aulis; with a lake, river, and town, of the same name.

HYSSOPUS, *HYSSOP*; a genus of the gymnospermia order, and dydynamia class of plants; the corolla has the lower lip with a small crenate segment; stamina straight, distant. There are three species; but only one of them, viz. the officinalis, or common hyssop, is cultivated for use. Besides by possessing the general virtues of aromatics, they have been supposed useful in humoral asthma, coughs, and other disorders of the lungs; and are said to promote expectoration.

HYSTERIA, or the *HYSTERIC AFFECTION* or *PASSION*, [from *ὑστέρησις*, the womb,] a disease in women, called also suffocation of the womb, and vulgarly, fits of the mother. It is a spasmodico-convulsive affection of the nervous system, proceeding from the womb. See MEDICINE.

HYSTERON PROTERON, in grammar and rhetoric, a species of hyperbaton, wherein the proper order of construction is so inverted, that the part of any sentence which should naturally come first is placed last; as in this of Terence, *Valet et vivit*, for *vivit et valet*: and in the following of Virgil, *Moriamur, & in media arma ruamus*, for *In media arma ruamus, & moriamur*.

HYSTRIX, *PORCUPINE*, in zoology, a genus of quadrupeds of the order glires. They have two fore-teeth, obliquely divided both in the upper and under jaw, besides eight grinders; body covered with quills or prickles; toes, four or five on the fore-feet. There are five species. See Plate LXIX.

H. CRISTATA, the *CRESTED PORCUPINE*, has four toes on the fore-feet, five on the hind-feet, a crested head, a short tail, and the upper lip is divided like that of a hare. The length of the body is about two feet, and the height about two and a half. The body is covered with prickles, some of them nine or ten inches long, and about one-fourth of an inch thick. Like the hedge-hog, he rolls himself up in a globular form, in which position he is proof against the attacks of the most rapacious animals. The prickles are exceedingly sharp, and each of them has five large, black, and as many white, rings, which succeed one another alternately from the root to the point. These quills the animal can erect or let down at pleasure; when irritated, he beats the ground with his hind-feet, erects his quills, shakes his tail, and makes a considerable rattling noise with his quills. Most authors have asserted,

serted, that the porcupine, when irritated, darts his quills to a considerable distance against the enemy, and that he will thus kill very large animals. But Count Buffon, and some other late naturalists, after repeatedly irritating him without effect, assure us, that he possesses no such power. He says, indeed, that when the creature was much agitated with passion, some of the quills which adhered but slightly to the skin, would fall off, particularly from the tail; and this circumstance, he imagines, has given rise to the mistake. The porcupine, though originally a native of Africa and the Indies, can live and multiply in the more temperate climates of Spain and Italy.

H. DORSATA, or CANADA PORCUPINE, the urson of Buffon, has four toes on the fore-feet, five on the hind-feet: and has quills only on the back, which are short, and almost hid among the long hair. He is about two feet long. This species inhabits North America, as high as Hudson's Bay; and makes its nest under the roots of great trees. They are very plentiful near Hudson's Bay, and many of the trading Indians depend on them for food. They feed on wild fruits and bark of trees, especially on juniper; eat snow in winter, and drink water in summer; but avoid going into it. When they cannot avoid their pursuer, they will fiddle towards him, in order to touch him with the quills, which seem but weak weapons of offence; for on stroking the hair they will come out of the skin, sticking to the hand. The Indians stick them in their noses and ears, to make holes for placing their ear-rings and other finery: they also trim the edges of their deer-skin habits

with fringes made of the quills, or cover them with their bark-boxes.

H. MACROURA, has five toes both on the hind and fore-feet; his tail is very long, and the prickles are elevated. He inhabits the isles of the Indian Archipelago, and lives in the forests.

H. MEXICANA, the MEXICAN PORCUPINE, the hoitzlacuatzin, or the Coendou of Buffon, is of a dusky colour, with very long bristles intermixed with the down: the spines three inches long, slender, and varied with white and yellow; scarcely apparent except on the tail, which Hernandez says is thicker and shorter than that of the Prehensilis. He adds, that the tail, from the middle to the end, is free from spines; and that he grows to the bulk of a middle-sized dog. His length is eighteen inches from the nose to the tail; the tail nine, French measure, but taken from a mutilated skin. He inhabits the mountains of Mexico, lives on fruits, and may be easily tamed. The Indians pulverise the quills, and say they are very efficacious in gravelly cases; and applied whole to the forehead, will relieve the most violent headach.

H. PREHENSILIS, or the BRASILIAN PORCUPINE, has four toes on the fore-feet, five on the hind, and a long tail. It is considerably less than the cristata. The legs and feet are covered with long brownish hair; the rest of the body covered with quills interspersed with long hair; the quills are about five inches long, and about one-twelfth of an inch diameter. He feeds upon birds and small animals. He sleeps in the day like the hedgehog, and searches for his food in the night.

I, J.

I, Is in English considered both as a vowel and consonant; though, since the vowel and consonant differ in their form as well as sound, they may be more properly accounted two letters. As a letter I is the ninth of the alphabet, and the third vowel. It is pronounced by throwing the breath suddenly against the palate, as it comes out of the larynx, with a small hollowing of the tongue, and nearly the same opening of the lips in talk as in pronouncing *a* or *e*. Its sound varies: I vowel has a long sound, as *fine*, *thine*, which is usually marked with an *e* final; and a short sound, as *sin*, *thin*. Prefixed to *e* it makes a diphthong of the same sound with the soft *i*, or double *e*, *ee*: thus *field*, *yield*, are spoken as *feeld*, *yeeld*; except *friend*, which is spoken *friend*. Subjoined to *a* or *e* it makes them long, as *fail*, *neigh*; and to *o* makes a mingled sound which approaches more nearly to the true notion of a diphthong, or sound composed of the sounds of two vowels, than any other combination of vowels in the English language, as *oil*, *coin*. In some words, it is pronounced like *y*, as in *collier*, *onion*, &c. No English word ends in *i*, *e* being either added to it, or else the *i* turned into *y*. The ancients sometimes changed *i* into *u*; as, *decimus* for *decimus*; *maximus* for *maximus*, &c. According to Plato, the vowel *i* is proper to express delicate but humble things, as in this verse in Virgil, which abounds in *i*'s and is generally admired:

Accipiunt inimicum imbrem remisque fatiscunt.

J consonant has invariably the same sound with that of *g* in *giant*, as, *jade*, *jet*, *jilt*, *jolt*, *just*. As a numeral, I signifies *one*, and stands for so many units as it is times repeated: thus I, one; II, two; III, three, &c.; and when put before a higher numeral, it subtracts its value, as, IV, four; IX, nine, &c. But when set after it so many are added to the higher numeral as there are I's added: thus, VI, is 5+1, or six; VII, 5+2, or seven; VIII, 5+3, or eight. The ancient Romans likewise used I for 500, CI for 1000, IGG for 5000, CCI for 10,000, IGGG for 50,000, and CCCIGGG for 100,000. Farther than this, as Pliny observes, they did not go in their notation; but, when necessary, repeated

the last number, twice for 200,000, thrice for 300,000, and so on.

JABLONSKI, THEODORE, counsellor of the court of Prussia, and secretary of the royal academy of sciences at Berlin, was a man of distinguished merit. He loved the sciences, and did them honour, without that ambition which is generally seen in men of learning: it was owing to this modesty that the greatest part of his works were published without his name. He published, in 1711, a French and German Dictionary; a Course of Morality, in 1712; a Dictionary of Arts and Sciences, in 1721; and translated Tacitus de Moribus Germanorum into High Dutch, in 1724.

JABLUNKAU, a town of Silesia, in the territory of Teschen, 30 miles S.E. of Troppaw. Lon 18. 10. E. Lat. 49. 41. N.

JABNE, or JABNEEL, in ancient geography, a town of Palestine, near Joppa (Josh. xv. 2 Chron. xxvi.) called Jamnia, or Jamnia, by the Greeks and Romans.

JACCA, an ancient town of Spain, in Arragon, 50 miles N. by E. of Saragossa. Lon. 0. 9. W. Lat. 42. 36. N.

IACCHUS, [from *ιαχω*, to shout,] a name of Bacchus, from the shouting at his festivals.

JACEA, BELL-WEED. See CENTAUREA.

JACI DE AGUILA, a sea-port of Sicily, on the eastern coast, between Catania and Tavormina. Lon. 15. 26. E. Lat. 37. 27. N.

JACK, in mechanics, an instrument in common use for raising heavy timber, or very great weights of any kind, being a powerful combination of teeth and pincions, and the whole inclosed in a strong wooden stock or frame, BC, and moved by a winch or handle HP. See fig. 8, 9, Plate XCV. In fig. 9, the wheel or rack-work is shewn, being the view of the inside when the stock is removed. Though it is not drawn in the just proportions and dimensions, for the rack AB must be supposed at least four times as long in proportion to the wheel Q, as the figure represents it; and the teeth, which will be then four times more in number, to have about three in the inch. Now, if the handle HP is seven inches long, the circumference of this radius will be forty-four inches,

which is the distance or space the power moves through in one revolution of the handle; but as the pinion of the handle has but four leaves, and the wheel Q suppose twenty teeth, or five times the number; therefore to make one revolution of the wheel Q, it requires five turns of the handle, in which case it passes through five times forty-four, or two hundred and twenty inches; but the wheel having a pinion R of three leaves, these will raise the rack three teeth, or one inch, in the same space. Hence, then, the handle or power moving two hundred and twenty times as fast as the weight, will raise or balance a weight of two hundred and twenty times its own energy. And if this is the hand of a man who can sustain fifty pounds weight, he will, by the help of this jack, be able to raise or sustain a weight or force of eleven thousand pounds, or about five tons weight. This machine is sometimes open behind, from the bottom almost up to the wheel Q, to let the lower claw, which in that case is turned up as at B, draw up any weight. When the weight is drawn or pushed sufficiently high, it is kept from going back by hanging the end of the hook S, fixed to a staple, over the curved part of the handle at h. Mr. Moccock, of Southwark, obtained a premium of twenty guineas from the Society of Arts, for his contrivance to prevent a jack from taking a retrograde course whenever the weight by any accidental circumstance over-balanced the power. The improved jack only differs from those in common use in this respect, that it has a pall or clock, and ratchet, applied in such manner as to stop the motion of the machine as soon as it begins to run back again. As the difference in the mechanism is very trifling, the improvement may be easily applied to any common jack already made, and indeed ought not to be omitted.

JACK is also the name of a well-known engine, in the kitchen, used for turning a spit. Here the weight is the power applied, acting by a set of pulleys; the friction of the parts, and the weight with which the spit is charged, are the forces to be overcome; and a steady uniform motion is maintained by means of a fly. ABC, fig. 11, represents the barrel round which the cord QR is wound; KL the main wheel, commonly containing sixty teeth; N the worm-wheel of about thirty teeth, cut obliquely; LM the pinion, of about fifteen; O the worm or endless screw, consisting of two spiral threads, making an angle of sixty or seventy degrees with its axis; X the stud, and Z the loop of the worm-spindle; P a heavy wheel or fly, connected with the spindle of the endless screw to make the motion uniform; DG the struck-wheel fixed to the axis FD; S, S, S, are holes in the frame, by which it may be nailed to a board, and thence to any wall, the end D being permitted to pass through it; III the handle going upon the axis ET, to wind up the weight when it has run down. R is a box of fixed pulleys, and V a corresponding one of moveable pulleys carrying the weight. The axis ET is fixed in the barrel AC, which axis being hollow, both it and the barrel turn round upon the axis FD, which is fixed to the wheel KL, when it turns in the order BTA; but cannot turn the contrary way, by reason of a catch nailed to the end AB, which lays hold of the cross-bars in the wheel LK. The weight, by means of the cord QR, in consequence of its descent, carries about the barrel AB, which by the action of the catch carries the wheel KL, and this moves the pinion LM and wheel N, the latter moving the worm O and the fly P. Also the wheel LM carries the axis FD with the wheel DG, which carries the cord or chain that goes about the wheel or pulley at the head of the spit. But when the handle H gives motion to the axis in a contrary order to that given by the weight, the catch is depressed; so that although the barrel BC moves and winds the cord upon it, the wheel DG continues at rest. The time which the jack continues in motion depends upon the number of pulleys at R and V: and as these increase or decrease, so must the weight which communicates the motion, in order to perform the same work in the same time.

JACK, SMOKE, is an engine used for the same purpose as the common jack; and is so called from its being moved by means of the smoke, or rarified air, ascending the chimney, and striking against the sails of the horizontal wheel AB, fig. 10, which being inclined to the horizon is moved about the axis of the wheel, together with the pinion C, which carries the wheels D and E; and E carries the chain F, which turns the spit. The wheel AB should be placed in the narrow part of the chimney, where the motion of the smoke is swiftest, and where also the greatest part of it must strike upon the sails. The force of this machine depends upon

the draught of the chimney, and the strength of the fire. Smoke-jacks are sometimes moved by means of spiral flyers coiling about a vertical axle; and at other times by a vertical wheel with sails like the float-boards of a mill; but the above is the more customary construction.

JACK, in sea-language, a flag, displayed from a mast erected on the outer end of a ship's bowsprit. In the British navy the jack is a small union flag; but in merchant ships this union is bordered with a red field. See UNION.

JACK is used also for a great leathern pitcher to carry drink in.

JACK, SMOKE. See SMOKE-JACK.

JACK-BY-THE-HEDGE. See ERYSIMUM.

JACK FLAG, in a ship, a flag hoisted up at the sprit-sail top-mast head.

JACK-IN-A-BOX. See HERNANDIA.

JACK-WITH-A-LANTERN, an ignis fatuus.

JACKAL, in zoology. See CANIS.

JACKDAW. See CORVUS. These birds are very mischievous to the farmer and gardener. The following useful method of destroying them by a kind of spring is much used. A stake about five feet long is driven into the ground, and made so fast that it cannot move, and so sharp in the point that the bird cannot settle upon it. Within a foot of the top a hole is bored through it, of three quarters of an inch diameter; through this hole is put a stick eight inches long; then a horse-hair noose is made fast to a thin hazel wand, and this brought up to the place where the short stick is placed, and carried with it through the hole, the remainder being left open under that stick. The other end of the hazel-rod is put through a hole in the stake near the ground, and fastened there. The stake being planted among the jackdaw's food, he is naturally led to settle on it: but finding the point too sharp, he descends to the little cross-stick, which sinks with his weight, and the noose holds him fast by the leg.

JACKSON, PORT, a port and bay of New South Wales, on the E. coast of New Holland, 9 miles N. of Botany Bay.

JACMEL, a sea-port of Hispaniola, on the neck of the S. peninsula.

JACOB, [יַעֲקֹב, Heb. *i. e.* a supplanter,] the son of Isaac and Rebekah, was born A. M. 2168, and B. C. 1836. The history of this patriarch is recorded in Genesis, xxv.—l. He died in Egypt in the 147th year of his age, and was honourably interred in Abraham's burying-place, near Hebron.

JACOB, GILES, an eminent lawyer, born at Romsey in Southamptonshire, in 1686. He is principally known for his Law Dictionary in one vol. folio, which has been often printed. He also wrote two dramatic pieces; and a Poetical Register, containing the lives and characters of English dramatic poets. He died in 1744.

JACOB BEN HAJIM, a rabbi famous for the collection of the Masora in 1515; together with the text of the bible, the Chaldaic paraphrase, and Rabbinical commentaries.

JACOB BEN NAPHTALI, a famous rabbi of the fifth century: he was one of the principal Masorets, and bred at the school of Tiberias in Palestine with Ben Aser. The invention of the vowel-points, and of accents to facilitate the reading of the Hebrew, are ascribed to these two rabbis: and said to have been done in an assembly of the Jews held at Tiberias, A. D. 476.

JACOBINS, or the JACOBINE CLUB, in modern history and politics, a political party in France, who cut a very conspicuous figure in the commencement of the French revolution; and were so called from their meeting in the hall of the Jacobin Friars at Paris. Many of them were members of the Constituent National Assembly of France, and many more were deputies to the different conventions which succeeded it. They are represented as having been determined enemies to monarchy, aristocracy, and the Christian religion; as "outrageously democratical, and fanatically impious." The origin of this sect or party has been ascribed to M. Voltaire, "who, daring (says Dr. Gleig,) to be jealous of his God, and being weary, as he said himself, of hearing people repeat, that twelve men were sufficient to establish Christianity, resolved to prove that one might be sufficient to overthrow it. Full of this project, he swore, before 1730, to dedicate his life to its accomplishment; and for some time he flattered himself, that he should enjoy alone the glory of destroying the Christian religion. He found, however, that associates would be necessary; and from the numerous tribe of his admirers and disciples, he chose D'Alembert

D'Alembert and Diderot as the most proper persons to co-operate with him in his designs. He contrived to embark in the same cause Frederick II. of Prussia, who wished to be thought a philosopher, and who of course deemed it expedient to talk and write against a religion he had never studied, and into the evidence of which he had probably never deigned to enquire. This royal adept was one of the most zealous of Voltaire's coadjutors, till he discovered that the Philosophists were waging war with the throne as well as with the altar." (Suppl. to Encyc. Brit. II. 763.) The Abbé Barruel says, that "at its very first appearance this sect counted 300,000 adepts; and it was supported by 2,000,000 of men, armed with torches and pikes, and all the firebrands of the revolution;" and he adds, that it was "the coalition of a triple sect, of a triple conspiracy, in which, long before the revolution, the overthrow of the altar, the ruin of the throne, and the dissolution of all civil society, had been debated and determined."

JACOBITES, a term of reproach bestowed on the persons who, vindicating the doctrines of passive obedience and non-resistance to princes, disavow the revolution in 1688, and assert the supposed rights, and adhere to the interests, of king James II. and his family.

JACOBITES, in church-history, a sect of Christians in Syria and Mesopotamia; so called either from Jacob a Syrian who lived in the reign of the emperor Mauritius, or from one Jacob a monk who flourished in 550. They are of two sects, some following the rites of the Latin church, and others continuing separated from it.

JACOB'S STAFF, a mathematical instrument, also called a cross-staff; a kind of astrolabe.

JACOBUS, a gold-coin, worth twenty-five shillings, so called from King James VI.

JACQUINIA, in botany, a genus of the monogynia order, and pentandria class of plants; corolla ten-cleft; stamina inserted into the receptacle; berry one-seeded. It has four species, natives of S. America.

JACULATOR, or SHOOTING FISH. See CHÆTODON.

JADDESSES, an interior order of priests in Ceylon, who have the care of the chapels appropriated to the genii, a third order of gods among these idolaters.

JADE. See NEPHRITE.

JAEN, a province of Spain, bounded on the E. and S. by Granada; nearly sixty miles square.

JAEN, the capital of the above province, forty-five miles E. of Cordova.

JAEN, or BRACAMOROS, a district of South America, in Quito. JAEN, the capital of Jaen, 330 miles N. N. E. of Lima.

JAFÀ, an independent country of Arabia, N. W. of Aden and Hadramaut. It is governed by three chiefs; and is fertile, particularly in coffee.

JAFÀ, a lake of Persia, in Segestan.

JAFFA, an ancient town of Asia, in Palestine, formerly called Joppa, fifty miles N. W. of Jerusalem.

JAFFIERABAD, a town of Hindoostan, in Berar. Lon. 76. 25. E. Lat. 20. 22. N.

JAFFNAPATAM, or JAFFNAPATAN, a sea-port town, seated at the N. E. end of the island of Ceylon.

JAGARNAUT, a famous pagoda of Hindoostan, in the province of Orissa, on the bay of Bengal, close to the shore, a few miles E. of lake Chilka. It is a shapeless mass of building, and only remarkable as one of the first objects of Hindoo veneration, and an excellent sea-mark. It is 311 miles S. W. of Calcutta. Lon. 85. 40. E. Lat. 19. 35. N.

JAGERNDORF, a town and castle of Silesia, sixty-five miles S. by E. of Breslaw.

JAGGERNAUT, a black pyramidal stone worshipped by the Gentoos, who pretend that it fell from heaven, or was miraculously presented on the place where their temple stands.

JAGHIRE, in the Indian polity, a grant of land from a sovereign to a subject, revokable at pleasure, but generally a life-rent.

JAGHIRE OF THE CARNAIC, a tract of land, in the peninsula of Hindoostan, subject to the English East India Company. It extends along the bay of Bengal, from Madras to the Lake Pulicat on the N. to Almeparvé on the S. and to Conjeveram on the W. being 108 miles along the shore, and 47 inland in the widest part. This Jaghire, Major Rennel thinks, is understood to be held in perpetuity. It contains 2440 square miles, and its revenue is about 150,000*l.* a year.

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JAGO, a town of Africa, in Guinea, on the Formosa, seventy miles from the sea.

JAGO, ST. an island on the coast of Africa, the largest, most populous, and fertile, of the Cape Verd islands, and the residence of the Portuguese viccroy.

JAGO, ST. a large navigable river of S. America, which rises in the audience of Quito, in Peru.

JAGO, ST. a handsome and considerable town of South America, the capital of Chili, with a good harbour, a bishop's see, and a royal audience. Lon. 69. 35. W. Lat. 33. 40. S.

JAGO, ST. a river of Mexico, which falls into the N. Pacific Ocean.

JAGO, ST. DE CUBA, a town of the isle of Cuba, situated on the southern coast. Lon. 76. 44. W. Lat. 20. 0. N.

JAGO, ST. DE LA VEGA, or SPANISHTOWN, the capital of Jamaica, is seated on the S. E. part of the island, on the bay of Port Royal. Lon. 76. 49. W. Lat. 18. 6. N.

JAGO, ST. DEL ENTERO, a town of South America, one of the most considerable of Tucuman, and the usual residence of the inquisitor.

JAGO, ST. DE LEON, a town of South America, in Terra Firma.

JAGRA, a country of Africa, on the Gambia, abounding in rice, corn, cotton, &c. fifty miles from the coast.

JAGUEER, in East India affairs, a pension from the grand Mogul, or King of Delhi; generally such as are assigned for military services.

JAGUEERDAR, the holder of a jagueer. It comes from three Persian words, *Ja*, a place; *gueriftun*, to take; and *dashtun*, to hold; *q. d.* a place-holder or pensioner. In the times of the Mogul empire, all the great officers of the court, called omrahs, were allowed jagueers, either in lands of which they collected the revenues, or assignments upon the revenues for specified sums, payable by the lord lieutenant of a province: which sums were for the maintenance and the support of such troops as they were bound to bring into the field when demanded by the emperor, as the condition of their jagueers, which were always revokable at pleasure.

JAIL. See JEHOVAH.

JALAP. See CONVULVULUS.

JALEMUS, in antiquity, a kind of mournful song, used upon occasion of death, or any other affecting accident. Hence the Greek proverb, *ωδὴν οἰκιστοῦ*, or *φανεροῦ*, i. e. more sad than a jalemus, *ὡς τὸς ἱερῶν ἐγγραπτοῦ*, worthy to be ranked among jalemus.

JALOFFS, or YALOFFS, a powerful and warlike nation in Africa, who inhabit the country between the Senegal and the Mandingoes.

JAMADAR, an officer of horse or foot, in Hindoostan. Also, the head or superintendant of the Peons in the Sewaury or train of any great man.

JAMAGOROD, a strong town of Ingria, twelve miles N. E. of Narva.

JAMAICA, an island of the West Indies, the largest of the Antilles, lying between 17° and 19° Lat. N. and between 76° and 79° Lon. W.; near 170 miles long, about 60 broad, and containing about 5,000,000 of acres. It approaches in its figure to an oval. The prospect of this island from the sea, by its constant verdure, and numerous bays, is wonderfully pleasant. The coast, and for some miles within, the land is low, but farther within land, it is hilly. The whole isle is divided by a ridge of mountains running E. and W. some rising to a great height: and composed of rocks and a very hard clay; through which the rains have worn long and deep cavities, called gullies. These mountains, however, are adorned by their summits by a variety of fine trees. There are also about 100 rivers that issue from them on both sides; and, though none of them are navigable but by canoes, are both pleasing and profitable. The climate, like that of all countries between the tropics, is very warm towards the sea, and in marshy places unhealthy; but in more elevated situations, cooler; and, where people live temperately, fully as healthful as in any part of the West Indies. The rains fall heavy for about a fortnight in May and October. Thunder is pretty frequent, and sometimes hail; but ice and snow, except on the tops of the mountains, are never seen: though at no very great height, the air is exceedingly cold. Their streams, though small, supply the inhabitants with good water, which is a great

great blessing, as their wells are generally brackish. They have several hot springs, which have performed great cures. Jamaica abounds in maize, pulse, vegetables of all kinds, meadows of fine grass, great variety of beautiful flowers, oranges, lemons, citrons, and other rich fruits; with horses, asses, mules, hogs, goats, black cattle of a large size, and sheep, the flesh of which is well tasted, though their wool is hairy and bad; also sea and river fish, wild, tame, and water fowls. Amongst its other valuable commodities are sugar-canes, cacao, indigo, pimento, cotton, ginger, and coffee; trees for timber and other uses, such as mahogany, manchineel, white wood, which no worm will touch, cedar, olives, tustic, red wood, and various other materials for dyeing: with many valuable drugs, such as guaiacum, sarsaparilla, cassia, tamarinds, vanillas, and the prickly pear, or opuntia, which produces the cochineal; with a number of odoriferous gums. Near the coast they have salt-ponds, with which they supply their own consumption, and might make any quantity they pleased. This island abounds with a number of excellent ports. Jamaica lies 90 miles E. of St. Domingo, 90 N. of Cuba, and 4000 S. W. of Great Britain. Its centre lies in Lon. 76. 45. W. and 18. 12. Lat. N.

JAMANLABAD, a strong and almost impregnable fortress in the Mysore country, the last that resisted the British arms in 1798—9. It is seated on a rock, 1700 feet perpendicular in height, twenty miles N. E. of Mangalore. It surrendered on the 10th Oct. 1799.

IAMBE, in fabulous history, a servant-girl of Metanira, afterwards wife of Celeus, King of Eleusis, who endeavoured to exhilarate Ceres, when she travelled in search of Proserpine. From the humour she displayed on that occasion, free and satirical verses are said to have been called iambs.

JAMBI, a mercantile town on the E. coast of Sumatra. The Dutch have a fort in it, and export pepper from it, with the best sort of canes. Lon. 103. 55. E. Lat. 0. 30. S.

IAMBICS, in ancient poetry. See **IAMBUS**. Ruddiman makes two kinds of iambs, viz. dimeter and trimeter; the former contain four feet, and the latter six. Their feet are various. In many verses of Horace, they consist entirely of iambuses: as,

1 2 3 4 5 6
Dim. Inar[sit æ]stuosius
Trim. Suis[et ipsa] Ro[ma] vi[]ribus[]ruit.

A dactylus, spondeus, anapestus, and sometimes tribrachys, obtain in the odd places; and the tribrachys also in the even places, excepting the last. Examples of all of which may be seen in Horace; as,

1 2 3 4 5 6
Canidi[]a trac[]tavit[]dapes[]
Vide[]re prope[]rantes domum[]
Dimeter.

Quò quò[]scele[]sti rui[]tis[]aut[]cur dex[]teris.
Prius[]que cæ[]lum si[]det in[]ferius[]mari.
Alite[]bus at[]que cani[]bus homi[]cidæ[]Hectorem.
Pavidum[]que lepo[]r aut ad[]venam laqueo[]gruem.

JAMBLICUS, a celebrated Platonic philosopher, of Colchis, whom Julian equals to Plato. He was the disciple of Anatolius and Porphyry, and died in the reign of Constantine the Great.

JAMBLICUS, another celebrated Platonic philosopher, born at Apamea, in Syria, and nearly contemporary with the former. Julian wrote several letters to him, and it is said he was poisoned under the reign of Valens. It is not known to which of the two we ought to attribute the works in Greek under the name of Jamblicus, viz. 1. The History of the Life of Pythagoras, and the Sect of the Pythagoreans. 2. An Exhortation to the Study of Philosophy. 3. A Piece against Porphyry's Letter on the Mysteries of the Egyptians.

IAMBUS, in the Greek and Latin prosody, a poetical foot, consisting of a short syllable followed by a long one; as in

v- v- v- v-
Θε γειω, *Dei meus.*

Horace calls the iambus pes citus, a swift, rapid, foot. The name, according to some, took its rise from Iambus, the son of Pan and Echo, who invented this foot. Others derive it from Iambe, Queen of Eleusis. (See **IAMBE**.) Others from the Greek ιαμ, poison; or ιαμβίζω, I rail; because Iambics were at first only used in satire.

JAMDRO, or **PALTA**, an extensive lake of Asia in Thibet,

150 miles in circumference, with many islands and hills in the middle of it.

JAMES VI. King of Scotland, and I. of England, was the son of Mary, Queen of Scots; whom he succeeded in Scotland, in 1567, as he did Elizabeth in England, in 1603. Strongly attached to the Protestant religion, he signalized himself in its support; which gave rise to the horrid conspiracy of the Papists to destroy him and all the English nobility by the Gunpowder Plot, discovered Nov. 5, 1605. In 1606, a political test of loyalty was required, which cleared the kingdom of those disaffected Roman Catholic subjects who would not submit to it. The chief glory of this king's reign consisted in the establishment of new colonies, and the introduction of some manufactures. The nation enjoyed peace, and commerce flourished during his reign. Yet his administration was despised both at home and abroad: for, being the head of the Protestant cause in Europe, he did not support it in that great crisis, the war of Bohemia; abandoning his son-in-law the elector Palatine; negotiating when he should have fought, deceived at the same time by the courts of Vienna and Madrid; and continually sending illustrious ambassadors to foreign powers, but never making a single ally. He valued himself much upon his polemical writings; and was so fond of theological disputations, that he founded, for this express purpose, Chelsea College; which was converted to a much better use by Charles II. His Basilicon Doron, Commentary on the Revelation, writings against Bellarmine, and his Dæmonologia, or Doctrine of Witchcraft, are sufficiently known. There is a collection of his writings and speeches in one folio volume. Several other pieces of his are extant; some of them in the Cabala, others in MS. in the British Museum, and others in Howard's collection. He died in 1625, in the fifty-ninth year of his age, and twenty-third of his reign.

JAMES, DR. THOMAS, a learned English critic and divine, born about 1571. He was educated at Winchester, and studied at Oxford, where he took his degree of D. D. and was appointed keeper of the public library. He distinguished himself by the arduous undertaking of publishing a catalogue of manuscripts in each college-library at both universities. He was elected to this office in 1602, and held it eighteen years, when he resigned it. In the convocation held with the parliament, Oxford, in 1625, of which he was a member, he moved to have proper commissioners appointed to collate the manuscripts of the fathers in all the libraries in England, with the popish editions, in order to detect the forgeries in the latter; but this proposal not meeting with the desired encouragement, he engaged in the laborious task himself, which he continued until his death in 1629. He left behind him a great number of learned works.

JAMES, ROBERT, M. D. an English physician of great eminence, and particularly distinguished by his fever-powder, was born at Kinverston, in Staffordshire, A. D. 1703. His father was a major in the army, and his mother a sister of Sir Robert Clarke. He was of St. John's College in Oxford, where he took the degree of A. B. and afterwards practised physic at Sheffield, Litchfield, and Birmingham. Thence he removed to London, became a licentiate in the college of physicians, practised physic, and in 1743, published a Medicinal Dictionary, in three volumes folio. Soon after he published an English translation, with a Supplement by himself, of Ramazzini de Morbis Artificum; to which he prefixed a piece of Frederic Hoffman, upon Endemial Distempers, 8vo.; in 1746, the Practice of Physic, 2 vols. 8vo.; in 1760, on Canine Madness, 8vo.; in 1764, a Dispensatory, 8vo. June 25, 1755, when the king being at Cambridge, he was admitted M. D. by mandamus. In 1778, were published, A Dissertation upon Fevers, and A Vindication of the Fever-Powder, 8vo. with a short Treatise on the Disorders of Children. This was the eighth edition of the Dissertation, of which the first was printed in 1751; and the purpose of it was, to set forth the success of this powder, as well as to describe more particularly the manner of administering it. The Vindication was posthumous and unfinished; for he died March 23, 1776, while he was employed upon it. Dr. James was married, and left several sons and daughters.

JAMES, ST. surnamed **MAJOR**, or **THE GREATER**, the son of Zebedee, and the brother of John the evangelist, was born at Bethsaida in Galilee. The only authentic accounts we have of him are recorded by the evangelists. It is believed that St. James first preached the gospel to the dispersed Jews; and afterwards returned

turned to Judea, where he preached at Jerusalem, when the Jews excited Herod Agrippa against him, who put him to a cruel death about A.D. 44. Thus he was the first of the apostles who suffered martyrdom. St. Clement of Alexandria relates, that his accuser was so struck with his constancy, that he became converted and suffered with him. The Spaniards pretend that they had St. James for their apostle, and boast of possessing his body; but Baronius, in his *Annals*, refutes their pretensions.

JAMES, ST. surnamed MINOR, or THE LESS, an apostle, the brother of Jude, and the son of Cleophas and Mary the sister of the mother of our Lord, is called in Scripture the Just, and the brother of Jesus, who appeared to him in particular after his resurrection. He was the first bishop of Jerusalem, when Ananias II. high priest of the Jews, caused him to be condemned, and delivered him into the hands of the people and the Pharisees, who threw him down from the steps of the temple, when a fuller dashed out his brains with a club, about the year sixty-two. His life was so holy, that Josephus considers the ruin of Jerusalem as a punishment inflicted on that city for his murder. He was author of, the epistle which bears his name.

JAMES, ST. OF THE SWORD, (SAN JAGO DEL SPADA), a military order in Spain, instituted in 1170, by Ferdinand II. King of Leon and Galicia, to stop the incursions of the Moors; three knights obliging themselves by a vow to secure the roads.

JAMES ISLAND, an island of Africa, thirty miles up the Gambia.

JAMES ISLAND, an island of the United States, opposite Charleston in South Carolina, E. of John's-Island, containing about fifty families.

JAMES RIVER, or the JAMES, or the FLUVANNA, a large navigable river of Virginia, which rises on the W. side of Jackson's Mountain, and falls into Chesapeake Bay near James-Town.

JAMES'S POWDER, a medicine prepared by Dr. R. James, of which the basis has been long known to chemists, though the particular receipt for making it lay concealed in Chancery till made public by Dr. Monro in his *Medical and Pharmaceutical Chymistry*, (Vol. I. p. 366,) wherein he gives the following copy of it: "Take antimony, calcine it with a continued protracted heat, in a flat, unglazed, earthen vessel, adding to it from time to time a sufficient quantity of any animal oil and salt, well dephlegmated; then boil it in melted nitre for a considerable time, and separate the powder from the nitre, by dissolving it in water." Dr. Monro adds, that "when the doctor first administered his powder, he used to join one grain of a mercurial preparation to 33 grains of his antimonial powder; but in the latter part of his life he often declared that he had long laid aside the addition of the mercurial." Dr. James, at the end of the receipt given into chancery, says, 'the dose of these medicines is uncertain; but in general thirty grains of the antimonial and one grain of the mercurial is a moderate dose.' Of this medicine Dr. Monro says, "Like other active preparations of antimony, it sometimes operates with great violence, even when given in small doses; at other times a large dose produces very little visible effects."

JAMES-TOWN, a borough of Ireland, in the county of Leitrim, five miles N. W. of Carrick on Shannon, and 73 N. W. of Dublin.

JAMES-TOWN, a town of the United States, in Virginia.

JANTLAND, a mountainous province of Sweden, near Norway, of an oval form; this province is seventy miles long, and sixty broad.

JANE OF FLANDERS, a remarkable lady, who seems to have possessed all the best qualities of both sexes, was the wife of John de Mountfort, a competitor for the dukedom of Brittany upon the death of John III. This duke, dying without issue, left his dominions to his niece Jane, wife of Charles de Blois nephew to the king of France; but John Mountfort, brother to the late duke, though by a second marriage, claimed the duchy, and was received as successor by the people of Nantes. The greatest part of the nobility swore fealty to Charles de Blois, thinking him best supported. This dispute occasioned a civil war; in the course of which John was taken prisoner, and sent to Paris. This misfortune would have ruined his party, had not his interest been supported by the extraordinary abilities of his wife, Jane. Bold, daring, and intrepid, she fought like a warrior in the field; shrewd, sensible, and sagacious, she spoke like a politician in the council; and en-

dowed with the most amiable manners, and winning address, she was able to move the minds of her subjects by the force of her eloquence, and mould them to her pleasure. She was at Rennes when she received the news of her husband's captivity; but that disaster served only to rouse her native courage and fortitude. She forthwith assembled the citizens; and, holding in her arms her infant son, recommended him to their care and protection in the most pathetic terms, as the male heir of their ancient dukes, who had always governed them with lenity and indulgence, and to whom they had ever professed the most zealous attachment. She declared herself willing to run all hazards with them in so just a cause; pointed out their resources in the alliance of England; earnestly beseeching them to make one vigorous effort against an usurper, who being forced upon them by the intrigues of France, would, as a mark of his gratitude, sacrifice the liberties of Brittany to his protector. The people, moved by the affecting appearance, and animated by the noble conduct, of the princess, vowed to live and die with her in defending the rights of her family; and their example was followed by almost all the Bretons. The countess went from place to place, encouraging the garrisons of the several fortresses, and providing them with every thing necessary for their subsistence; after which she shut herself up with her son in Hennebon, where she resolved to wait for the succours which Edward III. had promised to send to her assistance. Charles de Blois, accompanied by the dukes of Burgundy and Bourbon, and many other noblemen, took the field with a numerous army, and having reduced Rennes, laid siege to Hennebon, which was defended by the countess in person. This heroine repulsed the assailants in all their attacks with the most undaunted courage, and observing one day that their whole army had left the camp to join in a general storm, she rushed forth at a postern gate, with 300 horse, set fire to their tents and baggage, killed their sutlers and servants, and raised such a terror and consternation through all their quarters, that the enemy gave over their assault, and getting betwixt her and the walls, endeavoured to cut off her retreat to the city. Thus intercepted, she put the spurs to her horse, and, without halting, galloped directly to Brest, which lay at the distance of two and twenty miles from the scene of action. There being supplied with a body of 500 horse, she immediately returned, and fighting her way through part of the French camp, was received into Hennebon, amidst the acclamations of the people. Soon after this the English succours appeared, and obliged the enemy to raise the siege.

JANEIRO, a province of Brazil in S America, seated between the tropic of Capricorn and Lat. 22° S. It is bounded on the N. by the province of Spirito Sancto, on the E. and S. by the Atlantic Ocean, and on the W. by the mountains which separate it from Guiana.

JANEIRO, RIO DE, i. e. the river of Janeiro, or Januarius, a river of South America, which rises in the mountains W. of Brazil, and, running E. through Brazil, falls into the Atlantic at St. Sebastian.

JANISSARIES, or JANIZARIES, an order of infantry in the Turkish armies; reputed the grand seignior's foot-guards. Vossius derives the word from *genizers*, which in the Turkish language signifies *novi homines* or new troops. D'Herbelot tells us, that *jenitcheri* signifies a new band; and that the name was first given by Amurath I. who choosing out one-fifth of his Greek Christian prisoners, and instructing them in the discipline of war, and the doctrines of their religion, sent them to Hagi Bektasche (a person whose pretended piety rendered him extremely revered among the Turks,) that he might confer his blessing on them, and at the same time give them some mark to distinguish them from the rest of the troops. Bektasche, after blessing them, cut off one of the sleeves of his fur-gown, and put it on the head of the leader of this new militia: from which time, (viz. A. D. 1361,) they have still retained the name *jenitcheri*, and the fur-cap. The number of janizaries is generally above 40,000; divided into 162 companies or chambers called *odas*, where they live together at Constantinople as in a convent. They are of a superior rank to all other soldiers, and are also more arrogant and factious; and it is by them that the public tranquillity is oftenest disturbed. The government may therefore be said to be in the hands of the Janizaries. They have, however, some good qualities; they are employed to escort travellers, and especially ambassadors and persons of high rank, on the

the road; in which cases, they behave with the utmost zeal and fidelity.

JANIZARIES, at Rome, are officers of the pope, called also *participantes*, on account of certain duties which they enjoy in the annates, bulls, or expeditions, being officers of the third bench or college of the Roman chancery.

JANNA, a territory of European Turkey, in Macedonia, the Thessalia of the ancients. Larissa is the capital.

JANNA, or **JANNINA**, a town in the above province, inhabited by rich Greek merchants, 62 miles W. of Larissa.

JANOWITZ, a town of Bohemia, in the circle of Kaushim. It is 48 miles S. E. of Prague.

JANSEN, or **JANSENIUS**, **CORNELIUS**, D. D. bishop of Ypres, and professor of Divinity, in the universities of Louvain and Douay, was one of the most learned divines of the 17th century, and founder of the sect of the Jansenists. He was born in Holland, of Catholic parents, and studied at Louvain. Being sent to transact some business of consequence relating to the university, into Spain, the Catholic king, viewing with a jealous eye the intriguing policy of France, engaged him to write a book to expose the French to the pope as not good Catholics, as they formed alliances with Protestant states. Jansen performed this task in his *Mars Gallicus*; and was rewarded with the see of Ypres in 1635. He had, among other writings, before this, maintained a controversy against the Protestants upon the points of grace and predestination; but his Augustinus was the principal labour of his life, on which he spent above 20 years.

JANSENISTS, in church history, a sect of Roman Catholics in France, who followed the opinions of Dr. Jansenius, in relation to grace and predestination. In 1640, the universities of Louvain and Douay, and particularly P. Molina and F. Leonard Celsus, condemned the opinions of the Jesuits on grace and free will. This having set the controversy on foot, Jansenius opposed to the doctrine of the Jesuits the sentiments of St. Augustine; and wrote a treatise on grace, entitled *Augustinus*. This treatise was attacked by the Jesuits, who accused Jansenius of maintaining heretical opinions; and afterwards, in 1642, obtained of pope Urban VIII. a formal condemnation of Jansenius's treatise; when the partisans of Jansenius gave out that the bull was spurious, and composed by a person devoted to the Jesuits. After the death of Urban, Jansenism began to be more warmly controverted, and gave birth to an infinite number of polemical writings concerning grace. And what occasioned some mirth, was the titles each party gave to their writings: one published "The Torch of St. Augustine," another found "Smuffers for St. Augustine's Torch," and father Veron found "A Gag for the Jansenists," &c. In 1650, 68 bishops of France subscribed a letter to pope Innocent X. requesting an enquiry into, and condemnation of, the five following propositions, extracted from Jansenius's *Augustinus*: 1. Some of God's commandments are impossible to be observed by the righteous, even though they endeavour with all their power to accomplish them. 2. In the state of corrupted nature, we are incapable of resisting inward grace. 3. Merit and demerit, in a state of corrupted nature, does not depend on a liberty which excludes necessity, but on a liberty which excludes constraint. 4. The Semipelagians admitted the necessity of an inward preventing grace for the performance of each particular act, even for the beginning of faith; but they were heretics in maintaining that this grace was of such a nature, that the will of man was able either to resist or obey it. 5. It is Semipelagianism to say, that Jesus Christ died, or shed his blood for all mankind in general. In 1652, the pope appointed a congregation for examining into the dispute, Jansenius was condemned; and the bull of condemnation, published in 1653, filled all the pulpits in Paris with violent outcries against the heresy of the Jansenists.

JANUARIUS, Sr. the patron-saint of Naples, where his head is occasionally carried in procession, in order to stop the eruptions of Vesuvius. The liquefaction of his blood is a famous miracle at Naples. The saint suffered martyrdom about the end of the third century. When he was beheaded, a pious lady of Naples caught about an ounce of his blood, which, tradition says, has been carefully preserved in a bottle ever since, without having lost a single grain of its weight. This of itself, were it demonstrable, might be considered as a greater miracle than the circumstance on which the Neapolitans lay the whole stress, viz. that the blood which has con-

gealed, and acquired a solid form by age, is no sooner brought near the head of the saint, than, as a mark of veneration, it immediately liquefies. This experiment is made thrice a-year, and is considered by the Neapolitans as a miracle of the first magnitude. The substance in the bottle, which is exhibited for the blood of the saint, is supposed to be something naturally solid, but which melts with a small degree of heat. When first brought out of the cold chapel, it is in its solid state; but when brought before the saint by the priest, and rubbed between his warm hands, and breathed upon for some time, it melts; and this is the whole mystery. The head and blood of the saint are kept in a kind of press, with folding doors of silver, in the chapel of St. Januarius belonging to the cathedral church. The real head is probably not so fresh, and well preserved, as the blood. On that account it is not exposed to the eyes of the public; but is inclosed in a large silver bust, gilt and enriched with jewels of high value. This being what appears to the people, their idea of the saint's features and complexion are taken entirely from the bust. The blood is kept in a small repository by itself.

JANUARY, [from *Janus*, to whom it was consecrated, or from *janua*, Lat. a gate, this month being as it were, the gate of the year.] January and February were introduced into the year by Numa Pompilius; Romulus's year beginning in March. The calendar, or first of this month, was under the protection of Juno, and consecrated to Janus by an offering of a cake made of new meal and new salt, with new frankincense and new wine. On this day a beginning was made of every intended work; the consuls elect took possession of their office, and, with the flamines, offered sacrifices and prayers for the prosperity of the empire: all animosities were suspended, and friends gave and received Strenæ, or new-year's gifts. On this day too the Romans were jovial and merry; and oftentimes such scenes of drunkenness were exhibited, that they might have distinguished it with the name of All-fools day. The ancient Christians fasted on this day, by way of opposition to the superstitions and debaucheries of the heathens.

JANUS, in fabulous history and mythology, the first king of Italy, who, received Saturn hospitably, when he was driven from Arcadia by Jupiter. He tempered the manners of his subjects, and taught them civility: and from him they learned to improve the vine, to sow corn, and to make bread. After his death, he was adored as a god. He was thought to preside over all new undertakings. Hence, in all sacrifices, the first libations of wine and wheat were offered to Janus, all prayers prefaced with a short address to him; and the first month of the year was dedicated to and named from him. See **JANUARY**. Janus was represented with two faces, either to denote his prudence, or that he views at once the past and approaching years; he had a sceptre in his right hand, and a key in his left, to signify his extensive authority, and his invention of locks.

JAO-PIN, a town of China, of the third rank, in the province of Quang-tong, 22 miles N. E. of Tchao.

JAPAN, or **JAPON**, a large and powerful empire of Asia, consisting of a great number of islands, between the E. coast of Asia, and the W. coast of America; extending from 130° to 147° Lon. E. and from 30° to 41° Lat. N. Were South and North Britain divided by an arm of the sea, Japan might be compared to England, Scotland, and Ireland, with their islands, peninsulas, bays, channels, &c. all under the same monarch. Japan is the European name: but the inhabitants called the empire Nippon, from the largest island belonging to it; and the Chinese Chiphon, probably on account of its eastern situation; names signifying, in these languages, the Basis or Foundation of the Sun. It was first discovered by the Portuguese about A. D. 1542. Most of the islands which compose it are surrounded with such high craggy mountains, and such shallow and boisterous seas, that sailing about them is extremely dangerous; and the creeks and bays are choaked up with such rocks, shelves, and sands, that it looks as if Providence had designed it to be a kind of little world by itself. The Chinese pretend to have first peopled these islands, but it is probable that the original inhabitants were a mixture of different nations, driven thither by those tempestuous seas, at different times. As these islands lie in the fifth and sixth climates, they would be much hotter in summer than England, were not the heats refreshed by the winds which continually blow from the sea around them, and to which they are much exposed by the height of their situation,

tion; which renders their winters extremely cold, and their seasons inconstant. They have great falls of snow in winter, commonly followed by hard frosts. The rains in summer are very violent, especially in June and July, which on that account are called *sat-suki*, or water-months. The country is also much subject to dreadful thunders and lightnings, as well as storms and hurricanes, which frequently do a great deal of damage. The soil, though naturally barren and mountainous, by the industry of the inhabitants, not only supplies them with every necessary of life, but also furnishes other countries with them; producing, besides corn, the finest and whitest rice and other grains, with great variety of fruits, and vast numbers of cattle. Besides rice, and a sort of wheat and barley, with two sorts of beans, they have Indian wheat, millet, and several other kinds in abundance. Their seas, lakes, and rivers, abound with fish; and their mountains, woods, and forests, are well stocked with horses, elephants, deer, oxen, buffaloes, sheep, hogs, and other useful animals. Some of their mountains also are enriched with mines of gold, silver, and copper, exquisitely fine, besides tin, lead, iron, and various other minerals and fossils; whilst others abound with several sorts of marble and precious stones. Mr. Bryant says, "The history of Japan is divided into three eras; which consist of gods, demigods, and mortals. The person whom the natives look upon to be the real founder of their monarchy is Synmu, in whose reign the Sintoo religion, the most ancient of the country was introduced." This Synmu, or Sin-Noo, he considers to be the same with Noah. According to Dr. Thunberg's researches, the Japanese have never been subdued by any foreign power, not even in the most remote periods; their chronicles contain such accounts of their valour, as one would rather consider as fabulous inventions than actual occurrences, if later ages had not furnished equally striking proofs of it. When the Tartars, for the first time in 799, had over-run part of Japan, and when, after a considerable time had elapsed, their fleet was destroyed by a violent storm in the course of a night, the Japanese general attacked, and so totally defeated, his numerous and brave enemies, that not a single person survived to carry the tidings of such an unparalleled defeat. When the Japanese were again, in 1281, invaded by the warlike Tartars, to the number of 240,000 fighting men, they gained a victory equally complete. The government of these islands, has been long monarchical; though formerly it was split into a great number of petty kingdoms, which were at length all united into one. The imperial dignity had been enjoyed, for a considerable time before 1500 by a regular succession of princes, under the title of *dairos*, a name supposed to have been derived from *Dairo* the head of that family. The principal furniture of the Japanese consists in straw-mats, which serve for seats and beds; a small table for eating, is the only moveable. The Japanese sit always upon their hams. Before dinner begins, they make a profound bow, and drink to the health of the guests. The women eat by themselves. During the courses, they drink a glass of *Sakki*, a kind of beer made of rice kept constantly warm; and they drink at each new morsel. Tea and *sakki* are the most favourite drink of this people; wine and spirits are never used, nor even accepted when offered by the Dutch. *Sakki* is clear as wine, and of agreeable taste: taken in great quantity, it intoxicates and causes headach. Tobacco is in universal vogue, and smoked continually, by both sexes. The gardens about their houses are adorned with a variety of flowers, trees, verdure, baths, terraces, and other embellishments. The furniture and decorations of the houses of persons of distinction consist in japan-work of various colours, curious paintings, beds, couches, skreens, cabinets, tables, a variety of porcelain jars, vases, tea-equipage, &c. together with swords, guns, scymitars, and other arms. The Japanese are very ingenious in most handicraft trades, and excel the Chinese in several manufactures, particularly in the beauty, goodness, and variety, of their silks, cottons, and other stuffs, and in their japan and porcelain wares. No eastern nation comes up to them in the tempering and fabricating of scymitars, swords, muskets, and other such weapons. The Japanese architecture is much in the same taste and style as that of the Chinese, especially as to their temples, palaces, and other public buildings; but in private ones they affect more plainness and neatness than show. These last are of wood and cement, consisting of two stories; they dwell only in the lower; the upper chamber serving for wardrobes. The dress of the Japanese deserves,

more than that of any other people, the name of national; as they are not only different from that of all other men, but are also of the same form in all ranks, from the monarch to his meanest subject, as well as in both sexes; and what exceeds all credibility, they have not been altered for at least 2460 years. They universally consist of night-gowns, made long and wide, of which several are worn at once by all ranks and all ages. The more distinguished and the rich have them of the finest silk; the poorer sort of cotton. Those of the women reach down to the ground, and sometimes have a train; in the men, they reach down to the heels: travellers, soldiers, and labourers, either tuck them up, or wear them only down to the knees. The habit of the men is generally of one colour; the women have theirs variegated, and frequently interwoven with flowers of gold. The men seldom wear a great number; but the women 30, 50, or more, all so thin, that they scarcely together amount to 5lb. The undermost serves for a shirt, and is therefore either white or blue, and for the most part thin and transparent. All these gowns are fastened round the waist with a belt, which in the men are about a hand-breadth, in the women about a foot; of such a length that they go twice round the waist, and afterwards are tied in a knot with many ends and bows. The knot, particularly among the fair sex, is very conspicuous, and immediately informs the spectator whether they are married or not. The unmarried have it behind, on their back; the married before. In this belt the men fix their sabres, fans, pipe, tobacco, and medicine-boxes. In the neck the gowns are always cut round, without a collar; they therefore leave the neck bare; nor is it covered with cravat, cloth, or any thing else. The sleeves are always very wide: at the opening before, they are half sewed up, so that they form a sack, in which the hands can be put in cold weather; they also serve for pockets. Girls have their sleeves so long that they reach down to the ground. Such is the simplicity of their habit, that they are soon dressed: and to undress, they need only open their girdle, and draw in their arms. As the gowns, from their length, keep the thighs and legs warm, there is no occasion for stockings; nor do they use them in all the empire. Among poorer persons on a journey, and among soldiers, who have not such long gowns, buskins of cotton are used. Shoes, or more properly slippers, are, of all that is worn by the Japanese, the simplest and meanest, though in general use among high and low, rich and poor. They are made of interwoven rice-straw; and sometimes, for persons of distinction, of reeds split very thin. They consist only of a sole, without upper leathers or quarters. The religion throughout Japan is Paganism split into several sects; every sect having its own temples and priests. The spiritual emperor, the *Dairi*, is the chief of their religion. They acknowledge and honour a Supreme Being. Dr. Thunberg saw two temples of the God of gods of a majestic height. The temples are open to every body, even to the Dutch; and if they are in want of a lodging, when they go to the court of Jedo, they are entertained with hospitality in these temples. Christianity, or rather Popery, had once made a considerable progress in this country, in consequence of a mission conducted A. D. 1549, by the Portuguese and Spanish Jesuits, amongst whom the famous St. Francis Xavier was employed, but soon relinquished the service. There were also some Franciscan friars of Spain engaged. The Jesuits and friars were supplied from Goa, Macao, and the Manillas. At first the undertaking proceeded with the most rapid success, but ended at last in the most tragical manner, all owing to the pride and haughtiness, the misconduct, rapacity, and senseless extravagant conspiracy of the fathers against the state. This folly and madness produced a persecution of 40 years duration, terminated by a most horrid and bloody massacre, not to be paralleled in history. In 1640, the Portuguese, as likewise the Christian religion, were totally expelled the country; and the most effectual means taken for preventing their return. The natives are for this purpose prohibited from going out of the country; and all foreigners are excluded from an open and free trade; for as to the Dutch and Chinese, under which last name some other eastern nations go thither, they are shut up whilst they remain there, and a most strict watch is set upon them, inasmuch that they are little better than prisoners; and the Dutch, it is said, to obtain a privilege even so far, declared themselves to be no Christians, but Dutchmen. This calumny, however, Dr. Kempster has endeavoured to wipe off. A few days after the beginning of the year

is performed the horrid ceremony of trampling on images representing the cross and the Virgin Mary with her child. The images are of copper, scarce a foot in height. This ceremony is intended to impress every individual with hatred of the Christian religion, and to discover whether there is any remnant of it left. It is performed in the places where the Christians chiefly resided. In Nagasaki it lasts four days; the images are then conveyed to the circumjacent places, and afterwards laid aside till next year. Every person except the governor and his attendants, even the youngest child, must be present; but it is not true, as some have pretended, that the Dutch are obliged to trample on the cross. The sciences are very far from having arrived at the same height in Japan as in Europe. The history of the country is, however, very authentic, and is studied, without distinction, by all. Agriculture, which is considered as the art most necessary, and most conducive to the support and prosperity of the kingdom, is no where brought to greater perfection than here; where neither civil nor foreign wars, nor emigration, diminishes population; and where no idea is entertained, either of getting possession of other countries, or of importing the productions of foreign lands; but where the utmost care is taken that no spot lies uncultivated, and no produce of the earth unemployed. Astronomy is studied and respected; but the natives are unable, without the aid of Chinese, and sometimes of Dutch almanacks, to form a true calendar, or calculate an eclipse within minutes and seconds. Medicine is not likely to arrive at any degree of perfection. Anatomy is totally unknown; the knowledge of diseases is extremely imperfect, and botanical medicines constitute the whole of their remedies. They use only simples; and these generally in diuretic and diaphoretic decoctions. Jurisprudence is not an extensive study in Japan. No country has thinner law-books, or fewer judges. Explanation of the law, and advocates, are altogether unknown: but no where are the laws more strictly or impartially executed; and law-suits so very short. The Japanese know little more of physics or chemistry than what they have learned of the Europeans. Their computation of time takes its rise from Min-o, or 660 years before Christ. The year is divided according to the changes of the moon; and so that some years consist of 12 and others of 13 months, and the year begins in February or March. They pretend, like the Chinese, to have been the inventors of printing from time immemorial, and their method, like theirs, is on wooden blocks; but they excel them in the neatness of cutting them, as well as in the goodness of their ink and paper. They also claim the invention of gunpowder: and are vastly superior to the Chinese in the use of all sorts of fire-arms, as well as in the curiousness of their fire-works. Their manner of writing is, like that of the Chinese, in columns from top to bottom, beginning at the right, and ending at the left hand. Their characters were originally the same, but now differ considerably. Their language has some affinity with the Chinese, though it appears from its various dialects to have been a kind of compound of that and other languages, derived from the various nations that first peopled those islands. Their weapons consist of a bow and arrow, sabre, halbert, and musket. The bows are very large, and the arrows long, as in China. When the bows are to be bent and discharged, the troop always rests on one knee, which hinders them making a speedy discharge. In the spring, the troops assemble to practise shooting at a mark. Muskets are not general; the barrel is of the common length: but the stock is very short, and there is a match in the lock. The sabre is their principal weapon, and is universally worn except by the peasants.

JAPANNING, the art of varnishing and drawing figures on wood, in the manner done by the natives of Japan. The substances which admit of being japanned are almost every kind that are dry and rigid, or not too flexible; as wood, metals, leather, and prepared paper. Wood and metals do not require any other preparation, but to have their surface perfectly even and clean; but leather should be securely strained either on frames or on boards; as its bending or forming folds would otherwise crack and force off the coats of varnish; and paper should be treated in the same manner, and have a previous strong coat of some kind of size; but it is rarely made the subject of japanning till it is converted into papier maché, or wrought by other means into such form, that its original state, particularly with respect to flexibility, is lost. One principal variation from the method formerly used

in japanning is, the using or omitting any priming or undercoat on the work to be japanned. In the former practice, such priming was always used; and is at present retained in the French manner of japanning coaches and snuff-boxes of the papier maché; but in the Birmingham manufacture, it has been always rejected. The advantage of using such priming or undercoat is, that it makes a saving in the quantity of varnish used; because the matter of which the priming is composed fills up the inequalities of the body to be varnished; and makes it easy, by means of rubbing and water-polishing, to gain an even surface for the varnish: and this was therefore such a convenience in the case of wood, as the giving a hardness and firmness to the ground was also in the case of leather, that it became an established method; and is therefore retained even in the instance of the paper maché by the French, who applied the received method of japanning to that kind of work on its introduction. There is nevertheless this inconvenience always attending the use of an undercoat of size, that the japan coats of varnish and colour will be constantly liable to be cracked and peeled off by any violence, and will not last near so long as the bodies japanned in the same manner, but without such priming; as may be easily observed by comparing the wear of the Paris and Birmingham snuff-boxes; which last when good of their kind, never peel, crack, or suffer any damage, unless by great violence, and such a continued rubbing as wastes away the substance of the varnish; while the japan coats of the Parisian crack and fly into flakes, whenever any knock or fall, particularly near the edges, exposes them to be injured. But the Birmingham manufacturers, who originally practised the japanning only on metals, to which the reason above given for the use of priming did not extend, and who took up this art of themselves as an invention, of course omitted at first the use of any such undercoat; and not finding it more necessary in the instance of papier maché, than on metals, continue still to reject it. On which account, the boxes of their manufacture are, with regard to the wear, much better than the French. The laying on the colours in gum-water, instead of varnish, is also another variation from the method of japanning formerly practised: but the much greater strength of the work, where they are laid on in varnish or oil, caused this way to be justly exploded in all regular manufactures; however, they who may practise japanning on cabinets, or other such pieces as are not exposed to much wear and violence, for their amusement only, and consequently may not find it worth while to encumber themselves with the preparations necessary for the other methods, may paint with water-colours on an undercoat laid on the wood or other substance of which the piece to be japanned is formed; and then finish with the proper coats of varnish, according to the methods below taught: and if the colours are tempered with the strongest isinglass-size and honey, instead of gum-water, and laid on very flat and even, the work will not be much inferior in appearance to that done by the other method, and will last as long as the old japan. The common size has been generally used for the purpose of priming: but where the work is of a nicer kind, it is better to employ the glover's or the parchment-size; and if one-third of isinglass be added, it will be still better, and, if not laid on too thick, much less liable to peel and crack. The work should be prepared for this priming, by being well smoothed with the fish-skin or glass-shaver; and being made thoroughly clean, should be brushed over once or twice with hot size, diluted with two thirds of water, if it be of the common strength. The priming should then be laid on with a brush as even as possible; and should be formed of size, whose consistence is betwixt the common kind and glue, mixed with as much whitening as will give it a sufficient body of colour to hide the surface of whatever it is laid upon, but no more. If the surface be very clean on which the priming is used, two coats of it laid on in this manner will be sufficient; but if, on trial with a fine wet rag, it will not receive a proper water-polish, on account of any inequalities not sufficiently filled up and covered, two or more coats must be given it; and whether a greater or less number be used, the work should be smoothed, after the last coat but one is dry, by rubbing it with Dutch rushes. When the last coat is dry, the water-polish should be given, by passing over every part of it with a fine rag gently moistened, till the whole appear perfectly plain and even. The priming will then be completed, and the work ready to receive the painting or coloured varnish; the rest of the proceedings

ceedings being the same in this case as where no priming is used. When wood or leather is to be japanned, and no priming is used, the best preparation is to lay two or three coats of coarse varnish composed as follows:—"Take of rectified spirit of wine one pint, and of coarse seed-lac and resin, each twenty ounces. Dissolve the seed-lac and resin in the spirit; and then strain off the varnish." This varnish, as well as all others formed of spirit of wine, must be laid on in a warm place; and, if it can be conveniently managed, the piece of work to be varnished should be made warm likewise; and for the same reason all dampness should be avoided; for either cold or moisture chills this kind of varnish, and prevents its taking proper hold of the substance on which it is laid. When the work is thus prepared by the priming with the composition of size and whitening above described, the proper japan ground must be laid on, which is best formed of shell-lac varnish, and the colour desired, if white be not in question, which demands a peculiar treatment, or great brightness be not required, when also other means must be pursued. The colours used with the shell-lac varnish may be any pigments whatever which give the tint of the ground desired; and they may be mixed together to form browns or any compound colours. As metals never require to be undercoated with whitening, they may in general be treated in the same manner as wood or leather, when the undercoat is omitted. The forming a ground perfectly white, and of the first degree of hardness, remains hitherto a desideratum, in the art of japanning, as there are no substances which form a very hard varnish but what have too much colour not to deprave the whiteness, when laid on of a due thickness over the work. The nearest approach, however, yet known, to a perfect white varnish, is made as follows: Take flake white, or white lead, washed over and ground up with one-sixth of its weight of starch, and then dried; and temper it properly for spreading with the mastich varnish prepared as directed under the article VARNISH. Lay these on the body to be japanned, as above directed; and then varnish it over with five or six coats of the following varnish: provide any quantity of the best seed-lac; and pick out of it all the clearest and whitest grains, reserving the more coloured and fouler parts for the coarse varnishes, such as that used for priming or preparing wood or leather. Take of this picked seed-lac two ounces, and of gum animi three ounces, reduce them to a gross powder, and dissolve them in about a quart of spirit of wine; then strain off the clear varnish. The seed-lac will yet give a slight tinge to this composition; but cannot be omitted where the varnish is wanted to be hard; though, when a softer will answer the end, the proportion may be diminished, and a little crude turpentine added to the gum-animi to take off the brittleness. A very good varnish, free entirely from all brittleness, may be formed by dissolving as much gum-animi as the oil will take, in old nut or poppy-oil; which must be made to boil gently when the gum is put into it. The ground of white colour itself may be laid on in this varnish, and then a coat or two of it may be put over the ground; but it must be well diluted with oil of turpentine when it is used. This, though free from brittleness, is liable to suffer by any slight strokes; and it will not well bear any polish, but may be brought to a very smooth surface without, if it be judiciously managed in the laying it on. It is likewise somewhat tedious in drying, and will require some time where several coats are laid on; as the last ought not to contain much oil of turpentine.

JAPAN-WORK, METHOD OF PAINTING. Japan-work ought properly to be painted with colours in varnish: though, for the greater dispatch, and, in some very nice works small, for the freer use of the pencil, the colours are sometimes tempered in oil; which should previously have a fourth part of its weight of gum-animi dissolved in it; or of the gum-sandarac, or of gum-mastich. When the oil is thus used, it should be well diluted with spirit of turpentine, that the colours may be laid more evenly and thin; by which means, fewer of the upper coats of varnish are necessary. In some instances, water-colours are laid on grounds of gold, in the manner of other paintings; and are best, when so used, in their proper appearance, without any varnish over them. They are also sometimes so managed as to have the effect of embossed work. The colours employed in this way, for paintings are best prepared by isinglass-size, corrected with honey or sugar-candy. The body of which the embossed work is raised, need not, however, be tinged with the exterior colour; but may be best formed

of very strong gum-water, thickened to a proper consistence by bole armenian and whitening in equal parts; which, being laid on the figure, and repaired when dry, may be then painted with the proper colours tempered in the isinglass-size, or with shell-lac varnish.

JAPAN-WORK, METHOD OF VARNISHING. The finishing part of japanning lies in the laying on and polishing the outer coats of varnish: which are necessary, as well in the pieces that have only one simple ground of colour, as with those that are painted. This is the best done with common seed-lac varnish, except in some few instances: and the same reasons which decide as to the fitness or impropriety of the varnishes, with respect to the colours of the ground, hold equally with regard to those of the painting: for where brightness is the most material point, and a tinge of yellow will injure it, seed-lac must give way to the whiter gums; but where hardness, and a greater tenacity, are most essential, it must be adhered to; and where both are so necessary, that it is proper one should give way to the other in a certain degree reciprocally, a mixed varnish must be adopted. This mixed varnish should be made of the picked seed-lac. The common seed-lac varnish, which is the most useful preparation of the kind hitherto invented, may be thus made: Take of seed lac three ounces, and put it into water to free it from the sticks and filth intermixed with it; which must be done by stirring it about, pouring off the water, and adding fresh quantities to repeat the operation, till it be free from all impurities. Then dry it, powder it grossly, and put it, with a pint of rectified spirit of wine, into a bottle, capable of holding one-third more. Shake the mixture well together; and place the bottle in a gentle heat, till the seed appear to be dissolved; the shaking being in the mean time repeated as often as convenient; and then pour off all that can be obtained clear by this method, and strain the remainder through a coarse cloth. The varnish thus prepared must be kept for use in a bottle well stoppered. When the spirit of wine is very strong, it will dissolve a greater proportion of the seed-lac: but this will saturate the common, which is seldom sufficiently strong for making varnishes in perfection: as the chilling, which is the most inconvenient accident attending those of this kind, is prevented, or produced more frequently, according to the strength of the spirit. The manner of using the seed-lac or white varnish is the same, except with regard to the substance used in polishing; which, where a pure white or great clearness of other colours is required, should be itself white: whereas the browner sorts of polishing dust, being cheaper, and doing the business more quickly, may be used in other cases. The pieces of work to be varnished should be placed near a fire, or in a room where there is a stove, and made perfectly dry; then the varnish may be rubbed over them by the proper brushes, beginning in the middle, and passing the brush to one end; and then with another stroke from the middle, passing it to the other. But no part should be crossed, or twice passed over, in forming one coat, where it can possibly be avoided. When one coat is dry, another must be laid over it; and this must be continued at least five or six times, or more, if on trial there be not sufficient thickness of varnish to bear the polish, without laying bare the painting or the ground-colour underneath. When a sufficient number of coats is thus laid on, the work is fit to be polished; which must be done, in common cases, by rubbing it with a rag dipped in Tripoli or pumice-stone, finely powdered; but towards the end of the rubbing, a little oil of any kind should be used along with rotten stone; and when the work appears sufficiently bright and glossy, it should be well rubbed with the oil alone, to clean it from the powder, and give it a still brighter lustre. In the case of white grounds, instead of the Tripoli or pumice-stone, fine putty or whitening must be used; both which should be washed over to prevent the danger of damaging the work from any sand or other gritty matter that may be mixed with them. It is a great improvement of all kinds of japan-work, to harden the varnish by heat; which, in every degree in which it can be applied, short of what would burn or calcine the matter, tends to give it a more firm and strong texture.

JAPARA, a river and sea-port of the isle of Java, on the N. coast.

JAPETUS, in fabulous history, the son of Cælus, or Titan, and Terra. The Greeks considered him as the father of all mankind. See next article.

JAPHETH, the son of Noah. His descendants possessed all Europe and the isles in the Mediterranean, including those which depend on Asia. They had all Asia Minor, and the northern parts of Asia above the sources of the Tigris and Euphrates. Noah, when he blessed Japheth, said, "God shall enlarge Japheth, and he shall dwell in the tents of Shem; and Canaan shall be his servant." This blessing or rather prophecy of Noah was accomplished when the Greeks, and after them the Romans, carried their conquests into Asia and Africa, where were the dominions of the posterity of Shem and Canaan. The sons of Japheth were Gomer, Magog, Madai, Javan, Tubal, Meshech, and Tiras. The scripture says, "that they peopled the isles of the Gentiles, and settled in different countries, each according to his language, family, and people." It is supposed that Gomer was the father of the Cimbri, or Cimmerians; Magog of the Scythians; Madai of the Macedonians or Medes; Javan of the Ionians and Greeks; Tubal of the Tibarenians; Meshech of the Muscovites or Russians, and Tiras of the Thracians. By the isles of the Gentiles, the Hebrews understand the isles of the Mediterranean, and all the countries separated by the sea from the continent of Palestine; whither also the Hebrews could go by sea only, as Spain, Gaul, Italy, Greece, and Asia Minor. The name of Japheth was very little altered by profane authors, who call him Japetus. The poets make him the father of heaven and earth. The Greeks believe that he was the father of their race, and acknowledge nothing more ancient than him. Besides the seven sons above mentioned, the Septuagint, Eusebius, the Alexandrian Chronicle, and St. Austin, give him an eighth called Eliza, who is not mentioned either in the Hebrew or Chaldee; and the eastern people affirm that he had eleven children.

JAPODES, or **JAPYDES**, an ancient tribe of Scythians, who, settling in Italy, gave the country they possessed the name of Japydia.

JAPYDIA, in ancient geography, a western district of Illyricum anciently threefold; the first Japydia extending from the springs of Timavus to Istria; the second, from the river Arsia to the river Tedanius; and the third, called Inalpina, situated in mount Albius and the other Alps, which run out above Istria. Now constituting the S. part of Carniola, and the W. of Austrian Croatia.

JAPYGIUM, in ancient geography, a promontory of Calabria; called also Salentinum; now Capo di S. Maria di Leuca.

JARDES, hard callous tumours in horses, a little below the bending of the ham on the outside. This distemper in time will make the horse halt, and grow so painful as to cause him to pine away, and become light-bellied. It is most common to manage horses, that have been kept too much upon their haunches.

JARGON. See **ZIRCON**.

JARGON, in lithology, a kind of precious stone, of the nature of the diamond, but softer; found in Brasil, according to M. de Bomare; but in Ceylon, according to M. Rome de L'Isle. Its specific gravity is nearly equal to that of the ponderous spar, being 4416. Its crystals consist of two tetrahedral pyramids of equal sides, separated by a short prism; so that the jargon is properly of a dodecahedral form. According to some lapidaries, the jargon comes nearest to the sapphire in hardness; and as it has, when cut and polished, a great resemblance to the diamond, jargons are called by some soft diamonds; and one may be easily imposed upon in purchasing these for the true kind, when they are made up in any sort of jewellery work. On exposing this stone to a violent fire, M. D'Arcot found the surface a little vitrified where it stuck to the porcelain test in which it was set; whence it appears, that the jargon has not the least resemblance to the diamond, which is destructible by fire.

JARNAC, a town of France, in the department of Charente, and late province of Angoumois. Lon. 0. 4. W. Lat. 45. 43. N.

JAROMITZ, a town of Bohemia, on the river Elbe, 52 miles N. E. of Prague.

JAROSLAW, or **JAROSLOW**, a handsome town of Austrian Poland, in the palatinate of Red Russia, with a strong citadel, 100 miles E. of Cracow.

JASHER, a book which Joshua mentions, and refers to in chap. x. 13. "Is not this written in the book of Jasher?" It is difficult to determine what this book of Jasher, or the upright, is.

St. Jerom and the Jews believed it to be Genesis, or some other book of the Pentateuch, wherein God foretold he would do wonderful things in favour of his people. Huetius supposes it was a book of morality, in which it was said, that God would subvert the course of nature in favour of those who put their trust in him. Others think it was public annals, or records, which were styled justice or upright, because they contained a faithful account of the history of the Israelites. Grotius believes, that this book was a song, made to celebrate this miracle and this victory. This seems the most probable opinion, because the words cited by Joshua as taken from this work, "Sun, stand thou still upon Gibeon, and thou moon in the valley of Ajalon," are such poetical expressions as do not suit with historical memoirs; besides that in the second book of Samuel (i. 18.) mention is made of a book under the same title, on account of a song made on the death of Saul and Jonathan.

JASIONE, in botany, a genus of the monogamia order, and syngenesia class of plants; natural order, Campanaceae. Common calyx ten-leaved; petals five, regular; capsule beneath, two-celled. Four species, natives of the West Indies.

JASION, or **JASIUS**, in fabulous history, the son of Jupiter and Electra, and king of Arcadia. Having improved agriculture, he was fabled to have married the goddess Ceres.

JASMINUM, **JASMINE**, or **JASSAMINE TREE**, in botany, a genus of the monogynia order, and diandria class of plants; natural order, Sepiariaceae. Corolla salver-shaped; berry dicocous; seeds arillated; anthers within the tube. There are seventeen species.

JASON, the Greek hero, who undertook the Argonautic expedition, the history of which is obscured by fabulous traditions, flourished about B. C. 937. See **ARGONAUTS**. He was the son of Aeson and Alcimedea, and was educated by Chiron the Centaur. His uncle Pelias having usurped his father's kingdom, Jason boldly demanded it of him, but was advised by him first to go to Colchis, and recover the golden fleece previous to the restoration of it. Aetes king of Colchis subjected him to several arduous enterprises, all which Jason, by the aid of Juno and Medea, accomplished.

JASPER, in mineralogy, a species of the clay genus. Werner divides it into six sub-species, viz. the Egyptian, the striped, the porcelain, the common, the agate, and the opal jasper. The Egyptian jasper exhibits two or more colours in concentric zones or bands, with interspersed spots or dendritic figures. It is brittle, and the specific gravity is about 2.6. It occurs in rolled pieces, chiefly spherical, in Egypt and the adjoining deserts, and on account of its beautiful colour and great hardness, it is used for similar ornamental and useful purposes as the agate. Striped jasper is grey, green, yellow, or red; these are often found together, and arranged in striped and flamed delineations. There are large beds of it in Saxony, and also in Siberia, where it is of a very beautiful kind. It admits of a high polish, and is used for purposes of ornament chiefly. Porcelain jasper generally exhibits but a single colour, and is sometimes marked with cloudy delineations. It melts before the blow-pipe. Its component parts are, according to Mr. Rose,

Silica.....	60.75
Alumina.....	27.25
Magnesia.....	3.00
Oxide of iron.....	2.50
Potass.....	3.66
	97.16
Loss.....	2.84
	100.

It is found in great plenty in Bohemia. The common jasper is found generally in the veins of primitive rocks in many parts of Europe. It is susceptible of a high polish, and much used for ornamental purposes. Opal jasper is found in nests, in porphyry, near Tokay, in Hungary, in the neighbourhood of Constantinople, and in some Siberian mountains. It is supposed to be the connecting link between jasper and opal; its superior lustre, and constant conchoidal fracture, distinguish it.

JASQUE,

JASQUE, a sea-port of Persia, on the gulf of Ormus, and in the province of Tuberan. Lon. 59 15. E. Lat. 26. 10. N.

JASSELMERE, a town of Hindoostan Proper, in a small territory of the same name, in the province of Agimere, 680 miles N. of Bombay.

JASSY, a considerable city of Europe, the capital of Moldavia, and residence of the hospodar, who is a vassal of the grand signior. Lon. 27. 35. E. Lat. 47. 9. N.

JATROPHA, the **CASSADA PLANT**: a genus of the monadelphous order, and monœcia class of plants; natural order, *Tricocœæ*. Male, calyx none; corolla one-petaled, funnel-form; staminate, alternately longer and shorter: female, calyx none; corolla five-petaled, spreading; styles three, bifid; capsule three-celled; seed one. There are fourteen species.

J. ELASTICA, with ternate leaves, elliptic, very entire, hoary underneath, and longly petioled. See Plate LXV. This is the *Hevea Guianensis*, of Aublet, (*Hist. des Plantes de la Guiane*, Fr. p. 87.) or tree which yields the elastic resin, called caoutchouc or India rubber. The Indians, by an incision in the bark, extract a viscid white substance, like that which issues from the fig-tree; they receive it into earthen moulds, to make rings, bracelets, girdles, syringes, hats, boots, flambeaux, figures of animals, &c. The Abbé Rochon says that the inhabitants of Madagascar also made flambeaux of it, which burn without wicks, and afford them a very good light when they go out to fish in the night-time; that surgery has derived some benefit from it, as it serves to make excellent bandages, and that in a state of solution it is very proper for coating over silk, to render it impervious to air or water. It has the extensibility of leather, with a very considerable elasticity.

J. JANIPHA, the **SWEET CASSADA**, has palmated leaves, with lobes very entire; the intermediate leaves lobed with a sinus on both sides. See Plate LXV. It is difficult, Dr. Wright says, to distinguish the sweet from the bitter cassada by the roots; but it will be best to avoid those of the cassada that bear flowers, as it is the bitter which is poisonous when raw.

J. MANIHOT, the **BITTER CASSADA**, has palmated leaves: the lobes lanceolate, very entire, and polished. Both the Janipha and Manihot are natives of the West Indies, where they are used as food. The root of bitter cassada has no fibrous or woody filaments in the heart, and neither boils nor roasts soft. The sweet cassada has all the opposite qualities. The bitter, however, may be deprived of its noxious qualities, which reside in the juice, by heat. Cassada bread, therefore, is made of both the bitter and sweet.

JATS, a tribe of Hindoos, in Hindoostan Proper, formerly very powerful.

JAVA, a large island of the East Indies, lying between 105° and 110° Lon. E. and between 6° and 8° Lat. S. 700 miles long, and about 100 broad. It is situated S. of Borneo, and S. E. of Malacca, having Sumatra lying before it, from which it is separated by the Straits of Sunda. The country is mountainous and woody in the middle; but the coast is flat, full of bogs and marshes; and the air is unhealthful. It produces pepper, indigo, sugar, tobacco, rice, coffee, cocoa-nuts, plantains, cardamoms, and other tropical fruits. Gold in small quantities has been found in it. Many of the mountains are so high as to be seen at the distance of ten or twelve miles. The Blue Mountain is seen farthest off at sea. They have frequent and terrible earthquakes in this island, which shake the city of Batavia and places adjacent, in the most dreadful manner. There are many forests, which abound with buffaloes, tigers, rhinoceroses, and wild horses, with an infinite variety of serpents, some of them of an enormous size. Crocodiles prodigiously large are found near the mouths of the rivers. There is great variety of peacocks, partridges, pheasants, wood-pigeons, and other fowls. They have also fish and tortoises in great plenty. There are above forty cities in the island, and more than 4500 villages, besides hamlets; which are supposed to contain in all above thirty millions of inhabitants. The Dutch are masters of the greatest part of the island, particularly of the N. coast, though some of the princes beyond the mountains, on the S. coast, still maintain their independency.

JAVELIN, in antiquity, a spear: it was five feet and a half long; the shaft was of wood, and the point of steel. Every soldier in the Roman armies had seven of these, which were very light and slender.

JAUER, a city of Silesia, capital of a province so named, 30 miles S. W. of Breslau. Lon. 16. 29. E. Lat. 50. 56. N.

JAUFTIONI, a river of Louisiana, which runs S. E. and falls into the Mississippi, 16 miles S. of the Fabiani, in Lat. 39. 15. N.

JAUNDICE, [*jaunisse*, *jaune*, yellow, Fr.] a distemper from obstructions of the glands of the liver, which prevents the gall being duly separated by them from the blood; and sometimes, especially in hard drinkers, they are so indurated as never after to be opened, and straiten the motion of the blood so much through that viscus, as to make it divert with a force great enough into the gastric arteries, which go off from the hepatic, to break through them, and drain into the stomach; so that vomiting of blood, in this distemper, is a fatal symptom. See **MEDICINE**.

JAW, LOCKED, is a spasmodic contraction of the lower jaw, commonly produced by some external injury affecting the tendons or ligaments. See **MEDICINE**.

JAWS. See **MAXILLÆ**.

JAY, GUY MICHAEL LE, a French gentleman, who distinguished himself by causing a polyglot bible to be printed at his own expence in ten volumes folio: but he ruined himself by that impression, first because he would not suffer it to appear under the name of cardinal Richelieu, who, after the example of cardinal Ximenes, was ambitious of thus eternizing his name; and next, because he made it too dear for the English market; on which Dr. Walton undertook his polyglot bible, which, being more commodious, reduced the price of M. le Jay's. After the death of his wife, M. le Jay took orders, was made dean of Vezelay in the Nivernois, and Louis XIV. gave him the post of counsellor of state. He died in 1675.

JAY, in ornithology. See **CORVUS**.

JAYNA, a canton, parish, and river, of Hispaniola, in the S. part of the island, formerly belonging to Spain.

JAYPOUR, a town of Hindoostan, in Orissa, 400 miles S. W. of Patna.

JAZEL, a precious stone of an azure or blue colour.

JAZER, or **JASER**, in ancient geography, a Levitical city in the territory of the Amorites, beyond Jordan, 10 miles W. or rather S. W. of Philadelphia, and 15 miles from Heshbon; and therefore situated between Philadelphia and Heshbon, on the E. border of the tribe of Gad, supposed to be the Jazorem of Josephus. In Jeremiah, xlviii. mention is made of the sea of Jazer, that is a lake; taken either for an effusion or overflowing of the Arnon, or a lake through which it passes, or from which it takes its rise.

JAZIGES, or **JAZYGES**, an ancient nation of Sarmatia, who inhabited the country, on the banks of the *Palus Mæotis*. Tacitus xii. 29.

IBACH, a river of Germany, in Brisgau.

IBAICABAL, a river of Spain, which runs into the Bay of Biscay, below Bilbao.

IBBERVILLE, an island of West Florida, in the Mississippi. Lon. 91. 24. W. Lat. 30. 42. N.

IBERIA, the ancient name of Spain, so called from the river Iberus.

IBERIA was also the name of an inland country in Asia, having Colchis and a part of Pontus on the W. mount Caucasus on the N. Albania on the E. and Armenia Major on the S. It is now the western part of Georgia.

IBERIS, **SCIATICA CRESSES**, or **CANDY-TUFT**; a genus of the siliquosa order, and tetradynamia class of plants; natural order, Siliquose. Corolla irregular; two exterior petals larger than the interior ones; silicula polyspermous, emarginated. It has fourteen species.

IBERUS, a river of Spain, now the Ebro.

IBEX, in zoology. See **CAPRA**.

IBIS, in ornithology. See **TANTALUS**.

ICARUS. See **DÆDALUS**.

ICE, [*is*, Sax.] in physiology, a solid, transparent, and brittle body, formed of some fluid, particularly water, by means of cold. See **CALORIC**, and **FREEZING**. When water is exposed to a diminished temperature, it assumes the solid state, by shooting into crystals which cross each other in angles of 60 degrees. During this process of solidification, the temperature remains constant, being 32 degrees of the scale of Fahrenheit. M. Lemery, the younger,

younger, observes, that ice is only a re-establishment of the parts of water in their natural state; that the mere absence of fire is sufficient to account for this re-establishment; and that the fluidity of water is a real fusion, like that of metals exposed to the fire; differing only in this, that a greater quantity of fire is necessary to the one than the other. Galileo was the first that observed ice to be specifically lighter than the water which composed it: and hence it happens, that ice floats upon water, its specific gravity being to that of water as eight to nine. This rarefaction of ice seems to be owing to the air-bubbles produced in water by freezing; and which, being considerably large in proportion to the water frozen, render the body so much specifically lighter: these air-bubbles, during their production, acquire a great expansive power, so as to burst the containing vessels, though ever so strong. M. Marian, in a dissertation on ice, attributes the increase of its bulk chiefly to a different arrangement of the parts of the water; the icy skin on the water being composed of filaments which are constantly and regularly joined at an angle of 60° ; and which, by this angular disposition, occupy a greater volume than if they were parallel. He found the augmentation of the volume of water by freezing, in different trials, a fourteenth, an eighteenth, a nineteenth, and when the water was previously purged of air, only a twenty-second part: that ice, even after its formation, continues to expand by cold; for, after water had been frozen to some thickness, the fluid part being let out by a hole in the bottom of the vessel, a continuance of the cold made the ice convex; and a piece of ice, which was at first only a fourteenth part specifically lighter than water, on being exposed some days to the frost, became a twelfth part lighter. To this cause he attributes the bursting of ice on ponds. Wax, resins, and animal fats, made fluid by fire, instead of expanding like watery liquors, shrink in their return to solidity: for solid pieces of the same bodies sink to the bottom of the respective fluids; a proof that these bodies are more dense in their solid than in their fluid state. The oils which congeal by cold, as oil olive, and the essential oil of aniseeds, appear also to shrink in their congelation. Hence, the different dispositions of different kinds of trees to be burst by, or to resist, strong frosts, are by some attributed to the juices with which the tree abounds; being in the one case watery, and in the other resinous or oily. Ice concretes generally on the surface of the water; but this effect frequently varies under different circumstances. In the northern parts of Europe, there are three species of ice: 1. That which is formed on the surface. 2. Another kind, which congeals in the middle of the water, and bears some resemblance to small hail; and, 3. Ground-ice, that is produced at the bottom; especially where it meets with any fibrous substance to which it may adhere. The last species is full of irregular cells; and, on account of its inferior specific gravity, it produces many singular effects, by bringing up heavy bodies from the bottom of the water in which it is formed. The ice that concretes in the middle of the water, rises to the top, where it unites into large masses: the formation, however, both of this, and of the ground-ice, takes place only during intense and sudden frosts, in shallow waters, the surface of which is disturbed either by the wind or the current of the stream, so that it cannot be easily consolidated. In many countries, the warmth of the climate renders ice not only a desirable, but even a necessary article: hence it becomes an object of some importance to procure it in a cheap and easy manner. For this purpose, in the East Indies, three or four pits are dug on a large open plain, each of which is about thirty feet square, and two feet deep; the bottoms are covered to the depth of eight or ten inches with dried straw, or the stems of sugar-canes. On this bed are arranged, in rows, a number of unglazed pans made of porous earth, about a quarter of an inch thick, and an inch and a quarter deep, which are filled about sun-set, with water that has been boiled and become cool. Early in the morning, a coat of ice is found on the pans, which is broken by striking an iron-hook into its centre, and then conveyed in baskets to the place of preservation. The most expeditious method, however, of producing ice, consists in a combination of sal ammoniac with nitre. See FREEZING.

ICE-BERGS, large bodies of ice filling the valleys between the high mountains in northern latitudes. Among the most remarkable are those of the E. coast of Spitzbergen. They are seven in number, but at considerable distances from each other: each fills

the valleys for tracts unknown, in a region totally inaccessible in the internal parts. The glaciers of Switzerland seem contemptible to these; but present often a similar front into some lower valley. See GLACIERS. The last exhibits over the sea a front 300 feet high, emulating the emerald in colour: cataracts of melted snow precipitate down various parts, and black spring mountains, streaked with white, bound the sides, and rise crag above crag, as far as the eye can reach in the back ground.

ICE-BOAT. See BOAT.

ICE-CREAM, cream cooled by ice. It is prepared by mixing three parts cream with one of the juice or jam of raspberries, or currant, &c.: after beating and straining the mixture, put it with a little juice of lemon into a pewter-mould; cover the mould, and place it in a pail about two-thirds full of ice, into which two handfuls of salt have been thrown; turn the mould by the hand-hold with a quick motion to and fro, in the manner used for milling chocolate, for eight or ten minutes; then let it rest as long, and turn it again for the same time; and having left it to stand half an hour, it is fit to be turned out of the mould, and to be sent to table.

ICE-HOUSE, a repository for preserving ice during summer. The aspect of ice-houses should be towards the E. or S. E. for the advantage of the morning sun to expel the damp air, which is far more pernicious than warmth. The best soil for the ice-house to be made in is chalk, as it conveys away the waste water without any artificial drain; next to that, loose stony earth or gravelly soil. Its situation should be on the side of a hill, for the advantage of entering the cell upon a level. To construct an ice-house, first choose a proper place at a convenient distance from the house or houses it is to serve: dig a cavity of the figure of an inverted cone, sinking the bottom, concave, to form a reservoir for the waste water till it can drain off; if the soil require it, cut a drain to a considerable distance, or so far as will come out at the side of the hill, or into a well, to make it communicate with the springs, and in that drain form a sink or air-trap, marked *l*, (Plate LXXXV. fig. 11,) by sinking the drain so much lower in that place as it is high, and bring a partition from the top an inch or more into the water, which will consequently be in the trap; and will keep the well air-tight. Work up a sufficient number of brick-piers to receive a cart-wheel, to be laid with its convex side upwards to receive the ice; lay hurdles and straw upon the wheel, which will let the melted ice drain through, and serve as a floor. The sides and dome of the cone are to be nine inches thick, the sides to be done in steened brickwork, *i. e.* without mortar, and wrought at right angles to the face of the work: the filling in behind should be with gravel, loose stones, or brick-bats, that the water which drains through the sides may the more easily escape into the well. The doors of the ice-house should be made as close as possible, and bundles of straw placed always before the inner door to keep out the air. In fig. 11, *a* shows the line first dug out: *b* the brick-circumference of the cell: *c* the diminution of the cell downwards: *d* the less diameter of the cell: *e* the cart-wheel, or joists and hurdles: *f* the piers to receive the wheel or floor: *g* the principal receptacle for straw: *h* the inner passage: *i* the first entrance: *k* the outer door, passages having a separate door each: *l* an air-trap: *m* the well: *n* the profile of the piers: *o* the ice filled in: *p* the height of the cone: *q* the dome worked in two half-brick arches: *r* the arched passage: *s* the door-ways inserted in the walls: *t* the floor of the passage: *u* an aperture through which the ice may be put into the cell; this must be covered next the crown of the dome, and then filled in with earth: *x* the sloping door, against which the straw should be laid. The ice when to be put in should be collected during the frost, broken into small pieces, and rammed down hard in strata of not above a foot, to make it one complete body; the care in putting it in, and well ramming it, tends much to its preservation. In a season when ice is not to be had in sufficient quantities snow may be substituted. Ice may be preserved in a dry place under ground, by covering it well with chaff, straw, or reeds. Chaff is much used for this purpose in Italy.

ICE-ISLAND, a name given by sailors to a great quantity of ice collected into one huge, solid, mass, and floating about upon the seas near, or within, the Polar circles.

ICELAND, a large island in the northern part of the Atlantic Ocean, between 63° and 68° Lat. N. and between 10° and 26° Lon.

Lon. W. Its greatest length is about 700 miles, and its breadth about 300. As Iceland lies partly within the frigid zone, and is liable to be surrounded with vast quantities of ice, which come from the polar seas, it is very inhospitable. It is exceedingly subject to earthquakes; and so full of volcanoes, that the little part of it which appears fit for the habitation of man seems almost totally laid waste by them. The best account that has yet appeared of the island is in a late publication entitled, *Letters on Iceland*, &c. written by Uno Von Troil, D. D. first chaplain to his Swedish majesty. Dr. Troil sailed from London on the 12th of July, 1772, along with Mr. Banks, Dr. Solander, and Dr. James Lind, of Edinburgh. After visiting the Hebrides, they arrived on the 28th of August at Iceland, where they cast anchor at Bessædetr, in about 64° 6' N. Lat. in the western part of the island. The country had to them the most dismal appearance that can be conceived. The climate, however, is not unwholesome, or naturally subject to excessive colds, notwithstanding its northwesterly situation. There have been instances indeed of Fahrenheit's thermometer sinking to 24° below the freezing-point in winter, and rising to 104° in summer. Since 1749, observations have been made on the weather; and the coldness of the climate is thought to be so much on the increase, that the country is in danger of becoming unfit for the habitation of the human race. Wood, which formerly grew in great quantities all over the island, cannot now be raised. Even the hardy firs of Norway cannot be reared in this island. They seemed indeed to thrive till they were about two feet high; but then their tops withered, and they ceased to grow. This is owing chiefly to the storms and hurricanes which happen in May and June. In 1772, Governor Thodal sowed a little barley, which grew very briskly; but a short time before it was to be reaped, a violent storm so effectually destroyed it, that only a few grains were found scattered about. This island lies under another disadvantage, owing to the floating ice with which the coasts are often beset. This ice comes on by degrees, always with an E. wind, and frequently in such quantities as to fill up all the gulphs on the N. W. side of the island, and even to cover the sea as far as the eye can reach. It generally comes in January, and goes away in March. Sometimes it only reaches the land in April; and, remaining there for a long time, does an incredible deal of mischief. It consists partly of mountains of ice, said to be sometimes sixty fathoms in height; and partly of field-ice, which is neither so thick, nor so much dreaded. Sometimes these enormous masses are grounded in shoal-water; and in these cases they remain for many months, nay years, undissolved, chilling the atmosphere for a great way round. When many such bulky and lofty masses are floating together, the wood which is often found drifting between them, is so much chafed and pressed with such violence together, that it sometimes takes fire: which has occasioned fabulous accounts of the ice being in flames. In 1753, and the four following years, the frosts were extremely intense, and destroyed both animals and vegetables. These frosts are often followed by a famine, many examples of which are to be found in the Icelandic chronicles. A great number of bears annually arrive with the ice, and commit great ravages among the sheep. The Icelanders attempt to destroy these intruders as soon as they get sight of them. Sometimes they assemble together, and drive them back to the ice, with which they often float off again. For want of fire-arms, they are obliged to use spears on these occasions. The government also encourage the destruction of these animals, by paying a premium of ten dollars for every bear that is killed, and purchasing the skin of him who killed it. Notwithstanding this dismal picture, however, taken from Von Troil's letters, some tracts of ground, in high cultivation, are mentioned as being covered by the great eruption of lava in 1783. Thunder and lightning are seldom heard in Iceland, except in the neighbourhood of volcanoes. Auroræ Boreales are very frequent and strong. They generally appear in dry weather; though there are not wanting instances before or after rain, or even during the time of it. The lunar halo, which prognosticates bad weather, is likewise very frequent here; as are also parheliions, which appear from one to nine in number at a time. The e parheliions are observed chiefly at the approach of the Greenland ice, when an intense degree of frost is produced, and the frozen vapours fill the air. Fire-balls, sometimes round, and sometimes oval, are observed, and a kind of ignis fatuus which attaches itself to man and beasts;

and comets are also frequently mentioned in their chronicles. This last circumstance deserves the attention of astronomers. Iceland, besides all the inconvenience already mentioned, has two very terrible ones, called by the natives skrida and sniofodi: the name of the first imports large pieces of a mountain tumbling down and destroying the lands and houses which lie at the foot of it; this happened in 1554, when a whole farm was ruined, and thirteen people buried alive. The other word signifies the effects of a prodigious quantity of snow, which covers the tops of the mountains, rolling down in immense masses, and doing a great deal of damage: of this there was an instance in 1699, during the night, when two farms were buried, with all their inhabitants and cattle. This last accident Iceland has in common with all very mountainous countries, particularly Switzerland. Dr. Von Troil informs us, that, "Iceland abounds with hot and boiling springs, some of which spout up into the air a surprising height. All the jets d'eau, which have been contrived with so much art, and at such an enormous expence, cannot by any means be compared with these wonders of nature in Iceland. The water-works at Hærenhausen throw up a single column of water of half a quarter of a yard in circumference to a height of about seventy feet; those at Winterkasten at Cassel throw it up, but in a much thinner column, 130 feet; and the jet d'eau at St. Cloud, which is thought the greatest of all the French water-works, casts up a thin column eighty feet into the air: but some springs in Iceland pour forth columns of water several feet in thickness to the height of many fathoms; and many affirm of several hundred feet. These springs are unequal in their degrees of heat; but we have observed none under 188 degrees of Fahrenheit's thermometer; in some it is 192, 193, 212, and in one small vein of water 213 degrees. From some the water flows gently, and the spring is then called laug, a bath; from others it spouts with a great noise, and is then called huer, or kittel." See HUER, and Plate LXXXV. fig. 9. It is very common for some of these spouting springs to close up, and others to appear in their stead. All these hot waters have an incrusting quality; so that we very commonly find the exterior surface from whence it bursts forth covered with a kind of rind, which almost resembles chased work, and which we at first took for lime, but which was afterwards found by Mr. Bergman to be of a siliceous or flinty nature. In some places the water tastes of sulphur, in others not; but when drank as soon as it is cold, tastes like common boiled water. The inhabitants use it at particular times for dyeing; and were they to adopt proper regulations it might be of still greater use. Victuals may also be boiled in it, and milk held over its steam becomes sweet: owing, most probably, to the excessive heat of the water, as the same effect is produced by boiling it a long time over the fire. What time Iceland was first peopled is uncertain. An English colony indeed is said to have been settled there in the beginning of the fifth century. There is reason, however, to suppose that the English and Irish were acquainted with this country under another name, long before the arrival of the Norwegians; for the celebrated Bede gives a pretty accurate description of the island. But of these original inhabitants we can say nothing, as the Icelandic chronicles go no farther back than the arrival of the Norwegians. It appears to have been first visited by different adventurers, and at length peopled by colonies from different nations, the first and most numerous being from Norway. They supported an independence for a considerable time, but at length being reduced by their intestine quarrels, they put themselves under the protection of Norway, and were together with Norway soon after subjected to Denmark. The Icelanders breed numbers of cattle, but on the coasts the men employ themselves in fishing, both summer and winter. On their return home, when they have cleaned their fish, they give them to their wives, whose care it is to dry them. In winter, when the inclemency of the weather prevents them from fishing, they are obliged to take care of their cattle, and spin wool. In summer, they mow the grass, provide fuel, go in search of strayed sheep and goats, and kill cattle. They prepare leather with the spiraea ulmaria, instead of bark. Some few work in gold and silver; and others in mechanics, in which they are tolerable proficient. The women prepare the fish, take care of the cattle, manage the milk and wool, sew, spin, and gather eggs and down. When they work in the evening, they use, instead of an hour-glass, a lamp with a wick made of epilobium dypt in train-oil, which is contrived to burn, four,

four, six, or eight, hours. Among the common people, time is not reckoned by the course of the sun, but by the work they have done, which is prescribed by law. A man is to mow as much hay in one day as grows on thirty fathoms of manured soil, or forty fathoms of land which has not been manured; or he is to dig 700 pieces of turf, eight feet long and three broad. If as much snow falls as reaches to the horses' bellies, a man is required daily to clear a piece of ground sufficient for 100 sheep. A woman is to rake together as much hay as three men can mow, or to weave three yards of wadmal a day. A man's wages are four dollars and twelve yards of wadmal; those of a woman two dollars and five yards of wadmal. When men are sent a-fishing out of the country, there is allowed to each man, by law, from the 25th Sept. to the 14th May, six pounds of butter, and eighteen pounds of dried fish, every week. When they are at home, and can get milk, &c. every man receives only five pounds of dried fish, and three quarters of a pound of butter a-week. As Iceland produces no kind of grain, the inhabitants have no bread but what is imported; and which being too dear for common use, is reserved for weddings and other entertainments. The following list of their viands is taken from Troil's Letters. "1. Flour of fialgras, (lichen islandicus,) or rock-grass. The plant is first washed, and then cut into small pieces by some; though the greater number dry it by fire or in the sun, then put it into a bag in which it is well beaten, and lastly work it into a flour by stamping. 2. Flour of komsyrgr, (polygonum bistorta), is prepared in the same manner, as well as the two other sorts of wild corn melur, (Arundo arenaria, and Arundo foliorum lateribus convolutis), by separating it from the chaff, pounding, and lastly grinding it. 3. Surt smoor, sour butter. The Icelanders seldom use fresh or salt butter, but let it grow sour before they eat it. In this manner it may be kept for twenty years, or even longer; and the Icelanders look upon it as more wholesome and palatable than the butter used among other nations. It is reckoned better the older it grows; and one pound of it then is valued as much as two of fresh butter. 4. Striug, or whey boiled to the consistence of sour milk, and preserved for the winter. 5. Fish of all kinds, dried in the sun and in the air, and either salted or frozen. Those prepared in the last manner are preferred by many. 6. The flesh of bears, sheep, and birds, which is partly salted, partly hung or smoked, and some preserved in casks with sour or fermented whey poured over it. 7. Misost, or whey boiled to cheese, which is very good. But the art of making other kinds of good cheese is lost, though some tolerably palatable is sold in the E. quarter of Iceland. 8. Beina striug, bones and cartilages of beef and mutton, and likewise bones of cod, boiled in whey till they are quite dissolved: they are then left to ferment, and are eat with milk. 9. Skyr. The curds from which the whey is squeezed are preserved in casks or other vessels; they are sometimes mixed with black crow-berries, or juniper-berries, and are likewise eat with new milk. 10. Syra, is sour whey kept in casks, and left to ferment; which, however, is not reckoned fit for use till a year old. 11. Blanda, is a liquor made of water, to which a twelfth part of the syra is added. In winter, it is mixed with the juice of thyme and of the black crow-berries. 12. They likewise eat many vegetables, some of which grow wild, and some are cultivated; also shell-fish and mushrooms." The Icelanders, in general, eat three times a-day, at 7 A. M. 2 and 9 P. M. Their common beverage is milk, either warm from the cow, or cold, and sometimes boiled: they likewise use butter-milk with, or without, water. On the coasts they generally drink blanda and sour milk; which is sold after it is skimmed at two-fifths of a rix-dollar per cask: some likewise send for beer from Copenhagen, and some brew their own. A few of the principal inhabitants also have claret and coffee. The common people sometimes drink a kind of tea, which they make from the leaves of the dryas octopetala, and the veronica officinalis. The exports of Iceland consist of dried fish, salted mutton and lamb, beef, butter, tallow, train-oil, coarse woollen cloth, stockings, gloves, raw wool, sheep-skins, lamb-skins, fox-furs of various colours, cider down, feathers, and formerly sulphur; but there is no longer a demand for this mineral. On the other hand, the Icelanders import timber, fishing-lines and hooks, tobacco, bread, horse-shoes, brandy, wine, salt, linen, a little silk, and a few other necessities, as well as superfluities for those of superior rank. The whole trade of Iceland is engrossed by a Danish Company, who have an exclusive charter.

Iceland is noted for its volcanoes, which seem to be more furious than any others yet discovered. Indeed, from the latest accounts, it would seem that this miserable country were one continued volcano. Mount Hecla has been commonly supposed to be the only burning mountain, or at least the principal one, in the island. See HECLA. It has indeed been more taken notice of than many others of as great extent, partly from its having had more frequent eruptions than any other, and partly from its situation, which exposes it to the sight of ships sailing to Greenland and North America. But in a list of eruptions published in the appendix to Pennant's Arctic Zoology, it appears that out of fifty-one remarkable ones, only one-third have proceeded from Hecla, the other mountains being no less active in the work of destruction than this. These eruptions take place in the mountains covered with ice, which the inhabitants call jokuls. Some of these, as appears from a large map of Iceland, made by order of Frederick V. in 1734, have been swallowed up. The great lakes in this country have probably been occasioned by the sinking of such mountains, as similar instances are met with in other places. The great Icelandic lake called Myvatn seems to have been one. Its bottom is entirely formed of lava, divided by deep cracks, which shelter during winter a great quantity of trout. It is now only thirty feet deep; but originally was much deeper, having been nearly filled up in 1728 by an eruption of the great mountain Krafle. The fiery stream took its course towards Myvatn, and ran into it with a horrid noise, which continued till 1730. "The mountains of Iceland (says Mr. Pennant) are of two kinds, primitive and posterior. The former consist of strata usually regular, but sometimes confused. They are formed of different sorts of stone without the least appearance of fire. Some are composed of sand and free stone, petrosilex or chert, slaty or fissile stone, and various kinds of earth or bole, and steatite; different sorts of breccia or conglutinated stones; jaspers of different kinds, Iceland crystal; the common rhomboid spathum, chalcedonies stratified, and botryoid; zeolites of the most elegant kinds; crystals, and various other substances that have no relation to volcanoes.

ICENI, an ancient nation of South Britain, who inhabited the countries now called Suffolk, Norfolk, Cambridgeshire, Huntingdonshire, and the Isle of Ely.

ICH DIEN, the motto of the Prince of Wales's arms, signifying, in the High Dutch, I serve. It was first used by Edward the Black Prince, to shew his subjection to his father, King Edward III.

ICHNEUMON, [*ἰχθυόμων*], a small animal that breaks the eggs of the crocodile. See VIVERRA.

ICHNEUMON, the ICHNEUMON FLY, in entomology, a genus of flies of the hymenoptera order. Mouth armed with a bifid jaw, without any tongue; antennæ setaceous, having above thirty joints; abdomen generally petiolated, joined to the body by a pedicle or stalk; tail armed with a sting, inclosed in a double-valved cylindrical sheath; wings lanceolated and plain. This genus is very numerous, containing more than five hundred species. See Plate LXXVI. They are divided into families, from the colour of their scutellum and antennæ, as follows: 1. Those which have a whitish scutel, and antennæ annulate, with a whitish band. 2. Those which have a white scutel and antennæ entirely black. 3. With a scutel of the same colour as the thorax; the antennæ encompassed with a fillet. 4. With a scutel of the same colour as the thorax; the antennæ black and setaceous. 5. With setaceous clay-coloured antennæ. 6. With small filiform antennæ, and the abdomen oval and slender. One striking character of these species of flies is the almost continual agitation of their antennæ. The name ichneumon has been applied to them, from the service they do by destroying caterpillars, plant-lice, and other insects; as the ichneumon or mangouste destroys the crocodiles.

ICHNOGRAPHY, [*ἰχνόγραφω*, I describe,] in perspective, is the view of any thing cut off by a plane parallel to the horizon, just at the base or bottom of it.

ICHNOGRAPHY, in architecture, is taken for the geometrical plane, platform of an edifice, or the ground-plot of a house or building delineated upon paper.

ICHNOGRAPHY, in fortification, the plan of the length and breadth of a fortress, the distinct parts of which are marked either upon the ground or upon paper.

ICHOGRAPHY, among painters, signifies a description of images or of ancient statues of marble and copper, of busts and semi-busts, of paintings in fresco, mosaic works, and ancient pieces of miniature.

ICHOGLANS, the grand signior's pages serving in the seraglio. These are the children of Christian parents, either taken in war, purchased, or sent as presents from the viceroys and governors of distant provinces.

ICHOR, [*ἰχρὸς*, *ichor*, Lat.] in surgery, is sometimes used for a thicker kind of humour flowing from ulcers, called also sanies.

ICHTHYOCOLLA, [from *ἰχθύς*, fish, and *κόλλα*, glue,] ISINGLASS, or FISH-GLUE, a preparation from the fish named huso. See ACCIPENSER.

ICHTHYOCOLLA, METHOD OF MAKING. The method of making isinglass was long a secret in the hands of the Russians; but was discovered a few years ago, and a full account of it published by Humphrey Jackson, Esq. in the sixty-third volume of the Philosophical Transactions. "All authors (he says) who have hitherto delivered processes for making ichthyocolla, fish-glue, or isinglass, have greatly mistaken both its constituent matter and preparation." In proof of this he quotes the process of Pomel, who, he thinks, is the principal author whom the rest have copied. After describing the fish, Pomel directs, 'As to the manner of making the isinglass, the sinewy parts of the fish are boiled in water till all of them be dissolved that will dissolve; then the gluey liquor is strained, and set to cool. Being cold, the fat is carefully taken off, and the liquor itself boiled to a just consistency, then cut to pieces, and made into a twist, bent in form of a crescent, as commonly sold; then hung upon a string and carefully dried.' "From this account (says Mr. Jackson) it might be rationally concluded, that every species of fish which contained gelatinous principles would yield isinglass;" but, adds he, "relying too much upon such authority, I found myself constantly disappointed. Glue, not isinglass, was the result of every process; and although, in the same view, a journey to Russia proved fruitless, yet a steady perseverance in the research proved not only successful as to this object, but, in the pursuit, to discover a resinous matter plentifully procurable in the British fisheries, which has been found by ample experience to answer similar purposes. It is now no longer a secret, that our lakes and rivers in North America are stocked with immense quantities of fish, said to be the same species with those in Moscow, and yielding the finest isinglass. No artificial heat is necessary to the production of isinglass, neither is the matter dissolved for this purpose; for, as the continuity of its fibres would be destroyed by solution, the mass would become brittle in drying, and snap short asunder, which is always the case with glue, but never with isinglass. The latter, indeed, may be resolved into glue with boiling water; but its fibrous recombination would be found impracticable afterwards, and a fibrous texture is one of the most distinguishing characteristics of genuine isinglass. A due consideration that an imperfect solution of isinglass, called fining by the brewers, possessed a peculiar property of clarifying malt liquors, induced me to attempt its analysis in cold subacid menstrua. One ounce and a half of good isinglass, steeped a few days in a gallon of stale beer, was converted into good fining, of a remarkably thick consistency: the same quantity of glue, under similar treatment, yielded only a mucilaginous liquor resembling diluted gum-water, which, instead of clarifying beer, increased both its tenacity and turbidity, and communicated other properties in no respect corresponding with those of genuine fining. On commixing three spoonfuls of the solution of isinglass with a gallon of malt-liquor, in a tall cylindrical glass a vast number of curdly masses became presently formed, by the reciprocal attraction of the particles of isinglass and the feculencies of the beer, which, increasing in magnitude and specific gravity, arranged themselves accordingly, and fell in a combined state to the bottom, through the well-known laws of gravitation; for, in this case, there is elective attraction, as some have imagined, which bears not the least affinity with what frequently occurs in chemical decompositions. If what is commercially termed long or short-stapled isinglass be steeped a few hours in fair cold water, the entwined membranes will expand, and reassume their original beautiful hue, and, by a dexterous address, may be perfectly unfolded." (He adds, in a note, that "if the transparent isinglass be held in certain positions to the light, it

often exhibits beautiful prismatic colours.") "By this simple operation (continues Mr. Jackson, we find that isinglass is nothing more than certain membranous parts of fishes, divested of their native mucosity, rolled and twisted into the forms above-mentioned, and dried in open air. The sounds, or air-bladders, of fresh-water fish in general, are preferred for this purpose, as being the most transparent, flexible, delicate substances. These constitute the finest sorts of isinglass; those called book and ordinary staple, are made of the intestines, and probably of the peritoneum of the fish. The belluga yields the greatest quantity, as being the largest and most plentiful fish in the Moscow rivers; but the sounds of all fresh-water fish yield, more or less, fine isinglass, particularly the smaller sorts, found in prodigious quantities in the Caspian Sea, and several hundred miles beyond Astracan, in the Volga, Yaik, Don, and even as far as Siberia, where it is called *kic* or *kla* by the natives, which implies a glutinous matter; it is the basis of the Russian glue, which is preferred to all other kinds for its strength. The sounds, which yield the finer isinglass, consist of parallel fibres, and are easily rent longitudinally; but the ordinary sorts are found composed of double membranes, whose fibres cross each other obliquely, resembling the coats of a bladder; hence the former are more readily pervaded and divided with subacid liquors; but the latter, through a peculiar kind of interwoven texture, are with great difficulty torn asunder, and long resist the power of the same menstruum: yet, when duly resolved, are found to act with equal energy in clarifying liquors. Isinglass receives its different shapes in the following manner: The parts of which it is composed, particularly the sounds, are taken from the fish while sweet and fresh, slit open, washed from their slimy sorde, divested of every thin membrane which envelopes the sound, and then to stiffen a little in the air. In this state they are formed into rolls about the thickness of a finger, and in length according to the intended size of the staple: a thin membrane is generally selected for the centre of the roll, round which the rest are folded alternately, and about half an inch of each extremity of the roll is turned inwards. The due dimensions being thus obtained, the two ends of what is called short staple are pinned together with a small wooden peg; the middle of the roll is then pressed a little downwards, which gives it the resemblance of a heart shape; and thus it is laid on boards, or hung up to dry. The sounds, which compose the long staple, are longer than the former; but the operator lengthens this sort at pleasure, by inter-folding the ends of one or more pieces of the sound with each other. The extremities are fastened with a peg, like the former; but the middle part of the roll is bent more considerably downwards; and, to preserve the shape of the three obtuse angles thus formed, a piece of round stick, about a quarter of an inch diameter, is fastened in each angle with small wooden pegs, in the same manner at the ends; in this state it is permitted to dry long enough to retain its form, when the pegs and sticks are taken out, and the drying completed; lastly the pieces of isinglass are colligated in rows, by running packthread through the peg-holes, for convenience of package and exportation. The membranes of the book-sort, being thick and refractory, will not admit a similar formation with the preceding; the pieces, therefore, after their sides are folded inwardly, are bent in the centre, in such manner that the opposite sides resemble the cover of a book, whence the name; a peg being thus run across the middle, fastens the sides together, and thus it is dried like the former. This sort is inter-leaved, and the pegs run across the ends, the better to prevent its unfolding. Cake isinglass is formed of the fragments of the staple sorts, put into a flat metalline pan, with a very little water, and heated just enough to make the parts cohere like a paucake when it is dried; but frequently it is overheated, and such pieces are useless in fining. Experience has taught the consumers to reject them. Isinglass is best made in summer, as frost gives it a disagreeable colour, deprives it of weight, and impairs its gelatinous principles; its fashionable forms are unnecessary, and frequently injurious to its native qualities. It is common to find oily putrid matter, and exuviae of insects, between the implicated membranes, which, through the inattention of the cellarmen, often contaminate wines and malt-liquors in the act of clarification. It may be manufactured as follows: the sounds of cod and ling bear great analogy to those of the accipenser genus. The Newfoundland and Iceland fishermen split open the fish as soon as taken, and

throw the back-bones, with the sounds annexed, in a heap; but previous to incipient putrefaction, the sounds are cut out, washed from their slimes, and salted for use. In cutting out the sounds, the intercostal parts are left behind, which are much the best; the Iceland fishermen are so sensible of this, that they beat the bone upon a block with a thick stick, till the pockets, as they term them, come out easily, and thus preserve the sound entire. If the sounds have been cured with salt, that must be dissolved by steeping them in water before they are prepared for isinglass; the

fresh sound must then be laid upon a block of wood, whose surface is a little elliptical, to the end of which a small hair-brush is niled, and with a saw-knife the membranes on each side of the sound must be scraped off. The knife is rubbed upon the brush occasionally to clear its teeth; the pockets are cut open with scissors, and perfectly cleansed of the mucous matter with a coarse cloth; the sounds are afterwards washed a few minutes in lime-water to absorb their oily principle, and lastly in clear water.

ICHTHYOLOGY.

DEFINITIONS.

ICHTHYOLOGY, [*ἰχθυολογία*, from *ἰχθυς*, and *λογία*,] that part of zoology which treats of fishes. Writers who have considered this subject have proceeded on very different systems of classification. Linnaeus and Pennant are most followed, and they do not differ much in their method of division. According to the general system of Linnaeus, fishes form the fourth class of animals. This class he arranges into six orders, under three great divisions; none of which, however, include the cetaceous tribes, or the whale, dolphin, &c. these forming an order of the class mammalia in the Linnæan system. See **ZOOLOGY**. Mr. Pennant, in his *British Zoology*, makes a very judicious arrangement, by which the cetæ are restored to their proper rank. He distributes fish into three divisions, comprehending six orders. His divisions are, into cetaceous, cartilaginous, and bony.

DIVISION I. CETACEOUS FISH. The characters are the following: No gills; an orifice, on the top of the head, through which they breathe and eject water; a flat or horizontal tail. This division comprehends three genera: the Whale, Cachalot, and Dolphin.

DIV. II. CARTILAGINOUS FISH. The characters are: Breathing through certain apertures, generally placed on each side the neck; but in some instances beneath, in some above, and from one to seven in number on each part, except in the pipe-fish, which has only one; the muscles supported by cartilages instead of bones. The genera are, the Lamprey, Skate, Shark, Fishing-trog, Sturgeon, Sun-fish, Lump-fish, Pipe-fish.

DIV. III. BONY FISH, includes those whose muscles are supported by bones or spines, which breathe through gills covered or guarded by thin bony plates, open on the side, and dilatable by means of a row of bones on their lower part, each separated by a thin web; which bones are called the radii branchiostegi, or the gill-covering rays. The tails of all the fish that form this division are placed in a situation perpendicular to the body; and this is an invariable character. This division is by far the most numerous, and is subdivided into four sections, apodal, thoracic, jugular, and abdominal, which he copies from Linnaeus, who forms this system on a comparison of the ventral fins to the feet of land-animals or reptiles; and either from the want of them, or their particular situation, in respect to the other fins, establishes his sections.

SECT. 1. APODAL: the most imperfect, wanting the ventral fins. This also expresses the union of the dorsal and anal fins with the tail, as is found in some few fish. Genera: The Eel, Wolf-fish, Lamnee, Morris, Sword-fish.

SECT. 2. JUGULAR: the ventral fins placed before the pectoral fins as in the Haddock. Genera: the Dragonet, Weever, Cod-fish, Blenny.

SECT. 3. THORACIC: the ventral fins placed beneath the pectoral fins as in the Father-lasher. Genera: the Goby, Bull-head, Doree, Flounder, Gilt-head, V raffe, Perch, Stickleback, Mackerel, Surmullet, Gurnard.

SECT. 4. ABDOMINAL; the ventral fins placed behind the pectoral fins; as in the Minnow. Genera: the Loch Salmon, Pike, Argentine, Atherine, Mullet, Flying-fish, Herring, Carp.

Fishes are described by several technical terms, according to the configurations and other peculiarities of their different parts. Body compressed, is when it extends more vertically, or from back to belly than horizontally, or from side to side; depressed, when the horizontal extent is the greater. It is said to be cylindrical, when nearly circular; ensiform, or sword-shaped, when the

back and belly terminate in a sharp edge, or when the body gradually tapers from the head to the tail; cultrated, or knife-shaped, when the back is somewhat flat, and the angle below acute; carinated, or keel-shaped, when the back is rounded, and the under part of the belly acute through its length; oblong, when the longitudinal diameter is much longer than the transverse; oval, when the longitudinal diameter exceeds the transverse, the base being circular, and the apex more acute; orbicular, when the longitudinal and transverse diameters are nearly equal; lamellated, or spear-shaped, when oblong and attenuated at both extremities; cuneiform, or wedge-shaped, when the body gradually flattens towards the tail; conical, when it is cylindrical, and grows gradually more slender towards the tail; ventricose, when the belly is very prominent; gibbous, when the back presents one or more protuberances; annulated, when the body is surrounded by rings, or elevated lines; articulated, when it is covered and connected with bony plates; trigon, tetragon, pentagon, hexagon, and polygon, when the sides are plain, with three, four, six, or more, longitudinal angles. The surface is said to be naked when it is destitute of scales; scaly, when provided with them; smooth, when the scales are so; lubricous, or slippery, when invested with a slimy humour; tuberculated, or rough, when covered with prominent warts or tubercles; papillous, when covered with fleshy points; spinous, when the asperities are elongated, and pointed at their extremities; loricated, or mailed, when the body is inclosed in a hard, callous, or bony integument, or in scales so closely united as to seem but one; fasciated, or banded, when marked with transverse zones, from the back to the belly; striped, when marked with very narrow, scattered, and coloured streaks; vittated, when marked throughout with longitudinal zones along the side, reticulated, or chequered, when marked with lines forming the appearance of net-work; pointed, or dotted, when marked with points; and variegated, when the colours are different. The head extends from the extremity of the nose to the gills, and contains the mouth, nose, jaws, lips, teeth, tongue, palate, nostrils, eyes, branchial opercules, the branchiostegous membrane, the aperture of the gills, and the nape. The branchial opercules are scaly, or bony processes, situated on both sides of the head, behind the eyes; they serve to close the aperture of the gills, and sustain the branchial membrane. The branchial, or branchiostegous membrane, is a fin, formed of cartilaginous crooked bones, joined by a thin membrane, lying under the opercula, to which it adheres, and is capable of being folded, or expanded, as necessity requires. The trunk extends from the nape and branchial aperture to the extremity of the tail. It comprehends the gill, throat, thorax, back, sides, abdomen, lateral line, anus, tail, and scales. The gills, or branchia, consist, for the most part, of four crooked, parallel, unequal bones, furnished on the outside, with small soft appendages, like the beards of a feather, and generally of a red colour. The fins, according to their position, are denominated dorsal, pectoral, ventral, anal, or caudal. They consist of rays united by a fine membrane; the rays are small bones either flexible or jointed. The chief instruments of motion in fishes have been supposed to be the fins; which, in some are much more numerous than in others. A fish completely fitted for swimming with rapidity, is generally furnished with two pair of fins on the sides, and three single ones, two above, and one below. But the fish which has the greatest number of fins is not always the swiftest swimmer. The shark is thought to be one of the swiftest, and yet

it has no fins on its belly; the haddock seems to be more completely fitted for motion, and yet it does not move so swiftly. Nay, some fishes which have no fins at all, such as lobsters, dart forward with prodigious rapidity, by means of their tail. Hence the instrument of progressive motion, in all fishes, is now concluded to be the tail. The great use of the fins is to keep the body in equilibrio: if the fins are cut off, the fish can still swim, but will turn upon its sides or its back, without being able to keep itself in an erect posture as before. If the fish desire to turn, an exertion of the tail turns it about in an instant; but if the tail strike both ways, then the motion is progressive. All fishes are furnished with a slimy glutinous matter, which defends their bodies from the immediate contact of the surrounding fluid, and which likewise, in all probability, assists their motion through the water. Beneath this, in many kinds, is found a strong covering of scales, which, like a coat of mail, defends it still more powerfully; and under that, above the muscular parts, lies an oily substance, which also tends to preserve the requisite warmth and vigour. Fishes are considered by many naturalists as of a nature much inferior to land-animals, whether beasts or birds. Their sense of feeling, it is thought, must be very obscure on account of the scaly coat of mail in which they are wrapped up. Their sense of smelling also, it is said, they can have only in a very small degree. All fishes, indeed, have one or more nostrils; and even those that have not the holes perceptible without, yet have the bones within, properly formed for smelling. But as the air is the only medium we know proper for the distribution of odours, it cannot be supposed that these animals which reside constantly in the water can be affected by them. As to tasting, they seem to make very little distinction. The palate of most fishes is hard and bony, and consequently incapable of the power of relishing different substances; and accordingly these voracious animals have often been observed to swallow the fisherman's plummet instead of the bait. Hearing is generally thought to be totally deficient in fishes, notwithstanding the discoveries of some anatomists who pretend to have found out the bones designed for the organ of hearing in their heads. They have no voice, it is said, to communicate with each other, and consequently have no need of an organ for hearing. Seeing seems to be the sense of which they are possessed in the greatest degree; and yet even this seems obscure, if we compare it with that of other animals. The eye, in almost all fishes, is covered with the same transparent skin which covers the rest of the head, and which probably serves to defend it in the water, as they have no eyelids. The globe is more depressed anteriorly, and is furnished behind with a muscle which serves to lengthen or flatten it as there is occasion. The crystalline humour, which in quadrupeds is flat and of the shape of a button-mould, or like a very convex lens, in fishes is quite round, or sometimes oblong. Hence it is thought that fishes are extremely near-sighted; and that, even in the water, they can perceive objects only at a very small distance. Hence, (say they,) it is evident how far fishes are below terrestrial animals in their sensations, and consequently in their enjoyments. Even their brain, which in all animals is by some supposed to be of a size proportionate to the understanding, shews that fishes are very much inferior to birds in this respect. Others argue differently with regard to the nature of fishes. With respect to the sense of feeling, say they, it cannot be justly argued that fishes are deficient, merely because they are covered with scales, as it is possible these scales may be endued with as great a power of sensation as we can imagine. The sense of feeling is not properly connected with softness in any organ, more than with hardness. A similar argument is urged with regard to smelling; for though we do not know how smells can be propagated in water, that is no proof that they are not so. On the contrary, as water is found capable of absorbing putrid effluvia from the air, nothing is more probable than that these putrid effluvia, when mixed with the water, would affect the olfactory organs of fishes, as well as they affect ours when mixed with the air. With regard to taste, it is certain, that fishes are able to distinguish their proper food from what is improper, as well as other animals. But no voracious animal seems to be endued with much sensibility in this respect; nor would it probably be consistent with that way of promiscuously devouring every creature that comes within its reach, without which these kinds of animals could not subsist. With respect to the hearing of fishes, it is urged, that, when kept in a pond, they may

be made to answer at the call of a whistle or the ringing of a bell; and they will be terrified at any sudden and violent noise, such as thunder, the firing of guns, &c. and shrink to the bottom of the water. Among the ancients, many were of opinion that fishes had the sense of hearing, though they were by no means satisfied about the ways or passages by which they heard. Placentini afterwards discovered some bones in the head of the pike, which had very much the appearance of being organs of hearing, though he could never discover any external passages to them. Klein affirmed, from his experiments and observations, that all fishes have the organs of hearing; and have also passages from without to these organs, though in many species they are not easily seen; and that even the most minute and obscure of these are capable of communicating a tremulous motion to those organs, from sounds issuing from without. This is likewise asserted by M. Geoffroy, who gives a particular description of the organs of hearing belonging to several species. *Dissert. sur l'organe de l'ouïe*, p. 97, et seq. These organs are a set of little bones extremely hard, and white, like fine porcelain, which are to be found in the heads of all fishes: the external auditory passages are very small; being scarcely sufficient to admit a hog's bristle; though with care they may be distinguished in almost all fishes. Water cannot be thought an improper medium of sound, seeing daily experience shews us that sounds may be conveyed not only through water but through the most solid bodies. (See *Acoustics*.) It seems indeed very difficult to determine the matter by experiment. Mr. Gouan, who kept some gold-fishes in a vase, informs us, that whatever noise he made, he could neither terrify nor disturb them; he halloo'd as loud as he could, putting a piece of paper between his mouth and the water, to prevent the vibrations from affecting the surface, and the fishes still seemed insensible; but when the paper was removed, and the sound had its full effect on the water, the case was then altered, and the fishes instantly sunk to the bottom. This experiment, however, cannot prove that the fishes did not hear the sounds before the paper was removed; it only shews that they were not alarmed, till a sensible vibration was introduced into the water. The call of a whistle may also be supposed to affect the water in a fish-pond with a vibratory motion; but this certainly must be very obscure; and if fishes can be assembled in this manner when no person is in sight, it amounts to a demonstration that they actually do hear. See *ZOOLOGY*. The arguments used against the sight of fishes are the weakest of all. Many instances which daily occur, shew that fishes have a very acute sight, not only of objects in the water, but of those in the air. Their jumping out of the water to catch flies is a decisive proof of this; and this they will continue to do in a fine summer evening, even after it is so dark that we cannot distinguish the insects they attempt to catch. Though fishes are formed for living entirely in the water, yet they cannot subsist without air. On this subject Mr. Hawkesbee made several experiments, which are recorded in the *Philos. Trans.* The fishes he employed were gudgeons; a species that are very lively in the water, and can live a considerable time out of it. Three of them were put in a glass with about three pints of fresh water, which was designed as a standard to compare the others by. Into another glass, to a like quantity of water, were put three more gudgeons, and thus the water filled the glass to the very brim. Upon this he screwed down a brass-plate with a leather below, to prevent any communication between the water and the external air; and that it might the better resemble a pond frozen over, he suffered as little air as possible to remain on the surface of the water. A third glass had the same quantity of water put into it; which, first by boiling, and then by continuing it a whole night in vacuo, was purged of its air as well as possible; and into this also were put three gudgeons. In about half an hour the fishes in the water, from whence air had been exhausted, began to discover some signs of uneasiness by a more than ordinary motion in their mouths and gills. Those who had no communication with the external air would at this time also frequently ascend to the top, and suddenly swim down again: and in this state they continued for a considerable time, without any sensible alteration. About five hours after this observation, the fishes in the exhausted water were not so active as before, upon shaking the glass which contained them. In three hours more the included fishes lay all at the bottom of the glass with their bellies upwards; nor could they be made to shake their fins or tail by any motion given to

to the glass. They had a motion with their mouths, however, which shewed that they were not perfectly dead. On uncovering the vessel, they revived in two or three hours, and were perfectly well next morning; at which time those in the exhausted water were also recovered. The vessel containing these last being put under the receiver of an air-pump, and the air exhausted, they all instantly died. They continued, at top while the air remained exhausted, but sunk to the bottom on the admission of the atmosphere. The use of air to fishes is very difficult to be explained; and indeed their method of obtaining the supply of which they stand constantly in need, is not easily accounted for. The motion of the gills in fishes is certainly analogous to our breathing, and seems to be the operation by which they separate the air from the water. Their manner of breathing is as follows: the fish first takes a quantity of water by the mouth, which is driven to the gills; these close, and keep the water which is swallowed from returning by the mouth, while the bony covering of the gills prevents it from going through them till the animal has drawn the proper quantity of air from it: then the bony covers open, and give it a free passage; by which means also the gills are again opened, and admit a fresh quantity of water. If the fish be prevented from the free play of its gills, it soon falls into convulsions, and dies. But though this is a pretty plausible explanation of the respiration of fishes, it remains a difficulty not easily solved what is done with this air. There seems to be no receptacle for containing it, except the air-bladder or swim; which, by the generality of modern philosophers, is supposed not to answer any vital purpose, but only to enable the fish to rise or sink at pleasure.

The AIR-BLADDER or SOUND, is a bag filled with air, composed sometimes of one, sometimes of two, and sometimes of three divisions, situated towards the back of the fish, and opening into the back of the fish, and opening into the maw or the gullet. The use of this in raising or depressing the fish, is proved by the following experiment. A carp being put into the air-pump, and the air exhausted, the bladder bursts by the expansion of the air contained in it; after which the fish can no more rise to the top, but ever afterwards crawls at the bottom. The same thing also happens when the air-bladder is pricked or wounded in such a manner as to let the air out; in these cases also the fish continues at the bottom, without a possibility of rising to the top. From this it is inferred, that the use of the air-bladder is, by swelling at the will of the animal, to increase the surface of the fish's body, and thence diminishing its specific gravity, to enable it to rise to the

top of the water, and to keep there at pleasure. On the contrary, when the fish wants to descend, it is thought to contract the air-bladder; and being thus rendered specifically heavier, it descends to the bottom. Ancient zoologists were of opinion, that the air-bladder in fishes served for some purposes essentially necessary to life; and Dr. Priestley also conjectures, that the raising or depressing the fish is not the only use of these air-bladders, but that they also may serve some other purposes in the æconomy of fishes. There are many arguments indeed to be used on this side of the question: the most conclusive of which is, that all the cartilaginous kind of fishes want air-bladders, and yet they rise to the top, or sink to the bottom, of the water without difficulty; and though most of the eel-kind have air-bladders, yet they cannot raise themselves in the water without great difficulty. Fishes are, in general, the most voracious animals in nature. In most of them, the maw is placed next the mouth; and though possessed of no sensible heat, is endowed with a very surprising faculty of digestion. Its digestive power seems, in some measure to increase in proportion to the quantity of food with which the fish is supplied. A single pike has been known to devour 100 roaches in three days. Whatever is possessed of life, seems to be the most desirable prey for fishes. Some that have very small mouths, feed upon worms, and the spawn of other fish; others whose mouths are larger, seek larger prey; it matters not of what kind, whether of their own species, or any other. Those with the largest mouths pursue almost every thing that has life; and often meeting each other in fierce opposition, the fish with the widest throat devours its antagonist, and comes off victor. As a counterbalance to this great voracity, fishes are incredibly prolific. Lewenhoeck assures us, that the cod spawns above nine millions in a season. The flounder commonly produces above one million, and the mackarel above 500,000. Scarcely one in 100 of these eggs, however, brings forth an animal: they are devoured by all the less fry that frequent the shores, by waterfowls in shallow waters, and by the larger fishes in deep waters. Such a prodigious increase, if permitted to come to maturity, would overstock nature; even the ocean itself would not be able to contain, much less provide for, one-half of its inhabitants. But two wise purposes are answered by this amazing increase; it preserves the species in the midst of numberless enemies, and serves to furnish the rest with a sustenance adapted to their nature. And thus the purposes of the Creator and Upholder of all things are, in this part of his works, fully accomplished.

ICHTHYOMANCY, [from *ιχθυς*, a fish, and *μαντεια*, divination,] in antiquity, the art of divining by inspecting the entrails of fishes.

ICHTHYOPHAGI, [from *ιχθυς*, fish, and *φαγειν*, to eat,] Fish-EATERS, a name given to several nations who lived wholly on fishes.

ICHTHYOPITHALMITE, in mineralogy, a stone found in Sudermania, colour yellowish; specific gravity 2.5 nearly; froths and melts into an opaque head, before the blow-pipe. It occurs crystallized and massive, and it is thought to consist of

Silica	52.0
Lime	24.5
Potass	8.1
Water	15.0
Other matter	.4

100

ICHTHYPERIA, in natural history, a name given by Dr. Bill to the bony palates and mouths of fishes, usually met with either fossil, in single pieces or fragments.

ICKWORTH, a town of Suffolk, near Bury, 23 miles N. W. by N. of Ipswich, and 74 N. N. E. of London. Lon. 1. 0. E. Lat. 52. 22. N.

ICOLMKILL, or I-COLUMB-KILL, a celebrated island of Scotland, and one of the **HEERIDES**: called also I, Ily, Hii, and

anciently Iona: famous for the monastery, founded in it, by St. Columba.

ICONIUM, in ancient geography, the capital city of Lycaonia in Asia Minor, now called Cogni.

ICONOCLASTÆ, **ICONOCLASTES**, or the **ICONOCLASTS**, are titles which the church of Rome gives to all who reject the use of matters. Not only the reformed, but some of the eastern churches, are called Iconoclastes, and esteemed by them heretics, as opposing the worship of the images of God and the saints, and breaking their representations in churches. The opposition to images began in Greece under the emperor Bardanes, soon after the commencement of the eighth century, when the worship of them became common. See **IMAGE**. But the tumults occasioned by it were quelled by a revolution, which in 713, deprived Bardanes of the imperial throne. The dispute, however, broke out with redoubled fury under Leo the Isaurian, who issued out an edict in 726, abrogating the worship of images. This edict occasioned a civil war, which broke out in the islands of the Archipelago, and by the suggestions of the priests and monks, ravaged a part of Asia, and afterwards reached Italy. The civil commotions in Italy were chiefly promoted by the Roman pontiffs, Gregory I. and II. Leo was excommunicated, and his subjects in the Italian provinces, rising in arms, either massacred or banished all the emperor's officers. Leo assembled a council at Constantinople in 730, which degraded Germanus, the bishop of that city, who was a patron of images: he ordered all the images

images to be publicly burnt, and inflicted punishments upon all image-worshippers. Hence arose two factions; one of which adopted the adoration of images, and were called Iconoduli or Iconolatæ; the other maintained that such worship was unlawful, and that nothing was more worthy the zeal of Christians than to destroy the objects of this gross idolatry; and hence they were distinguished by the titles of Iconomachi, and Iconoclastæ. But the zeal of Gregory II. in favour of image-worship was surpassed by his successor Gregory III. in consequence of which the Italian provinces were torn from the Grecian empire. Constantine Copronymus, in 754, convened a council at Constantinople, regarded by the Greeks as the seventh œcumenical council, which solemnly condemned the worship and use of images; and he enacted new laws to set bounds to the violence of monastic rage. His successor Leo IV. pursued the same measures, and enacted penal statutes to extirpate idolatry. Irene, who poisoned her husband Leo in 780, and usurped the throne during the minority of her son Constantine, summoned a council at Nice in Bithynia, in 786, called the second Nicene council, which restored the worship of images, and denounced severe punishments against those who maintained, that God was the only object of religious adoration. In this contest, the Britons, Germans, and Gauls, were of opinion, that images might be lawfully continued in churches, but that the worship of them is highly offensive to God. Charlemagne distinguished himself as a mediator in this controversy; he ordered four books to be composed, refuting the reasons urged by the Nicene bishops to justify the worship of images; which he sent to pope Adrian in 790, to engage him to withdraw his approbation of the decrees of the last council of Nice. Adrian wrote an answer; and in 794, a council of 300 bishops, assembled by Charlemagne at Frankfort on the Main, confirmed the opinion contained in the four books, and solemnly condemned the worship of images. In the Greek church, after the banishment of Irene, the controversy concerning images broke out anew, and was carried on by the contending parties, during the half of the ninth century, with various success. The emperor Nicephorus appears to have been an enemy to this idolatrous worship. His successor, Michael Curopalates, patronized and encouraged it. But the scene changed on the accession of Leo the Armenian, who assembled a council at Constantinople in 814, that abolished the decrees of the Nicene council. His successor Michael Balbus, disapproved the worship of images, and his son Theophilus treated the idolaters with great severity. However, the empress Theodora, after his death, and during the minority of her son, assembled a council at Constantinople in 842, which approved the decrees of the second Nicene council, and restored image-worship. The council held under Photius, in 879, reckoned by the Greeks the eighth general council, also confirmed the Nicene decrees; upon which a festival was instituted by the superstitious Greeks, called the feast of orthodoxy. The Latins were generally of opinion, that images might be suffered as the means of aiding the memories of the faithful, but they detested paying them the least marks of adoration. The council of Paris, assembled in 824 by Lewis the Meek, allowed images in churches, but prohibited rendering them religious worship. But, towards the conclusion of this century, the Gallican clergy began to pay a kind of religious homage to the images of saints, and their example was followed by the Germans, and other nations. However, the Iconoclasts still had their adherents among the Latins; the most eminent of whom was Claudius bishop of Turin, who, in 823, ordered all images, and even the cross, to be cast out of the churches, and burnt; and he wrote a treatise against the use and worship of them. He also condemned relics and pilgrimages to the holy land, and the tombs of saints; and to his writings it was owing, that the city of Turin, and the adjacent country, was long after his death much less infected with superstition than the other parts of Europe. The controversy was again revived by Leo bishop of Chalcedon, in the 11th century, on the emperor Alexius's converting the silver-images that adorned the churches into money, to supply the exigencies of the state. The bishop maintained that he had been guilty of sacrilege, and published a treatise to shew that in these images there resided an inherent sanctity, and that the adoration of Christians ought to be extended to them. Alexius assembled a council at Constantinople, which determined, that the images of Christ and the saints were to be honoured only with a relative

worship; and that invocation and worship were to be addressed to the saints only as the servants of Christ. Leo, dissatisfied even with these superstitious decisions, was banished. In the western church, the worship of images was opposed by several considerable parties, as the Petrobrussians, Albigenes, Waldenses, &c. till at length this idolatrous practice was entirely abolished in many parts of the Christian world by the Reformation.

ICONODULI, [from *εικων*, and *δουλω*, I serve,] worshippers of images. See **ICONOLATRE**.

ICONOGRAPHIA, or **ICONOGRAPHY**, [from *εικων*, and *γραφω*, I describe,] the description of images or ancient statues of marble and copper; also of busts and semi-busts, penates, paintings in fresco, mosaic works, and ancient pieces of miniature.

ICONOLATRE, **ICONOLATRES**, or **ICONODULI**, [from *εικων*, and *λατρεω*, I worship,] those who worship images: a name which the Iconoclasts give to those of the Romish communion on account of their adoring images, and of rendering to them the worship only due to God. See **ICONOCLAST**.

ICONOLOGY, [*εικων* and *λογω*,] the doctrine of picture or representation.

ICOSAHEDRON, [from *εικοσι*, twenty, and *εδρα*, a base,] in geometry, a regular solid, consisting of twenty triangular pyramids, whose vertexes meet in the centre of a sphere supposed to circumscribe it; and therefore have their height and bases equal: wherefore the solidity of one of these pyramids multiplied by 20, the number of bases, gives the solid contents of the icosahedron.

ICOSANDRIA, [from *εικοσι*, twenty, and *ανηρ*, a husband,] the name of the twelfth class of Linnæus's sexual method, consisting of plants with hermaphrodite flowers, which are furnished with twenty or more stamina, inserted into the inner side of the calyx or petals. By this last circumstance this class is distinguished from the polyandria class. See **BOTANY**.

ICTERUS. See **JAUNDICE**.

IDA, in ancient geography, a mountain in the heart of Crete, the highest in the island; round, and in compass sixty stadia.

IDA, a mountain of Mysia, or rather a chain of mountains, extending from Zeleia, on the S. of the territory of Cyzicus, to Lectum, the utmost promontory of Troas.

IDEA, an epithet of Cybele.

IDÆUS, a surname of Jupiter.

IDALIA, an epithet of Venus; according to Bochart, it denotes the place or spot of Idalium, sacred to the goddess.

IDALIUM, in ancient geography, a promontory on the E. side of Cyprus, now called Capo di Griego; with a high rugged eminence rising over it, in the form of a table: sacred to Venus.

IDEA, [*ιδεω*,] the reflect perception of objects after the original perception or impression has been felt by the mind. Ideas are variously divided by metaphysical writers, but the most natural and useful division of ideas is into simple and complex. Ideas, in reference to the things which they are supposed to represent, are distributed into adequate and inadequate; clear and obscure; real and fantastical. See **LOGIC**, and **METAPHYSICS**.

IDEALOGY, [*ιδεω*, and *λογω*,] that branch of science which treats on ideas, their origin, nature, divisions, use, &c. See **METAPHYSICS**.

IDENTITY, or **SAMENESS**, denotes that by which a thing is itself, and not any thing else; in which sense, identity differs from similitude as well as diversity. The idea of identity we owe to that power which the mind has of comparing the very being and existence of things, whereby considering any thing as existing at any certain time and place, and comparing it with itself as existing at any other time and place, we accordingly pronounce it the same, or different. Thus, when we see a man at any time and place, and compare him with himself when we see him again at any other time or place, we pronounce him to be the same we saw before. See **METAPHYSICS**.

IDEOT. See **IDIOT**.

IDES, in the Roman calendar, were eight days in each month. The origin of the word is contested. Some will have it formed from *ιδω*, to see; because the full moon was commonly seen on the days of the ides: others from *ιδεω*, figure, from the image of the full moon then visible: others from *idulium* or *ovis idulis*, a name

name given by the Hetrurians to a victim offered on that day to Jupiter: others from the Hetrurian word *iduo*, i. e. I divide, because the ides divided the moon into two nearly equal parts. The ides came between the Kalends and the Nones; and, like them, were reckoned backwards. Thus they called the 14th day of March, May, July, and October, and the 12th of the other months, pridie idus, or the day before the ides; the next preceding day they called the *tertius idus*; the next *quarta*, and so on, reckoning always backwards till they came to the Nones. This method of reckoning time is still retained in the chancery of Rome, and in the calendar of the Breviary. The ides of May were consecrated to Mercury: the ides of March were esteemed unhappy, after the murder of Cæsar on that day: the time after the ides of June was reckoned fortunate for those who married; the ides of August were consecrated to Diana, and were observed as a feast-day by the slaves. On the ides of September, auguries were taken for appointing the magistrates who formerly entered into their offices on the ides of May, afterwards on those of March.

IDIOCY, [*ιδιωσις*,] want of understanding.

IDOCY, and **LUNACY**, in law, excuse from the guilt of crimes. "For the rule of law (says Blackstone) as to lunatics, which also may be easily adapted to idiots, is, that *furiosus furere solum puniatur*. In criminal cases, therefore, idiots and lunatics are not chargeable for their own acts, if committed when under these incapacities: no, not even for treason itself." By a late act however, (39 Geo. III.) lunacy is not to be held an excuse for an attempt upon his majesty's life. See **LUNACY**.

IDIOM, [*ιδιωμε*,] a mode of speaking peculiar to a language or dialect; the particular cast of a tongue; a phrase; phraseology.

IDIOPATHIC, peculiar to a certain part of the body; not arising from any preceding disease.

IDIOPATHY, [*ιδιου και παθου*,] a primary disease that neither depends on nor proceeds from another.

IDIOPATHY, in medicine, is opposed to sympathy. Thus, an epilepsy is idiopathic when it happens merely through some fault in the brain; and sympathetic when it is the consequence of some other disorder.

IDIOSYNCRACY, [*ιδιου, συν, και κραισις*,] a peculiar temper or disposition of body not common to another.

IDIOT, or **IDEOT**, in law, denotes a fool from his birth. A person who has understanding enough to measure a yard of cloth, number twenty rightly, and tell the days of the week, &c. is not an idiot in the eye of the law. But a man who is born deaf, dumb, and blind, is considered by the law in the same state as an idiot. Indeed it is doubted, if ever such an unfortunate human being has existed.

IDIOR is also used, by ancient writers, for a person ignorant or unlearned; answering to *illiteratus* or *imperitus*.

IDLENESS, aversion from labour: this, in any person whomsoever, is a high offence against the public economy. In China it is a maxim, that if there be a man who does not work, or a woman that is idle, in the empire, somebody must suffer cold or hunger: the produce of the lands not being more than sufficient, with culture, to maintain the inhabitants; and therefore, though the idle person may shift off the want from himself, yet it must fall somewhere. The court of Areopagus at Athens punished idleness, and examined every citizen how he spent his time. The intention was, that the Athenians, knowing they were to give an account of their occupations, should follow only such as were laudable, and that there might be no room left for such as lived by unlawful arts. The civil law expelled all sturdy vagrants from the city: and, in the English law, all idle persons or vagabonds, whom our ancient statutes describe to be "such as wake on the night, and sleep on the day, and haunt customable taverns and ale-houses, and routs about; and no man wot from whence they come, or whether they go;" or such as are more particularly described by stat. 17 Geo. II. c. 5, and divided into three classes, idle and disorderly persons, rogues and vagabonds, and incorrigible rogues;—all these are offenders against good order, and blemishes in the government, of any kingdom. They are therefore all punished, by the statute last mentioned; idle and disorderly persons with one month's imprisonment in the house of correction; rogues and vagabonds with whipping, and imprisonment not exceeding six months; and incorrigible rogues with the like disci-

pline, and confinement not exceeding two years: the breach and escape from which confinement, in one of an inferior class, ranks him among incorrigible rogues; and in a rogue (before incorrigible) makes him a felon, and liable to be transported for seven years. Persons harbouring vagrants are liable to a fine of forty shillings, and to pay all expences brought upon the parish thereby: in the same manner as, by the ancient laws, whoever harboured any stranger for more than two nights, was answerable to the public for any offence that such his inmate might commit.

IDOL, in pagan worship, a fancied representation of any of the heathen gods. This image, of whatever materials it consisted, was, by certain ceremonies, called consecration, converted into a god. While under the artificer's hands, it was only a mere statue. Three things were necessary to turn it into a god; proper ornaments, consecration, and oration. The ornaments were various, and wholly designed to blind the eyes of the ignorant and stupid multitude, who were chiefly taken with shew and pageantry. Then followed the consecration and oration, which were performed with great solemnity among the Romans.

IDOLATRY, the worship of any thing as God which is not God; it may be distinguished into two sorts. By the first, men adore the works of God, the sun, the moon, the stars, angels, demons, men, and animals: by the second, men worship the work of their own hands, as statues, pictures, and the like. The celestial bodies were the first objects of idolatrous worship. Afterwards, as their sentiments became more corrupted, they began to form images, and to entertain the opinion, that by virtue of consecration, the gods were called down to inhabit their statues; though it is certain, that the wiser heathens considered them only as figures designed to recal to their minds the memory of their gods. But the people in general were stupid enough to believe the statues themselves to be gods, and to pay divine worship to stocks and stones. Soon after the flood, idolatry seems to have prevailed over all the world: for so early as the time of Abraham, we scarcely find any other worship. And it appears from Scripture, that Abraham's forefathers, and even Abraham himself, were for a time idolaters. The Hebrews were expressly forbidden to make any representation of God; they were not so much as to look upon an idol: and from the time of the Maccabees to the destruction of Jerusalem, the Jews extended this precept to the making the figure of any man: by the law of Moses, they were obliged to destroy all the images they found, and were forbidden to apply any of the gold or silver to their own use, that no one might receive the least profit from any thing belonging to an idol. Of this the Jews, after they had smarted for their idolatry, were so sensible, that they thought it unlawful to use any vessel that had been employed in sacrificing to a false god, to warn themselves with the wood of a grove after it was cut down, or to shelter themselves under its shade. But the Christian religion, wherever it prevailed, entirely rooted out idolatry; as did also the Mohammedan, which is built upon the worship of one God. Protestant Christians, however, still charge those of the church of Rome with paying an idolatrous worship to pictures or images of saints and martyrs: before these they burn lamps, wax-candles, and incense; and, kneeling, offer up their vows and petitions: they, like the Pagans, believe that the saint, to whom the image is dedicated, presides in a particular manner about its shrine, and works miracles by the intervention of its image; and that if the image was destroyed or taken away, the saint would no longer perform any miracle in that place. See **IMAGE**.

IDOMENEUS, in fabulous history, succeeded his father Deucalion on the throne of Crete. He accompanied the Greeks to the Trojan war with a fleet of ninety ships, behaved with great valour, and slaughtered many of the enemy. At his return from the Trojan war, he made a vow to Neptune in a dangerous tempest, that if he escaped from the fury of the seas and storms, he would offer to the god whatever living creature first presented itself to his eye on the Cretan shore. Unfortunately his son came to congratulate him upon his safe return. Idomeneus performed his vow, but the inhumanity of this sacrifice rendered him so odious in the eyes of his subjects, that he left Crete, and migrated in quest of a settlement. He came to Italy and founded a city on the coast of Calabria, which he called Salernum. He died in an extreme old age, after he had had the satisfaction of seeing his new kingdom flourish, and his subjects happy.

IDUMEA. See EDOM.

IDYLLION, in ancient poetry, a diminutive of the diminutive word Edios, properly signifying any poem of moderate extent, without considering the subject. But as the collection of Theocritus's poems were called idyllia, and the pastoral pieces being by far the best in that collection, the term idyllion seems to be now appropriated to pastoral pieces.

I. E. for id est, or, that is.

JEALOUSY, in ethics, is that peculiar uneasiness which arises from the fear that some rival may rob us of the affection of one whom we greatly love, or suspicion that he has already done it. The first sort of jealousy is inseparable from love, before it is in possession of its object: the latter is often unjust, generally mischievous, always troublesome.

JEAN, ST. or ST. JOHN, an island of the Helvetic republic, in the canton of Basle, in lake Benne.

JEAN, ST. DE LOSNE, a town of France, in the department of Cote d'Or, and late province of Burgundy, 115 miles S. E. of Paris. Lon. 3. 19. E. Lat. 47. 8. N.

JEAN, ST. DE LUZ, a town of France, in the department of the Lower Pyrenees, and late province of Basques, 12 miles S. W. of Bayonne, and 315 S. by W. of Paris. Lon. 1. 40. E. Lat. 43. 23. N.

JEAN, ST. PIED DE PORT, a town of France, in the Lower Pyrenees, at the foot of the defiles called Ports, whence the name. It is 20 miles S. E. of Bayonne.

JEARS, or JEERS. See JEERS.

JEBB, DR. SAMUEL, a learned physician, born at Nottingham, and educated at Cambridge. He settled at Stratford le Bow, where he practised with great credit, till his death. He published, 1. *S. Justini Martyris cum Tryphone Dialogus*, 1729, 8vo. 2. *Bibliotheca Literaria*, a learned compilation, of which only ten numbers were published, in 1722. 3. *De Vita et Rebus gestis Mariæ Scotorum Reginae*, 8vo. 4. The same work in English, 8vo. 1725. 5. An edition of *Aristides* with notes, 2 vols. 4to. 1728. 6. An elegant edition of *Cæli de Canibus Britannicis*, &c. 8vo. 1729. 7. Another of *Baconi Opus Majus*, fol. 1733. 8. Another of *Hodii de Græcis Illustribus, Linguae Græcæ Instauratoribus*, 8vo. 1742. He died March 9, 1772, leaving several children, one of whom, Sir Richard Jebb, was physician to his Majesty.

JED, a river of Scotland, in Roxburghshire.

JEDBURGH, a town of Scotland, capital of Roxburghshire, situated nearly in the middle of the county, on the banks of the river Jed, whence its name.

JEDDO, JEDO, or YEDDO, the capital of the empire of Japan. It is open on all sides, having neither walls nor ramparts; and the houses are built with earth, and boarded on the outside to prevent the rain from destroying the walls. The houses of the citizens are only a ground-floor, and the rooms are parted by folding screens: so that they can make the rooms larger or smaller at pleasure. It is seated in an agreeable plain, at the bottom of a fine bay; and the river which crosses it, is divided into several canals. Lon. 150. 0. E. Lat. 35. 32. N.

JEER, or JEER-ROPE, in a ship, is a large rope reeved through double or treble blocks, lashed at the mast-head, and on the yard, in order to hoist or lower the yards.

JEERS, or, being brought to the jeers, in the sea-language, signifies, a person's being punished at the jeer-capstan, by having his arms extended crosswise, and tied to the capstan-bar when thrust through the barrel, and standing thus, with a heavy weight about his neck. In this posture he is obliged to continue until he is either brought to confess some crime of which he is accused, or has suffered the punishment which the captain has sentenced him to undergo.

JEFFERSON, a county of Kentucky, named after the late President of the United States.

JEFFERSON, a town of Virginia, on the N. side of the Roanoke; 19 miles below the Oeconachy Isles. Lat. 36. 32. N.

JEFFREYS, SIR GEORGE, baron Wem, commonly called Judge Jeffreys, was the sixth son of John Jeffreys, Esq. of Acton in Denbighshire; and was educated at Westminster; whence he removed to the Inner Temple, where he applied himself to the study of the law. Alderman Jeffreys introduced him among the citizens of London; and he, being a merry bottle-companion, soon

came into great business, and was chosen their recorder. He was afterwards chosen solicitor to the duke of York; and in 1680, was knighted, and made chief justice of Chester. At length resigning the recordership, he obtained the post of chief justice of the King's Bench, and, soon after the accession of James II. the great seal. During the reign of king Charles II. he shewed himself a bitter enemy to those dissenting ministers, who, in that time of persecution, were tried by him: he was one of the greatest advisers and promoters of all the oppressions and arbitrary measures carried on in the reign of James II.; and his sanguinary and inhuman proceedings against Monmouth's adherents in the west will ever render his name infamous. Whenever the prisoner was of a different party, or he could please the court by condemning him, instead of appearing, according to the duty of his office, as his counsel, he would scarcely allow him to speak for himself; but would load him with the grossest and most vulgar abuse, brow-beating, insulting, and ridiculing the witnesses that spoke in his behalf; and even threatening the jury with fines and imprisonment, if they made the least hesitation about bringing in the prisoner guilty. Yet it is said, that when he was under no state-influence, he was inclined to protect the natural and civil rights of mankind; of which the following instance has been given:—The mayor and aldermen of Bristol had been used to transport convicted criminals to the American plantations, and sell them for their own private emolument, privately threatening to hang the petty thieves, if they did not petition for transportation. This infamous trade, which had been carried on many years, coming to the knowledge of the lord chief justice, he made the mayor stand at the bar in his scarlet and fur, with his guilty brethren the aldermen, and plead as common criminals. He then obliged them to give securities to answer informations; but the proceedings were stopped by the Revolution. On the arrival of the prince of Orange, the lord chancellor, dreading the public resentment, disguised himself in a seaman's dress, in order to leave the kingdom; and was drinking in a cellar, when he was recognized by a scrivener, who gave notice that he was there; and the mob rushing in seized him, and carried him before the lord mayor; who sent him with a strong guard to the lords of the council, by whom he was committed to the Tower, where he died April 18, 1689.

JEHOVAH, [יהוה] the proper name of God in the Hebrew language.

JEHOVAH, or JAH, signifies the Being who is self-existent, and gives existence to others. The Jews had so great a veneration for this name, that they left off the custom of pronouncing it, whereby its true pronunciation was forgotten. They call it tetragrammaton, or the name with four letters; and believe, that whoever knows the true pronunciation of it cannot fail to be heard by God.

JEJUNUM, the second of the small guts, so called from jejunos, hungry; because generally found empty. See ANATOMY.

JEKYL, a small island of North America, at the mouth of Alatomah, in Georgia. Lon. 81. 40. W. Lat. 31. 7. N.

JELLALÉAN EPOCH, or the EPOCH OF THE SULTANS, began in the year of the Julian period 5792, on the 14th March, at the equinox, and was established by Jellaledan, for finding the vernal equinox, at which time the Persians celebrate their great feast of Neurur.

JELLY, a form of food, prepared either from the juice of ripe fruits, boiled to a proper consistence with sugar; or without it, from the flesh, intestines, or bones, of animals, which are stewed so as to become perfectly stiff and firm when cold. The jellies of fruits are cooling, and acescent; in all disorders of the first passages, they are of eminent service, especially when diluted with water. On the other hand, those prepared from animal substances are very nourishing, and useful to invalids. They ought, however, to be uniformly made of young meat; as the flesh of old quadrupeds and birds is hard, tough, and productive of a thick glutinous jelly, which is extremely difficult of digestion. See GELATINE. A wholesome jelly may be obtained by boiling a large portion of blanched oats, with some hartshorn-shavings and currants, together with a leg of veal cut to pieces, the bones of which are broken. These ingredients are to be boiled or stewed over the fire, in a sufficient quantity of water, till the whole be reduced to a kind of jelly, which, when strained, and suffered to

grow

grow cold, will become firm and elastic. Such a preparation is much used on the Continent, in all hectic disorders, and eaten with broth of snails, or cray-fish. A few spoonfuls of the jelly are taken every morning, diluted with a basin of either of those broths, or any other warm liquor; a dish which furnishes grateful and invigorating aliment to phthisical patients, or those who are afflicted with lingering complaints. Although we are no advocates for liquid food in general, which is apt to distend the stomach, and impair the powers of digestion, by not affording them proper exercise; yet such preparations may occasionally be very useful, if conjoined with a due proportion of either well baked bread, or other substantial nutriment.

JEMME, a town of Tunis, anciently called Tisdra, which has several Roman antiquities, particularly an amphitheatre. The emperor Gordian was crowned in it. It is 90 miles S. of Tunis.

JEMPTERLAND, HIEMTLAND, or JAMTLAND, a mountainous province of Sweden, bounded on the N. by Angermania, E. by Medelpadia, S. by Helsingia, and W. by Norway. The principal towns are Ressund, Lich, and Docra.

JENA, a strong town of Germany, in Upper Saxony, and in Thuringia, with an university. This place has been rendered famous by a late decisive battle fought here between the French and Prussians on the 14th of October, 1806, in which the army of the latter, consisting of 150,000 men, were completely defeated with the loss of little less than 40,000 killed, wounded, and taken, including about twenty generals, among whom were generals Ruchel and the duke of Brunswick, both wounded, the latter of whom died a few days after the battle. Lon. 2. 59. E. Lat. 51. 0. N.

JENAU, or CHUNAU, a river of Hindoostan Proper, one of the five Eastern head-waters of the Indus. It runs through Cashmere and Lahore.

JENCOPING, or JONKIOPING, a town of Sweden, in the province of Smaland. Lon. 14. 20. E. Lat. 57. 22. N.

JENGHIZ, or JENGHIZ KHAN, khan or emperor of the Moguls, the most bloody conqueror that ever disgraced the world, was born in 1193, and began to reign when he was only thirteen years of age. He conquered Cathay, Corea, the greatest part of China, and almost all Asia. He was the most bloody monster that ever existed. He murdered above fourteen millions of the human race, under pretence of extirpating superstition and establishing the worship of one God. He died A. D. 1227.

JENISA, a river of the Russian empire, that runs from N. to S. through Siberia, and falls into the Frozen Ocean.

JENISKOI, a town on the Russian empire, in Siberia, seated on the Jenisa. Corn, butcher's meat, and wild fowls, are very cheap. Lon. 86. 25. E. Lat. 58. 40. N.

JENKINS, HENRY, a native of Yorkshire, remarkable for having lived to the extraordinary age of 169. He died in 1670. See **LONGEVITY**.

JENNERIAN INOCULATION, a name given to the inoculation with the Cow-pox, to prevent infection with the Small Pox, from its discoverer, Dr. Jenner. See **VACCINE INOCULATION**.

JENNERIAN INSTITUTION, an hospital instituted in 1800, in Malta, for inoculating the poor with the cow-pox.

JENTACULUM, among the ancient Romans, a morning refreshment like our breakfast. It was exceedingly simple, consisting, for the most part, of bread alone; labouring people indeed had something more substantial, to enable them to support the fatigues of their employment. The same may be said of the Jews and Greeks. The latter distinguished this meal by the names of *αριστον, ακραυτισμας* or *ακραυτισμα*, though *αριστον* is generally applied to dinner.

JEOPHAILE, [from *Jay faille*, Fr. I have failed,] a term in law, used for an oversight in pleading or other proceedings at law. The shewing of these defects or oversights was formerly often practised by the counsel; and when the jury came into court to try the issue, they said, This inquest you ought not to take; and after verdict they would say to the court, To judgement you ought not to go. But several statutes have been made to avoid the delays occasioned by such suggestions, and a judgement is not to be stayed after verdict for mistaking the Christian or surname of either of the parties, or in a sum of money, or in the day,

month, year, &c. where the same are rightly named in any preceding record.

JEPHTHAH, a judge of Israel, and successor to Jair, in the government of the Hebrew republic, was a native of Mizpeh, and the son of one Gilead by a harlot. The unkindness of his brethren, his promotion to the command of the army, his message to the king of the Ammonites, his rash vow, and its melancholy consequences, with his important victories over the Ammonites and Ephraimites, are recorded in Judges xi. and xii. These events happened about A. M. 2817. Jephthah, after judging Israel six years, died, and was buried in the city of Gilead. St. Paul (Heb. xi. 32.) places Jephthah among the saints of the Old Testament, whose faith distinguished them. But there is something so extraordinary in Jephthah's vow, and such difficulties arise concerning it, that commentators, have been not a little puzzled to solve them. Some maintain, that this daughter of Jephthah was not sacrificed, as that would have been a violation of the law of Moses; and especially, when by the same law he might have redeemed his daughter for ten shekels of silver: therefore they contend, that it was something else Jephthah did to his daughter, such as devoting her to a state of celibacy, or dedicating her to the service of God. On the other hand, those who maintained the affirmative, or that Jephthah's daughter was actually sacrificed, urge, that the times wherein Jephthah lived were sadly addicted to idolatry; also the manner wherein he lived before he was called to the assistance of his country; but above all, the clear, evident, and express meaning of the text. They observe, that vows of perpetual virginity are institutions of a modern date; and had there been no more in it, there would have been little occasion for rending his clothes, and bemoaning himself as he did; besides the bitter lamentations made by herself, and by the daughters of Israel in succeeding times. But in answer to this, it is observed, 1. That these lamentations are expressly recorded to have been made (Judges xi. 37, 38,) not for her untimely death, but on account of her virginity, which, though no nunneries were instituted by the law of Moses, might (and in all probability was) the alternative of Jephthah's vow. 2. That Jephthah's vow must have had some such alternative is highly probable from the consideration, that a dog, a sow, or any other unclean beast, might have met him, and in such a case he could not, without impiety, have offered such animals in sacrifice. 3. That as such sacrifices were expressly prohibited, so were also human sacrifices. But, 4. As a decisive evidence, that there was an alternative, the Hebrew word *vau*, rendered *an* in our translation, likewise signifies *or*; and therefore the vow ran in these terms—"Whatsoever cometh forth of the doors of my house to meet me, shall surely be the Lord's, or I will offer it up for a burnt-offering," i. e. provided it be proper for being sacrificed. 5. That the reason of the grief of Jephthah, his daughter, and all concerned, arose from the consideration, that "she was his only child," and devoting her to perpetual virginity was killing the hope of his family, because all the Israelites reckoned children the greatest of blessings, from the hopes they entertained of being progenitors of the Messiah. 6. The last and perhaps the strongest argument is drawn from the radical meaning of the Hebrew word in the 40th verse; which in our version is translated lament, but which, Hebraists say, ought to be translated give gifts of love; and therefore the verse should be read thus: "The daughters of Israel went yearly to give gifts of love to the daughter of Jephthah four days in a year." The Hebrew word translated bewail in the 37th verse is right, but it is a very different word from that translated lament, in the 40th. This last word occurs and is more properly translated in Psal. lxxviii. 18; and Hosea, viii. 9, 10; though the former of these texts is still better expressed in Ephes. iv. 8. where it is quoted by St. Paul. These arguments seem decisive, that Jephthah's daughter was not sacrificed.

JEREMIAH, an inspired writer, of the race of the priests, the son of Ililkia of Anathoth, of the tribe of Benjamin. He was called to the prophetic office when very young, about the 13th year of Josiah, and continued in the discharge of it about 40 years. He was not carried captive to Babylon with the other Jews, but remained in Judea to lament the desolation of his country. He was afterwards a prisoner in Egypt with his disciple Baruch, where it is supposed he died in a very advanced age. Some of the Christian fathers say, he was stoned to death by the Jews, for preaching

preaching against their idolatry; others, that he was put to death by Pharaoh Hophrah, because of his prophecy against him.

JEREMIAH, THE PROPHECY OF, a canonical book of the Old Testament. Part of this prophecy relates to the time after the captivity of Israel, and before that of Judah, from the 1st chapter to the 44th; part of it to that of the latter captivity, from the 44th chapter to the end. Jeremiah predicts the grievous calamities that were approaching, particularly the 70 years captivity in Chaldea. He also foretells their deliverance and happy return, and the recompence which Babylon, Moab, and other enemies of the Jews, should meet with in due time. There are likewise several intimations in this prophecy concerning the kingdom of the Messiah; as also several remarkable visions, and types, and historical passages relating to those times. The 52d chapter does not belong to the prophecy of Jeremiah, but probably was added by Ezra, and contains a narrative of the taking of Jerusalem, and of what happened during the captivity, to the death of Jeconias, and also looks forwards to the great captivity of the Jewish nation in the time of the Papal apostacy, styled in the Revelation Babylon the Great. St. Jerom has observed, that Jeremiah's style is more easy than that of Isaiah and Hosea; that he retains something of the rusticity of the village where he was born: but that he is very learned and majestic, and equal to those two prophets in the sense of his prophecy.

JERICHO, or HIERICHIUS, in ancient geography, a city of Judea, between Jordan and Jerusalem. 150 stadia from the latter, and 60 from the former. Josephus says, "the whole space from Jerusalem is desert and rocky, and equally barren and uncultivated from Jericho to the lake Asphaltites; yet the palaces near the town and above it are extremely fertile and delicious, so that it may be justly called a divine plain, surpassing the rest of the land of Canaan, no unfruitful country, and surrounded by hills in the manner of an amphitheatre." It produces opobalsamum myrobalsam, and dates; from the last of which it is called the city of palm-trees, by Moses. It is now called Raha; and is situated, M. Volney informs us, "in a plain six or seven leagues long, by three wide, around which are a number of barren mountains, that render it extremely hot."

JERIM, a town of Arabia, in Yemen, 80 miles N. E. of Mocha.

JEROME, or HIERONYMUS, ST. a famous doctor of the church, and the most learned of all the Latin fathers, was the son of Eusebius; and was born at Stridon, a city of ancient Pannonia, about A. D. 340. He studied at Rome under Donatus, the learned grammarian. After being baptized, he went into Gaul, and transcribed St. Hilary's book de Synodis. He then went into Aquileia, where he contracted a friendship with Heliodorus, who prevailed on him to travel with him into Thrace, Pontus, Bithynia, Galatia, and Cappadocia. In 372, he retired into a desert in Syria, where he was persecuted by the orthodox of Melitius's party, for being a Sabellian, because he made use of the hypostasis, as used by the council of Rome in 369. This obliged him to go to Jerusalem; where he studied, with great assiduity and considerable success, the Hebrew language, to acquire a more perfect knowledge of the Holy Scriptures; and consented to be ordained, provided he should not be confined to any particular church. In 381, he went to Constantinople to hear St. Gregory of Nazianzen; and in 382, returned to Rome, where he was made secretary to pope Damasus. He then instructed many Roman ladies in piety and the sciences, which exposed him to the calumnies of those whom he zealously reprov'd for their irregularities; and Pope Siricus, not having all the esteem for him which his learning and virtue justly entitled him to, he returned to the monastery of Bethlehem, where he wrote against heretics. He had a quarrel with John of Jerusalem and Rufinus about the Origenists; and was the first who wrote against Pelagius. He died on the 30th Sept. 420, about 80 years of age. The last edition of his works is that of Verona, in 11 vols. folio. His principal works are, 1. A Latin Version of the Scriptures, commonly called the Vulgate. 2. Commentaries on the Prophets. Ecclesiastes, St. Matthew, and the Epistles to the Galatians, Ephesians, Titus, and Philemon. 3. Polemical Treatises against Montanus, Helvidius, Jovinian, Vigilantius, and Pelagius. 4. Several Letters. 5. A Treatise on the

Lives and Writings of the ecclesiastical Authors who had flourished before his time. His style is lively and animated, and sometimes sublime.

JERONYMITES, or HIERONYMITES, a name given to several orders of religious; otherwise called Hermits of St. Jerom.

JERSEY, an island in the English channel, believed to be the island called in the Itinerary Casarea, in after-times Angia, by us Gersey, or Jersey. It is situated in the English channel, eighteen miles W. of Normandy, and eighty-four S. of Portland in Dorsetshire. It is about twelve miles long, and six broad, where broadest, which is at the two extremities. It is defended by rocks and dangerous quicksands. On the N. side the cliffs rise forty or fifty fathoms high, which render it inaccessible on that side; but on the S. the shore is almost level with the water. In the W. part of the island is a large tract of land, once cultivated and very fertile, but now a barren desert, caused by the westerly winds throwing up sands from the bottom to the top of the highest cliffs. The higher lands are diversified by gritty, gravelly, stony, and fine mould; the lower by a deep, rich, and heavy, soil. The middle part of the island is somewhat mountainous, and so thick planted with trees, that at a distance it resembles one entire forest, though in walking through it there is hardly a thicket or any other thing to be seen but hedge-rows and orchards of apple-trees. The valleys under the hills are finely watered by brooks, and have plenty of cattle and small sheep, with very fine wool; which afford excellent mutton. The horses are good for draught; but few fit for the saddle. The island produces variety of trees, roots, and herbs; but not corn enough for the inhabitants, who therefore import it from England, France, and Dantzic. The fields are inclosed by great mounds of earth, raised from six to ten feet high, proportionably thick and solid, planted with quicksets and trees. As the air is very salubrious, many of the inhabitants live to a great age: but the coast is very subject to storms by westerly winds, from which they have no land to shelter them nearer than North America; and there is a vast chain of rocks about the island, among which the tides and currents are so strong and rapid, that the navigation is dangerous to those who are not perfectly acquainted with the coast. The buildings are generally of rag-stone; but some of the wealthy inhabitants have their houses fronted with a reddish white stone, capable of being polished like marble, and of which there is a rich quarry on a hill called Montmado. The ordinary dwellings are thatched. The churches are very plain, most of them with square steeples; and the communion table is not at the E. end, but placed just under the pulpit. The staple manufacture is knit stockings and caps, many thousand pairs of which are sold weekly at St. Helier; also cyder, of which 25,000 hogsheds have been made here in one year. Their principal foreign trade is to Newfoundland. During the American war this island was invaded by the French. The first attempt was made in 1779. About 6000 men were embarked in flat-bottomed boats, and endeavoured to land in the bay of St. Ouen, on the first of May, supported by five frigates and other armed vessels; but they met with such a vigorous resistance, that they were compelled to retire without having landed a single man. Another attempt was resolved on. The troops and seamen were equally desirous of retrieving their honour; but they were for some time prevented from making any attempt by bad weather; and, before another opportunity offered, the squadron designed to cover their descent was attacked by Sir James Wallace, who drove them ashore on the coast of Normandy, silenced a battery under whose guns they had taken shelter, captured a frigate of thirty-four guns, with two rich prizes, burnt two other large frigates, and a considerable number of smaller vessels. The scheme, though thus totally disconcerted, was resumed in 1781. The conduct of this expedition was given to Baron Rullecourt, a man of courage, but violent in his disposition, and deficient in the prudence requisite for bringing such an enterprise to a successful issue. His force consisted of 2000 men; with whom he embarked in very tempestuous weather, hoping that he might thus be able to surprise the garrison. Many of his transports, however, were dispersed, and he himself, with the remainder, obliged to take shelter in some islands in the neighbourhood of Jersey. As soon as the weather grew calm, he landed, in a dark night, at Grouville, where he made prisoners of

a party of militia. Hence he proceeded with the utmost expedition to St. Helier's. His arrival was so unexpected, that he seized on a party of men who guarded it, together with the commanding officer, and the magistrates. Ruellecourt then drew up a capitulation, the terms of which were, that the island should be instantly surrendered to the French, and the garrison be sent to England; threatening the town with immediate destruction in case of non-compliance. This point being gained, he summoned Elizabeth Castle to surrender in virtue of the capitulation just concluded. To this a peremptory refusal was given, and followed by such a vigorous discharge of artillery, that he was obliged to retire into the town. In the mean time the British troops stationed in the island began to assemble from every quarter under the command of Major Pierson; who, on being required by the French commander to submit, replied, that if the French themselves did not, within twenty minutes, lay down their arms, he would attack them. This being refused, an attack was instantly made with such impetuosity, that the French were totally routed in less than half an hour, and driven into the market-place, where they endeavoured to make a stand. Their commander, exasperated at this unexpected change of affairs, endeavoured to wreak his vengeance on the captive governor, whom he obliged to stand by his side during the whole time of the conflict. This, however, was quickly over; the French were broken on all sides, the baron himself mortally wounded, and the next in command obliged to surrender himself and the whole party prisoners of war; while the captive governor escaped without a wound. This last disaster put an end to all hopes of the French ministry being able to reduce the island, and was indeed no small mortification to them; 800 troops having been landed at that time, of which not one escaped. A monument was erected at the public expence in the church of St. Helier, to the memory of Major Pierson, to whom the deliverance of the island was owing; but who unhappily fell in the moment of victory, when only twenty-four years of age. All the landing-places and creeks about the island are now fortified with batteries, and seventeen or eighteen watch-houses are erected on the headlands. These are round towers with embrasures for small cannon, and loop-holes for small musketry; the entrance by a door in the wall out of the reach of man, and to be ascended by a ladder afterwards drawn up. This island, with those of Guernsey, Sark, Alderney, and their appendages, were part of the duchy of Normandy, and were united to the crown of England by the first princes of the Norman line. The language of the pulpit and the bar is the French, which is also generally spoken by the people. They are governed by their own laws, which are for the most part the feudal customs of Normandy, being collected in an ancient book of customs, entitled *Le grand costumier*. The king's writ, or process from the courts of Westminster, is here of no force; but his commission is. They are not bound by any acts of the imperial parliament, unless particularly named. All causes are originally determined by the bailiff and jurats. But an appeal lies from them to the king and council in the last resort.

JERSEY, NEW, or, as it is commonly called, the **JERSEYS**, (being two provinces united into one government), one of the United States of North America, lying from 39° to 41° Lat. N. and from 74° to 75° 30' Lon. W. from London. It is 160 miles long, from N. to S. and 60 broad, or, according to Mr. Scott, 78, where broadest. It is bounded on the E. by Hudson's river and the sea; on the S. by the sea; on the W. by Delaware bay and river, which divide it from the states of Delaware and Pennsylvania; and on the N. by a line drawn from the mouth of the Mahakamak, in Lat. 41° 24', to a point on Hudson's river, in Lat. 41°; containing about 8,320 square miles, equal to 5,324,800 acres. It is divided into thirteen counties, which are subdivided into ninety-four townships. The counties of Sussex, Morris, and the northern part of Bergen, are mountainous. Five-eighths of most of the southern counties, or one-fourth of the whole state, is sandy and barren. The soil is generally a light sand; but on digging, at an average, about fifty feet below the surface (which can be done, even at the distance of twenty or thirty miles from the sea, without any impediment from rocks or stones), we come to a salt marsh. This state has all the varieties of soil from the worst to the best kind. The barren grounds produce little else but shrub-oaks, and white and yellow pines. The hilly and mountainous parts, which are not too rocky for cultivation, have a stronger soil, naturally co-

vered with stately oaks, hickories, chesnuts, &c. &c. and, when cultivated, produce wheat, rye, Indian corn, buck wheat, oats, barley, flax, and fruits of all kinds. The lands in this hilly country is good for grazing, and the farmers feed great numbers of cattle for New York and Philadelphia markets, and many of them keep large dairies. The great number of navigable rivers and creeks renders it very easy to export the produce, which, besides cattle, fruit, and vegetables, consists of cyder in large quantities, and of the best quality, butter, cheese, beef, pork, mutton, wheat, flour, hams, (which are celebrated as the best in the world,) lumber, flax, seed, leather, and iron, in great quantities.

JERUSALEM, [Heb. from ירו, they shall see, and שֶׁלֶם, Salem, Peace,] a famous and ancient city, capital of Judea, now a province of Turkey in Asia. According to Manetho, an Egyptian historian, it was founded by the shepherds who invaded Egypt in an unknown period of antiquity. According to Josephus, it was the capital of Melchisedek's kingdom, called Salem in the book of Genesis: and the Arabians assert, that it was built in honour of Melchisedek by twelve neighbouring kings. We know nothing of it with certainty, however, till the time of King David, who took it from the Jebusites, and made it the capital of his kingdom, which it ever after continued to be. It was first taken in the days of Joash, by Hazael, King of Syria, who slew all the nobility, but did not destroy the city. It was afterwards taken by Nebuchadnezzar, King of Babylon, who destroyed it, and carried away the inhabitants. Seventy years after, it was rebuilt, by permission of Cyrus, King of Persia, and it continued to be the capital of Judea, (though frequently suffering much from the Grecian monarchs of Syria and Egypt), till the time of Vespasian, Emperor of Rome, by whose son Titus it was totally destroyed. It was, however, rebuilt by Adrian; and seemed likely to have recovered its former grandeur, being surrounded with walls, and adorned with several noble buildings; the Christians also being permitted to settle in it. But this was a short-lived change; for when the empress Helena, mother of Constantine the Great, visited this city, she found it in the most ruinous situation. Having formed a design of restoring it to its ancient lustre, she caused, with a great deal of cost and labour, all the rubbish that had been thrown upon those places where our Saviour had suffered, been buried, &c. to be removed. In doing this, they found the cross on which he died, as well as those of the two malefactors who suffered with him; and, (as the writers of those times relate,) discovered by a miracle that which had borne the Saviour of mankind. She then caused a magnificent church to be built, which inclosed as many of the scenes of our Saviour's sufferings as could conveniently be done, and adorned the city with several other buildings. The emperor Julian is said to have formed a design of rebuilding the temple of Jerusalem, and of restoring the Jewish worship, on purpose to give the lie to our Saviour's prophecy concerning the temple and city of Jerusalem; namely, that the temple should be totally destroyed, without one stone being left upon another; and that the city should be trodden down of the Gentiles till the times of the Gentiles were fulfilled. In this attempt, however, according to the accounts of the Christian writers of that age, the emperor was frustrated by an earthquake and fiery eruption from the earth, which totally destroyed the work, consumed the materials which had been collected, and killed a great number of the workmen. This event has been the subject of much dispute. Bishop Warburton published a treatise expressly on the truth of this fact, and collected testimonies in favour of it, from Ammianus Marcellinus, and Gregory of Nazianzum; for which we shall refer our readers to the bishop and the original authors. But it is a matter of very little consequence, whether this event happened with the circumstances related by these authors, and quoted by the bishop, or not. If Julian did make any attempt to rebuild the temple, it is certain that something obstructed his attempt, because the temple was never rebuilt. If he made no such attempt, the prophecy of our Saviour still holds good; and it surely cannot detract from the merit of a prophecy, that nobody ever attempted to elude it, or prove it to be a falsehood. Jerusalem continued in the hands of the eastern emperors till the reign of the Caliph Omar, who reduced it under his subjection. The Saracens continued in possession of it till 1099, when it was taken by the Crusaders. They founded a new kingdom, of which Jerusalem was the capital, and Godfrey the first king. The Christian kingdom of Jerusalem last-

ed eighty-eight years under nine kings, when it was taken by Saladin, sultan of Egypt in 1187. In 1217, the Saracens were expelled by the Turks, who have ever since continued in possession of it. Jerusalem, in its most flourishing state, was divided into four parts, each inclosed with its own walls; viz. 1. The old city of Jebus, which stood on mount Zion, where the prophets dwelt, and where David built a magnificent castle and palace, which became the residence both of himself and successors; on which account it was emphatically called, the city of David. 2. The lower city, called also the daughter of Zion, being built after it; on which stood the two magnificent palaces which Solomon built for himself and his queen; that of the Maccabean princes; and the stately amphitheatre built by Herod, capable of containing 80,000 spectators; the strong citadel, built by Antiochus, to command and overtop the temple, but afterwards razed by Simon the Maccabee, who recovered the city from the Syrians; and lastly, a second citadel, built by Herod, upon a high and craggy rock, and called by him Antiochia. 3. The new city, mostly inhabited by tradesmen, artificers, and merchants; and 4. Mount Moriah, on which was built the famed temple of Solomon, described in 2 Kings, chap. vi. and vii. and, since then, that rebuilt by the Jews on their return from Babylon, and afterwards built almost anew, and greatly adorned and enriched by Herod. Some idea of the magnificence of this temple may be had from the following considerations: 1. That there were no less than 163,300 men employed in the work: 2. That notwithstanding that prodigious number of hands, it took up seven years in building: 3. That the height of this building was 120 cubits, or 82 yards; and the courts round it about half as high: 4. That the front, on the E. side, was sustained by ramparts of square stone, of vast bulk, and built up from the valley below; which last was 300 cubits high, and being added to that of the edifice amounted to 420 cubits; to which, if we add, 5. The height of the principal tower above all the rest, viz. 60, will bring it to 480 cubits, which, reckoning at two feet to a cubit, will amount to 960 feet; but, according to the length of that measure, as others reckon it, viz. at two feet and an half, it will amount to 1200 feet; a prodigious height from the ground, and such as might well make Josephus say, that the very design of it was sufficient to have turned the brain of any but Solomon. 6. These ramparts, which were raised in this manner, to fill up the prodigious chasm made by the deep valley below, and to make the area of a sufficient breadth and length for the edifice, were 1000 cubits in length at the bottom, and 800 at the top, and the breadth of them 100 more. 7. The huge buttresses which supported the ramparts were of the same height, square at the top, and 50 cubits broad, and jutted out 150 cubits at the bottom. 8. The stones, of which they were built, were, according to Josephus, 40 cubits long, 12 thick, and 8 high, all of marble, and so exquisitely joined, that they seemed one continued piece, or rather polished rock. 9. According to the same Jewish historian, there were 1453 columns of Parian marble, and 2206 pilasters; of such thickness, that three men could hardly encircle them; with height and capitals proportionable, of the Corinthian order. But it is probable, that Josephus has given us these two last articles from the temple of Herod, there being nothing like them mentioned by the sacred historians, but a great deal about the prodigious cedars of Lebanon used in that noble edifice, the excellent workmanship of them adapted to their several ends; together with their gildings and other ornaments. At present Jerusalem is called by the Turks Cudsenbaric, Coudsheriff, and Heleods, or the Holy City. It is reduced to a poor thinly inhabited town, about three miles in circumference, situated on a rocky mountain, surrounded on all sides, except the N. with steep ascents and deep valleys; and these environed with other hills, at some distance. In the neighbourhood grow corn, vines, olives, &c. The stately church erected by the empress Helena on mount Calvary, is called the Church of the Sepulchre; and is kept in good repair by the offerings of pilgrims, who annually resort to it, as well as by the contributions of Christian princes. Jerusalem is 112 miles S.W. of Damascus, and 45 from the Mediterranean. Lon. 35. 25. E. Lat. 31. 55. N.

JESI, an ancient town of Italy, in the late territory of the church, and march of Ancona. Lon. 12. 20. E. Lat. 43. 50. N.

JESO, a group of the Kurile islands. The name is applied by the Japanese to the whole chain of islands between Kamtschatka and Japan.

JESSAMINE. See JASMINUM.

JESSO, JEDSO, or YADSO, a large island of Asia, north of Nippon, governed by a prince tributary to the emperor of Japan.

JESTING, or CONCISE WIT, as distinguished from continued wit or humour, lies either in the thought, or the language, or both. In the first case it does not depend upon any particular words or turn of the expression. But the greatest fund of jests lies in the language, i. e. in tropes or verbal figures; those afforded by tropes consist in the metaphorical sense of the words, and those of verbal figures principally turn upon a double sense of the same word, or a similitude of sound in different words. This is commonly called punning. The third kind of jokes, which lie both in the sense and language, arise from figures of sentences, where the figure itself consists in the sense, but the wit turns upon the choice of the words.

JESUITS, or THE SOCIETY OF JESUS, a famous religious order of the Romish church, founded by Ignotius Loyola. See LOYOLA. The plan which this fanatic formed of its constitution and laws was suggested, as he gave out, by the immediate inspiration of heaven. But notwithstanding this high pretension his design met at first with violent opposition. Pope Paul III. to whom Loyola had applied for his authority to confirm the institution, referred his petition to a committee of the cardinals. They represented the establishment to be unnecessary, as well as dangerous, and Paul refused to grant his sanction to it. At last, Loyola removed all his scruples by an offer which it was impossible for any pope to resist. He proposed, that besides the three vows of poverty, of chastity, and of monastic obedience, common to all the orders of regulars, the members of this society should take a fourth vow of obedience to the pope, binding themselves to go whithersoever he should command for the service of religion, and without requiring any thing from the holy see for their support. At a time when the papal authority had received such a shock by the revolt of so many nations from the Romish church; at a time when the popish system was attacked with so much violence and success, the acquisition of a body of men, thus peculiarly devoted to the see of Rome, and whom it might set in opposition to all its enemies, was an object of the highest consequence. Paul instantly perceiving this, confirmed the institution of the Jesuits by his bull, granted the most ample privileges to the members of the society, and appointed Loyola to be the first general of the order. The event fully justified Paul's discernment. In less than half a century the society obtained establishments in every country that adhered to the Roman catholic church; its power and wealth increased amazingly; the number of its members became great; their character as well as accomplishments were still greater; and the Jesuits were celebrated by the friends, and dreaded by the enemies, of the Romish faith, as the most able and entertaining order in the church. The constitution and laws of the society were perfected by Laynez and Aquaviva, the two generals who succeeded Loyola, men far superior to their master in abilities, and the science of government. They framed that system of profound and artful policy which distinguished the order. The large infusion of fanaticism mingled with its regulation should be imputed to Loyola, its founder. Many circumstances concurred in giving a peculiarity of character to the order of Jesuits, and in forming the members of it not only to take greater part in the affairs of the world than any other body of monks, but to acquire superior influence in the conduct of them. The primary object of almost all the monastic orders is to separate men from the world, and from any concern in its affairs. In the solitude and silence of the cloister, the monk is called to work out his own salvation by extraordinary acts of mortification and piety. He is dead to the world, and ought not to mingle in its transactions. He can be of no benefit to mankind but by his example and by his prayers. On the contrary, the Jesuits were taught to consider themselves as formed for action. They were chosen soldiers, bound to exert themselves continually in the service of God, and of the pope, his vicar, on earth. Whatever tends to instruct the ignorant, or can be of use to reclaim or oppose the enemies of the holy see, was their object. That they might have leisure for this actual service, they were totally exempted from those functions, the performance of which is the chief business of other monks. They appeared in no processions; they practised no rigorous austerities; they did not consume their time in the repetitions of tedious offices; but attended to all the transactions of the world, with a view to their influence upon religion; they were directed to study the disposi-

tions of persons in high rank, and to cultivate their friendship; and by the very constitution, as well as genius, of the order, a spirit of action and intrigue was infused into all its members. As the object of the society of Jesuits differed from that of the other monastic orders, the diversity was no less in the form of its government. The other orders are voluntary associations, in which whatever affects the whole body, is regulated by the common suffrages of all its members. The executive power is vested in the head of each society; the legislative authority resides in the community. Affairs of moment, relating to particular convents, are determined in conventual chapters; such as respect the whole are considered in general congregations. But Loyola, full of the idea of implicit obedience, which he had derived from his military profession, appointed that the government of his order should be purely monarchical. A general, chosen for life by deputies from the several provinces, possessed power supreme and independent, extending to every person and case. He nominated provincials, rectors, and every other officer employed in the government of the society, and could remove them at pleasure. In him was vested the sovereign administration of the revenues and funds of the order. Every member belonging to it was at his disposal, and by his uncontrollable mandate he could impose on them any task, or employ them as he pleased. To his commands they were required to yield not only outward obedience, but to resign to him their inclinations and sentiments. They were to listen to his injunctions as if they had been uttered by Christ himself. Under his direction they were to be mere passive instruments, like clay in the hands of the potter. Such a singular form of policy could not fail to impress its character on all the members of the order, and to give a peculiar force to all its operations. There is not, in the annals of mankind, any example of such a perfect despotism exercised, not over monks shut up in a convent, but over men dispersed among all the nations of the earth. As the constitution of the order vested in the general such absolute dominion, it carefully provided for his being perfectly informed with respect to the character and abilities of his subjects. Every novice who offered himself a candidate was obliged to lay open his conscience to the superior, or a person appointed by him; and not only to confess his sins, but to discover the inclinations, the passions, and the bent, of his soul. This was to be renewed every six months. The society, not satisfied with thus penetrating into the innermost recesses of the heart, directed each member to observe the words and actions of the novices: they were constituted spies upon their conduct, and were bound to disclose every thing of importance concerning them to the superior. That this scrutiny into their character might be as complete as possible, the novitiate was long, during which they passed through the several gradations of ranks in the society; and they must have attained the full age of thirty-three years before they could be admitted to take the final vows, by which they became members. By these methods the superiors, under whose immediate inspection the novices were placed, acquired a thorough knowledge of their disposition and talents. The general, who was the soul that animated and moved the whole society, might have under his eye every thing necessary to direct him; the provincials and heads of houses were obliged to transmit to him regular and frequent reports of the members under their inspection. In these they descended into minute details with respect to the character, abilities, temper, and experience, of each person, and the particular department for which he was best fitted. These reports were entered into registers kept on purpose, that the general might, at one view, survey the state of the society all over the globe; observe the talents of the members; and thus choose the instruments which his absolute power could employ in any service for which he thought proper to destine them. As it was the professed intention of the Jesuits to promote the salvation of men, this engaged them in many active functions. They considered the education of youth as their peculiar province; they aimed at being spiritual guides and confessors; they preached frequently in order to instruct the people; they set out as missionaries to convert unbelieving nations. The novelty of the institution, as well as the singularity of its objects, procured the order many admirers and patrons. The governors of the society availed themselves of every favourable circumstance; and the number and influence of its members increased rapidly. Before the expiration of the six-

teenth century, they had obtained the chief direction of the education of youth in every catholic country in Europe. They had become the confessors of all its catholic monarchs; a function of importance in any reign; but, under a weak prince, superior even to that of minister. They were the spiritual guides of almost every person eminent for rank or power. They possessed the highest interest with the papal court, as the most zealous and able champions for its authority. The advantages which they derived from all these circumstances are obvious. They formed the minds of men in their youth, and retained an ascendancy over them in their advanced years. They possessed the direction of the most considerable courts of Europe. They mingled in all affairs. They took part in every intrigue and revolution. The general, by the extensive intelligence he received, regulated the operations of the order with perfect discernment; and, by means of his absolute power, carried them on with vigour and effect. Along with the power of the order, its wealth increased. Various expedients were devised for eluding the obligation of the vow of poverty. The order acquired ample possessions in every catholic country; and by the number and magnificence of its public buildings, with the value of its property, it vied with the most opulent of the monastic fraternities. Besides the sources of wealth common to the regular clergy, the Jesuits possessed one peculiar to themselves. Under the pretext of promoting the success of their missions, and of facilitating the support of their missionaries, they obtained a special licence from the court of Rome to trade with the nations which they laboured to convert. In consequence of this, they engaged in extensive and lucrative commerce both in the East and West Indies, and opened warehouses in Europe for vending their commodities. They imitated the example of other commercial societies; obtained settlements; and acquired possession of a large and fertile province in South America, and reigned as sovereigns over some hundred thousand subjects. Unhappily the vast influence which the Jesuits acquired by all these different means, was often exerted with the most pernicious effect. Such was the tendency of that discipline observed by the society in forming its members, and such the fundamental maxims in its constitution, that every Jesuit was taught to regard the interest of the order as a capital object to which every consideration was to be sacrificed. This attachment to their order, the most ardent perhaps that ever influenced any body of men, was the characteristic principle of the Jesuits, and serves as a key to the genius of their policy, as well as the peculiarities of their conduct. As it was for the advantage of the society that its members should possess an ascendancy over persons in high rank of great power; the desire of acquiring and preserving such an ascendancy led the Jesuits to propagate a system of relaxed and pliant morality which accommodates itself to the passions of men, justifies their vices, tolerates their imperfections, and authorises almost every action that the most audacious or crafty politician would wish to perpetrate. As the prosperity of the order was intimately connected with the preservation of the papal authority, the Jesuits influenced by the same principal of attachment to the interests of their society, have been the most zealous patrons of those doctrines which tend to exalt ecclesiastical power on the ruin of civil government. They attributed to the court of Rome a jurisdiction as extensive and absolute as was claimed by the most presumptuous pontiffs in the dark ages. They contended for the intire independence of ecclesiastics on civil magistrates. They published such tenets concerning the duty of opposing princes, who were enemies of the Catholic faith, as countenanced the most atrocious crimes, and tended to dissolve all the ties which connect subjects with their rulers. As the order derived both reputation and authority from the zeal with which it stood forth in defence of the Romish church, its members considered it as their peculiar duty to combat the opinions, and check the progress, of the Protestants. They used every art, and employed every weapon, against them. They opposed every gentle and tolerating measure in their favour. They incessantly stirred up against them all the rage of ecclesiastical and civil persecution. Monks of other denominations indeed ventured to teach the same pernicious doctrines, and held opinions equally inconsistent with the order and happiness of civil society. But they either delivered such opinions with greater reserve, or propagated them with less success. Whoever considers the events which happened in Europe during the sixteenth and seventeenth centuries,

centuries, will find the Jesuits responsible for most of the pernicious effects arising from that corrupt casuistry, those extravagant tenets, and that intolerant spirit, which disgraced the church of Rome throughout that period, and which brought so many calamities upon civil society. Amidst the many bad consequences flowing from the institution of this order, mankind derived from it considerable advantages. As the Jesuits, in their first attempts to establish colleges, were violently opposed by the universities in different countries, it became necessary for them, in order to acquire the public favour, to surpass their rivals in science and industry. This prompted them to cultivate the study of ancient literature with extraordinary ardour, and put them upon various methods for facilitating the instruction of youth. By the improvements they made in it, they contributed so much towards the progress of polite learning, that on this account they have merited well of society. Nor has the order been successful only in teaching literature; it has produced likewise eminent masters in many branches of science, and can boast of a greater number of ingenious authors than all the other religious fraternities taken together. But it was in the new world, that the Jesuits exhibited the most wonderful display of their abilities, and contributed most effectually to the benefit of the human species. The conquerors of that unfortunate quarter of the globe had nothing in view, but to plunder, enslave, and exterminate, its inhabitants. The Jesuits alone made humanity the object of their settling there. About the beginning of the 17th century, they obtained admission into the fertile province of Paraguay. They found the inhabitants strangers to the arts, subsisting precariously by hunting or fishing, and hardly acquainted with the first principles of government. The Jesuits instructed and civilized these savages. They taught them to cultivate the ground, to rear tame animals, and to build houses. They were the first persons, who brought them to live together in villages; trained them to arts and manufactures; made them taste the sweets of society, and accustomed them to the blessings of security and order. These people became the subjects of their benefactors, who governed them with a tender and paternal attention. Respected and beloved almost to adoration, a few Jesuits presided over several hundred thousand Indians. They maintained a perfect equality among all the members of the community. Each of them was obliged to labour, not for himself alone, but for the public. The produce of their fields, with the fruits of their industry, were deposited in storehouses, from which each individual received every necessary supply. By this institution almost all the passions which disturb the peace of society, and render the members of it unhappy, were restrained. A few magistrates, chosen by the Indians themselves, watched over the public tranquillity, and secured obedience to the laws. The sanguinary punishments frequent under other governments were unknown. An admonition from a Jesuit, a slight mark of infamy, or on some particular occasion, a few lashes with a whip, were quite sufficient to maintain good order among these innocent and happy people. But even in this meritorious effort of the Jesuits, for the good of mankind, the genius and spirit of their order appeared. They aimed at establishing in Paraguay an independent empire, subject to the society alone, and which, by the superior excellence of its constitution and police, could scarcely have failed to extend its dominions over all the southern continent of America. With this view, to prevent the Spaniards or Portuguese in the adjacent settlements from acquiring any dangerous influence over the people within the limits of the province subject to the society, the Jesuits endeavoured to inspire the Indians with hatred and contempt of these nations. They cut off all intercourse between their subjects and the Spanish or Portuguese settlements. They prohibited any private trader of either nation from entering their territories. When they were obliged to admit any person in a public character from the neighbouring governments, they did not permit him to have any conversation with their subjects; and no Indian was allowed even to enter the house where these strangers resided, unless in the presence of a Jesuit. To render any communication between them as difficult as possible, they industriously avoided giving the Indians any knowledge of the Spanish or any other European language; but encouraged the different tribes which they had civilized to acquire a certain dialect of the Indian tongue, and laboured to make that the universal language throughout their dominions. To render

their empire secure and permanent, they instructed their subjects in the European arts of war. They formed them into bodies of cavalry and infantry, completely armed, and regularly disciplined. They provided a great train of artillery, as well as magazines stored with all the implements of war. Thus they established an army so numerous and well appointed, as to be formidable in a country where a few sickly and ill-disciplined battalions composed all the military force kept up by the Spaniards or Portuguese. Such were the laws, policy, and genius, of this formidable order. The courts of Europe had observed, for two centuries, the ambition and power of the order. But while they felt many fatal effects of these, they could not fully discern the causes to which they were to be imputed. They were unacquainted with many of the singular regulations in the political constitution of the Jesuits, which formed the enterprising spirit of intrigue that distinguished its members, and elevated the society to such a height of power. It was a fundamental maxim with the Jesuits, from their institution, not to publish the rules of their order. These they kept concealed as an impenetrable mystery. They never communicated them to strangers, nor even to the greater part of their own members. They refused to produce them when required by courts of justice; and, by a strange solecism in policy, the civil power in different countries authorised or connived at the establishment of an order of men, whose constitution and laws were concealed with a solicitude which alone was a good reason for having excluded them. During the prosecutions carried on against them in Portugal and France, the Jesuits imprudently produced the mysterious volumes of their institute. By these authentic records, the principles of their government were discovered, and the sources of their power investigated with a degree of certainty, which, previous to that event, it was impossible to attain. The pernicious effects of the constitution of this order, had rendered it early obnoxious to some of the principal powers in Europe, and gradually brought on its downfall. The emperor Charles V. saw it expedient to check its progress in his dominions; it was expelled England, by proclamation 2 Jam. I. in 1604; Venice, in 1606; Portugal, in 1759; France, in 1764; Spain and Sicily, in 1767; and totally suppressed and abolished by pope Clement XIV. in 1773.

JESUIT'S BARK. See CINCHONA, and PERUVIAN BARK.

JESUS CHRIST, [ΙΗΣΟΥΣ ΧΡΙΣΤΟΣ, Gr. *i. e.* the Saviour Anointed,] the Son of God, and Saviour of mankind. He descended from heaven, and took upon him the human nature according to the prophecies, which had been recorded concerning him. He was miraculously conceived by the Holy Ghost, and born of the Virgin Mary in a stable at Bethlehem, A.M. 4000. His birth was announced to shepherds by angels; and a star appeared in the east which guided the magi to Jerusalem, who inquired of Herod where the Messiah was born, as they were come to worship him. This threw the king and his court into consternation. The magi, following the direction of the star, went to Bethlehem, where they found the child, to whom they made their offerings, and being divinely warned, did not go back to Herod, but returned home a contrary way. Herod, full of wrath, determined on the death of the infant; but Joseph, the husband of Mary, being divinely warned in a dream, fled with the child and his mother into Egypt. While they were on their journey, Herod made a horrid slaughter of all the children in Bethlehem. On the death of the tyrant, Joseph returned towards home, but finding that Archelaus reigned in the room of his father, he went to Nazareth, by which that prophecy was fulfilled which called Jesus a Nazarene. At the age of 12 years, he disputed in the temple with the most learned of the Jewish doctors; whom he surprised with his knowledge, and the answers he gave to their questions. After this, he continued with his parents, and was subject to them, probably working at his father's trade, which was that of a carpenter, till he entered upon his ministry. In the 30th year of his age, he began his public ministry; to which the attention of the people was drawn by the preaching of John, a prophet miraculously inspired of God to proclaim the existence of the Saviour, as now descended upon earth, and visible to the eyes of all; and by this prophet Christ himself was baptized in the waters of Jordan, that he might not, in any point, neglect to answer the demands of the Jewish law. It is not necessary here to enter into a particular detail of the life and actions of Jesus Christ. Every one knows, that his

life was one continued scene of the most perfect sanctity, and the purest and most active virtue, so that he did not offend in one single point, but fulfilled all righteousness. By miracles of the most stupendous kind, and not more stupendous than beneficent, he displayed to the universe the truth of that religion which he declared to mankind, and demonstrated the reality of his divine mission in the most illustrious manner. For the propagation of his religion through the country of Judea, our Saviour chose twelve apostles: whom, however, he sent out only once, and after their return, kept them constantly about his person. But, besides these, he chose other 70, whom he dispersed throughout the country. The Jews were filled with astonishment at his doctrine and works, but they hardened their hearts against the truth, and instead of receiving him as the promised Messiah, they persecuted him with the utmost malignity, and attributed his miracles to diabolical agency. To this they were instigated by malice, partly because, through the wickedness of their hearts, they had shut the eyes of their understandings against the clearest evidence, and partly because he plainly and forcibly reproved their wicked deeds. Hence the Sanhedrim, or council, and the body of the Jewish nation, formed a conspiracy against him. For a considerable time their designs had proved abortive; but at last Jesus, knowing that he had fulfilled every purpose for which he came into the world, suffered himself to be taken through the treachery of Judas Iscariot, and was brought before the Sanhedrim, who accused him of blasphemy; and being afterwards brought before Pilate the Roman governor, where he was accused of sedition. Pilate was no sooner sat down to judge in this cause, than he received a message from his wife, desiring him to have nothing to do with the affair, having that very day had a frightful dream on account of our Saviour, whom she called that just man. The governor, intimidated by this message, and still more by the majesty of our Saviour himself, and the evident falsehood of the accusations brought against him, was determined, if possible, to save him. But the clamours of an enraged populace, who at last threatened to accuse Pilate himself as a traitor to the Roman emperor, got the better of his love of justice, which indeed on other occasions was not very fervent. Our Saviour being condemned by his judge, though contrary to the plainest dictates of reason and justice, was crucified between two malefactors on Mount Calvary, Friday, April 3, being about 33 years of age. His body was entombed by Joseph of Arimathea in a new sepulchre; and as Jesus had declared that he would rise again the third day, the Jews obtained a guard from Pilate to watch the tomb. But on the third day he arose, and the soldiers went and gave information to their employers, who bribed them to say that the body was stolen by his disciples. In confutation of this calumny Jesus remained forty days among his followers, and then conducting them to Mount Olivet, ascended into heaven. The Christian religion has subsisted to the present day, uninjured by all the attacks which have been made against it. The evidences upon which it stands are irrefragable, and its doctrines are of the most exalted nature. They teach that man is a miserable creature in consequence of the fall, but that he may be restored to the divine favour by the obedience, death, and mediation of Christ, who came from heaven to make an atonement for the sins of the world, and to bring that life and immortality to light by the gospel which had been lost by the fall of Adam. It is required on the part of him who would participate in this salvation, that he believe in Jesus Christ, with his heart unto righteousness, or in other words that he cordially receive Jesus Christ, and consequently his doctrine, his atonement, and his authority. The precepts of Christianity are agreeable to its doctrinal system; tending to make men humble, virtuous, patient, contented, and holy, in this world, and to qualify them for a state of endless felicity.

JESUS, THE SON OF SIRACH, a native of Jerusalem, composed about 200 B. C. the book of Ecclesiasticus, called by the Greeks Πνευματικὸς, "replenished with virtue;" who also quote it under the title of the Wisdom of Solomon the Son of Sirach. His grandson, who was also of the same name, and a native of Jerusalem, translated it from the Hebrew into Greek about 121 B. C. This Greek version is extant, but the Hebrew original is lost.

JET, a black inflammable substance of the bituminous kind, harder than asphaltum, and susceptible of a good polish. It becomes electrical by rubbing, swims on water, and resembles can-

nel-coal extremely, so that it has also been confounded with this substance. The distinction, however, is easily made, for cannel-coal wants the electrical properties of jet, and is likewise so heavy as to sink in water. M. Magellan is of opinion that jet is a true amber, differing from the yellow kind only in the mere circumstance of colour, and being lighter on account of the greater quantity of bituminous matter which enters into its composition. When burning, it emits a bituminous smell. It is never found in strata or continued masses like fossil stones: but always in separate and unconnected heaps like the true amber. Great quantities of it have been dug up in the Pyrenean mountains; also near Batalha, a small town of Portugal; and in Galicia in Spain. It is found also in Ireland, Sweden, Prussia, Germany, and Italy. It is used in making small boxes, buttons, bracelets, mourning jewels, &c.

JET D'EAU, a French term, adopted into the English language, for a fountain that casts up water to a considerable height in the air. See **HYDROSTATICS**.

JETTE, the border made round the stilts under a pier in old bridges; the same with starling. It consists of a strong framing of timber, filled with stones, chalk, &c. to defend the foundations of the pier from injury.

JETTY HEAD, a name usually given in the royal dock-yards to that part of a wharf which projects beyond the rest; but more particularly the front of a wharf, whose side forms one of the cheeks of a dry or wet dock.

JEVER, a town in Westphalia, 28 miles N. E. of Embden. Lon. 7. 52. E. Lat. 53. 33. N.

JEVRLAND, a territory in Westphalia.

JEW BILL, in law, is the famous statute of the 26 Geo. II. cap. 26, which enabled all Jews to prefer bills of naturalization in parliament, without receiving the sacrament, as ordained by stat. 7. Jac. 1. This act was repealed by 27 Geo. II. c. 1.

JEWEL, any precious stone, or ornament, beset with them. See **DIAMOND**, **RUBY**, &c. Jewels made a part of the ornaments with which the Jews, Greeks, and Romans, especially their ladies of distinction, adorned themselves. So prodigious was the extravagance of the Roman ladies, that Pliny the elder says he saw Lollia Paulina with an equipage of this kind, amounting according to Dr. Arbuthnot's calculation, to 322,916*l.* 13*s.* 4*d.* of our money. Precious stones, amongst the Romans and all the ancients, were much scarcer, and consequently in higher esteem, than they are amongst us, since a commerce has been opened with the Indies. The ancients did not know how to cut and polish them to much perfection; but coloured stones were not scarce, and they cut them very well either hollow or in relief. When luxury had gained ground amongst them, the Romans hung pendants and pearls in their ears; and for this purpose the ears of both sexes were frequently bored.

JEWEL, JOHN, a learned English writer and bishop, born in 1522, and educated at Oxford. He was first entered of Merton, and afterwards of Corpus Christi college. In the reign of Edward VI. he avowed the Protestant religion, and became an admired preacher, which in the succeeding reign brought him into imminent danger. Finding that bishop Bonner was devising means to apprehend him, he went abroad, and resided with Peter Martyr at Strasburgh, and afterwards at Zurich. On the death of Mary he returned home, and was appointed one of the sixteen Protestant divines to dispute with as many Romanists before queen Elizabeth. In 1559 he was preferred to the bishopric of Salisbury, and in 1565 he received the degree of D. D. from the university of Oxford. His conduct as a bishop was exemplary, and he paid great attention to the work of reformation in his diocese. His application to study was so intense as to lay the foundation of an illness of which he died in 1571. His remains were interred in Salisbury cathedral. His learning and abilities were celebrated over Europe, by his admirable works. He wrote, 1. A View of a Seditious Bull sent into England by Pope Pius V. in 1569. 2. A Treatise on the Holy Scriptures. 3. An Exposition of St. Paul's Two Epistles to the Thessalonians. 4. A Treatise on the Sacrament. 5. An Apology for the National Church. 6. Several Sermons, Controversial Treatises, and other works. "This excellent prelate (says the Rev. Mr. Granger) was one of the greatest champions of the reformed religion. He was to the church of England what Bellarmine was to that of Rome. His admirable Apology was translated from the Latin by Anne, the second of the

the four learned daughters of Sir Anthony Coke, and mother of Sir Francis Bacon. It was published, as it came from her pen, in 1564, with the approbation of the queen and the prelates. It was printed in Greek at Constantinople, under the direction of St. Cyril the patriarch. His Defence of it, against Harding and other Popish divines, was in such esteem, that Queen Elizabeth, King James I. King Charles I. and four successive archbishops, ordered it to be kept chained in all parish-churches for public use.

JEWEL-BLOCKS, in sea-language, two small blocks suspended at the extremity of the main and fore top-sail yards, by an eyebolt driven from without into the middle of the yard-arm, parallel to its axis. Their use is, to retain the upper part of the top-mast studding sails beyond the skirts of the top-sails, so that each of those sails may have its full force of action, which would be diminished by the encroachment of the other over its surface.

JEWS, a name derived from the patriarch Judah, and given to the descendants of Abraham by his eldest son Isaac, who for a long time possessed the land of Palestine in Asia, and are now dispersed through all nations in the world. The history of this people, as it is the most singular, so it is also the most ancient in the world; and the greatest part, being before the beginning of profane history, depends entirely on the authenticity of the Old Testament, where it is only to be found; except in the writings of Josephus, which seem to be chiefly copied from it. To repeat here what is said in the sacred writings would be superfluous, as these are in every person's hands. During the Babylonish captivity, the Jews enjoyed their own laws, and appointed judges of life and death, and were at the same time under Achaemenidean kings, or heads of the captivity: in this situation they even forgot their native language, and the form of their letters. Their vulgar tongue was the Syriac or Chaldee, and none but the learned understood the Hebrew; however, they carefully kept their genealogies. After a period of 70 years, Cyrus gave them their liberty; but many of them stayed at Babylon and other places where they had settled; and of the small number that returned to their native country, some few were of the ten tribes: for in order to people Jerusalem, they received all that would come and settle there; but carefully distinguished the true Israelites from the strangers, whom they admitted into their society, and whom in their own language, they called *Giores*, and, in the Greek, *proselytes*. One of the first concerns after their return was to separate themselves from strangers, and to make the prohibitions of the law, relating to marriages with infidels, observed. They rebuilt their temple, and the walls of Jerusalem, and during the reign of the Persians lived in the form of a commonwealth, governed by the high priest, and the council of 71 elders; plenty was seen again, and they enjoyed a profound peace and tranquillity for near 300 years. Upon Alexander's conquering Persia, they continued to live according to their own laws, under the protection of the Macedonian kings, as they had before done under the Persian; but their country lying between Syria and Egypt, they sometimes obeyed the king of one of those nations, and sometimes the other. Ptolemy I. however took Jerusalem by surprise, and carried many Jews captive into Egypt; but observing their regard for their religion, and faithfulness to their oaths, he put some of them into his garrisons, and treated them with great indulgence. Ptolemy Philadelphus, his son, set at liberty all the Jews who were slaves in his dominions, and sent great presents to Jerusalem, in order to procure a Greek translation of the Old Testament; which, it is said, was performed by 72 Jewish elders, whence it obtained the name of the Septuagint. The Jews also received considerable favours from several kings of Syria. Seleucus Nicator gave them the right of citizens in the cities which he built in Asia Minor, and Coele-Syria, and even in Antioch, his capital. Antiochus the Great, also established colonies of Jews in Lydia and Phrygia; in all which places they were allowed the free exercise of their religion, and the observance of their laws. But as the Jews made morality, and the worship of the Deity, the principal objects of their attention, without engaging themselves in the study of oratory, poetry, and music; or the polite arts, as painting, sculpture, and architecture. The Greeks soon considered them as an ignorant people, who would learn nothing but their own law; and as they thought all other nations but themselves barbarians, they despised them more than any other strangers, on account of their religion, which appeared absurd, and too aus-

tere; they saw them refrain from debauchery, not out of frugality and good policy, but from a principle of conscience; and their fasts and distinction of meats made them considered as churlish, unfriendly, and unsociable. "They live," says a Greek philosopher, "separate from every body else; having nothing in common with us, neither altars, offerings, prayers, nor sacrifices; they are at a greater distance from us than the inhabitants of Susa, Bactria, and India." The Jews had indeed far greater reason to dislike the Greeks: it was impossible for them sometimes to avoid shewing signs of abhorrence at the abominable ceremonies of Venus, Bacchus, and Ceres; or to listen with patience to the genealogies, amours, and crimes, of their gods; and this mutual dislike induced the Greeks to proceed to violence and persecution. Thus Ptolemy Philopater, after he had lost the battle of Raphia, discharged his wrath upon the Jews, and several of the succeeding kings of Syria followed his example; and particularly Antiochus Epiphanes, who defiled the temple, by offering a sow upon the altar of burnt-offerings, and carried on the greatest persecution against them they had ever known; then many of the Jews apostatized from the law of God: multitudes of them however suffered martyrdom, and gave up their lives rather than violate their consciences. The Jews, however, at last, took up arms to defend themselves against the Syrian princes, and having recovered their liberties, flourished under their Asmonean kings for about four-score years; but at the end of that short period being conquered by Pompey, they became tributary to the Romans; but after the defeat of Brutus and Cassius, the Parthians taking advantage of the weakness of Mark Antony, who was governor of the east, became masters of Syria and Palestine. The Jews had for above 20 years been plundered by the Romans, and they were still exposed to cruel ravages by many armies of different nations passing through their country, and by the incursions of the Arabians, and others of their neighbours. They were soon however brought again under the Roman government, when they recovered themselves a little under Herod; but he destroyed the succession of their high priests. At his death, his sons kept only a part of his kingdom, and that only for a short time. About the year 70, Titus besieged and took Jerusalem the Jewish capital. The temple and city were given up to plunder, and were burnt, and so completely erased, that scarcely a mark was left to indicate where this magnificent city had stood. Thus ended the Jewish nation and worship; nor have the Jews ever since been able to regain the smallest footing in Judea, nor indeed in any country on earth, though there is scarcely any part of the globe where they are not to be found. They continue their vain expectation of a Messiah to deliver them from the low estate into which they are fallen; and notwithstanding their repeated disappointments, there are few who can ever be persuaded to embrace Christianity. Their ceremonies and religious worship ought to be taken from the law of Moses; but they have added a multitude of absurdities to it. In many countries, and in different ages, they have been terribly massacred, and in general have been better treated by the Mohammedans and Pagans than by Christians. Since the revival of arts and learning, however, they have felt the benefit of that increase of humanity which has taken place almost all over the globe. It is said, that in this country the life of a Jew was formerly at the disposal of the chief lord where he lived, and likewise all his goods. So strong also were popular prejudices against them, that in 1348, when a fatal endemic distemper raged in a great part of Europe, it was said that they had poisoned the springs and wells; in consequence of which a million and a half of them were cruelly massacred. In 1492, half a million of them were driven out of Spain, and 150,000 from Portugal. Edward I. did the same. In short, they were every where persecuted, oppressed, and most rigorously treated. In this enlightened period a more generous system is taking place. In France, and some other countries, they are allowed the rights of citizens, which induces numbers of the most wealthy Jews to fix their residence in these countries. England and Prussia tolerate and protect them; and the emperor of Austria has revoked some restrictions against them.

JEWS-HARP, a kind of musical instrument held between the teeth, which gives the sound by the motion of a broad spring of iron, which being struck by the hand, plays against the breath.

JEWS MALLOW. See *CORCHORUS*.

JEZIDES, among the Mohammedans, a term of similar import with

with heretics among Christians. The Jezides are a numerous sect inhabiting Turkey and Persia, so called from their head Jezid, an Arabian prince, who slew the sons of Ali, Mohammed's father-in-law; for which reason he is reckoned a parricide, and his followers heretics. There are about 20,000 Jezides in Turkey and Persia; who are of two sorts, black and white. The white are clad like Turks; and distinguished only by their shirts, which are not slit at the neck like those of others, but have a round hole to thrust their heads through. This is in memory of a golden ring, or circle of light, which descended from heaven upon the neck of their chief, the head of their religion, after his undergoing a fast of 40 days. The black Jezides, though married, are the monks or religious of the order; and these are called Fakirs. The Turks exact excessive taxes from the Jezides, who hate the Turks as their mortal enemies; and when, in their wrath, they curse any creature, they call it mussulman: but they are great lovers of the Christians, being more fond of Jesus Christ than of Mohammed, and are never circumcised but when they are forced to it. They are extremely ignorant, and believe both the bible and the koran without reading either of them: they make vows and pilgrimages, but have no places of religious worship. All the adoration they pay to God consists of some songs in honour of Jesus Christ, the Virgin, Moses, and sometimes Mohammed; and it is a principal point of their religion never to speak ill of the devil, lest he should resent the injury, if ever he should come to be in favour with God again, which they think possible; whenever they speak of him, they call him the angel Peacock.

JEZRAEL, or **JEZREEL**, a town in the N. of Samaria, where stood a palace of the kings of Israel; (1 Kings xxi. 18,) on the borders of Galilee.

IGLAU, or **IGLAW**, a circle of Moravia, containing about 21 towns, 294 villages, and 6433 houses.

IGLAW, a populous town, capital of the above circle. It is 62 miles S. E. of Prague. Lon. 15. 5. E. Lat. 49. 16. N.

IGNATIA, in botany, a genus of the monogynia order, and pentandria class of plants. Calyx five-toothed; corolla long; fruit an unilocular plum; seeds many. There are two species.

IGNATIUS, Sr. surnamed **THEOPHRASTUS**, one of the apostolical fathers of the church, was born in Syria, and educated under the apostle John and Peter. Being fully instructed in the doctrines of Christianity, he was, for his eminent parts and piety, ordained by St. John, and confirmed about A. D. 67, bishop of Antioch, by those two apostles, who first planted Christianity in that city. In this important seat he continued above forty years, building up the church in its most holy faith, till A. D. 107, when Trajan the emperor, flushed with a victory which he had obtained over the Scythians and Daci, about the ninth year of his reign, came to Antioch, which he entered with the pomp of a triumph. This prince had already commenced a persecution against the Christians. Ignatius was now brought before the emperor; and, in a long discourse, asserted his innocence, and vindicated his faith with freedom. The issue was, that he was cast into prison, and this sentence passed upon him; That being incurably superstitious he should be carried bound to Rome, and there thrown to wild beasts. Accordingly, on the 13, kal. Jan. i. e. Dec. 20, he was brought out into the amphitheatre, and the lions being let loose quickly dispatched him, leaving nothing but a few of his bones. These were gathered up by two deacons, who had been the companions of his journey; and being transported to Antioch, were interred in the cemetery; whence, by order of the emperor Theodotius, they were removed with great solemnity to the Tycheon, a pagan temple within the city, now consecrated to the memory of the martyr St. Ignatius, stands at the head of those Antinician fathers, who defended the true divinity of Christ, whom he calls the Son of God and his eternal Word. A very important use of his writings respects the authenticity of the holy Scriptures, which he frequently alludes to, in the very expressions as they stand at this day. Archbishop Ussher's edition of his works, printed in 1647, is thought the best: yet there is a later edition extant at Amsterdam, where, besides the best notes, there are the dissertations of Ussher and Pearson.

IGNIS FATUUS, a common meteor, chiefly seen in dark nights about meadows, marshes, and other moist places, as also in burying-grounds, and near dunghills. It is known among the people by the appellations. Will with a wisp, and Jack with a lanthorn. See **METEOROLOGY**.

IGNITION, in chemistry, that kind of burning which does not produce a chemical change in the body which is ignited, as in the case of metals, charcoal, &c.

IGNOMINIA, a species of punishment among the ancient Romans, whereby the offender suffered public shame, either by the prator's edict, or by order of the censor.

IGNORAMUS, in law, a term which signifies we are ignorant. This is used when the grand jury impanelled on the inquisition of criminal causes, reject the evidence as too weak to make good the presentment or indictment brought against a person, so as to bring him upon his trial by a petty jury; in which case, they indorse this word on the back of the bill of indictment. In consequence of which, all further proceedings against the party accused are stopped, and the supposed offender is delivered without further answer.

IGNORANCE, according to Locke, is owing chiefly to these three causes: 1. Want of ideas. 2. Want of a discoverable connection between the ideas we have; and, 3. Want of tracing and examining our ideas. See **METAPHYSICS**.

IGNORANCE, is also used to denote illiterateness. Previous to the taking of Rome by the Gauls, such gross ignorance prevailed among the Romans, that few of the citizens could read or write, and the alphabet was almost unknown. During three ages there were no public schools, but the little learning their children had, was taught them by their parents; and how little that was, may be partly concluded from this circumstance, that a nail was usually driven into the wall of the temple of Jupiter Capitolinus, on the 15th of September, to assist the ignorance of the people in reckoning the years, because they were unacquainted with letters or figures. The driving of the nail was afterwards converted into a religious ceremony, and performed by the Dictator, to avert public calamities.

IGNORANCE, or **MISTAKE**, in law, a defect of will, whereby a person is excused from the guilt of a crime, when, intending to do a lawful act, he does that which is unlawful. For here the deed and the will acting separately, there is not that conjunction between them which is necessary to form a criminal act. But this must be an ignorance or mistake of fact, and not an error in point of law. As if a man intending to kill a thief or house-breaker in his own house, by mistake kills one of his own family, this is no criminal action: but if a man thinks he has a right to kill a person excommunicated or outlawed wherever he meets him, and does so; this is wilful murder. For a mistake in point of law, which every person of discretion not only may, but is bound and presumed to know, is, in criminal cases, no sort of defence. *Ignorantia juris, quod quisque tenetur scire, neminem excusat*, is as well the maxim of English law as it was of the Roman.

IHOR, **JOHOR**, or **JOR**, a town of Asia, in Malacca. Lon. 93. 55. E. Lat. 1. 15. N.

JIB, the foremost sail of a ship, being a large stay-sail extended from the outer end of the bowsprit prolonged by the jib-boom, towards the fore-top mast head. See **SAIL**. The jib is a sail of great command with any side-wind, but especially when the ship is close-hauled, or has the wind upon her beam; and its effort in casting the ship, or turning her head to leeward, is very powerful, and of great utility, particularly when the ship is working through a narrow channel.

JIB-BOOM, a boom run out from the extremity of the bowsprit, parallel to its length, and serving to extend the bottom of the jib, and the stay of the fore-top-gallant mast.

JUDDA, **DJHDDA**, or **DSJDIDA**, a town of Arabia. It is 170 miles S. of Medina. Mr. Bruce places it in Lon. 39° 16' 45" E. Lat. 28° 0' 1" N.

JIGGER, in naval affairs, a machine consisting of a piece of rope five feet long, with a block at one end, and a sheave at the other, used to hold on the cable when it is heaved into the ship by the revolution of the windlass.

JILLIFREE, a town of Africa, in the kingdom of Barra. Lon. 16. 10. E. Lat. 13. 16. N.

JINNET BAY, a bay 33 miles E. of Algiers.

JINZO, a town of Spain, in Galicia.

JINZOOWARAIL, a town of Hindoostan, in Guzerat, forty miles S. of Janagur.

JIO, or **JOSSU**, a province of Japan.

JIONPOUR, a city of Hindoostan Proper, capital of a circar

so named, in the district of Benares. It is seated on the Goomty, and near its confluence with the Ganges stands the fort of Jionpour, a building of considerable extent, on a high bank commanding the bridge over the Goomty. It is now mostly in ruins; although formerly it commanded the country from the Ganges to Lucknow, and was once the seat of an empire. Chaja Jehan, vizier to sultan Mahummed Shah, during the minority of his son Mamood Shah, assumed the title of sultan Shirki or king of the the East, took possession of Bahar, and fixed his residence at Jionpour, where he built the great musjud, or mausoleum, which is still remaining. The bridge over the Goomty is built of stone, and consists of sixteen pointed arches. On the top of the bridge are many little shops on both sides, built of stone. It was built in 1567, upon such sound principles, as to have withstood, for such a length of time, the force of the stream, which, in the time of the rains, is very great. The inundations have been known to rise frequently over the bridge, insomuch that in 1774, a whole British brigade of 10,000 men passed over it in boats. Jionpour is 49 miles N. W. of Benares. Lon. 84. 7. E. Lat. 25. 45. N.

ILA, ILAY, or ISLAY, one of the Western Isles of Scotland, lying S. W. of Jura. It is 23 miles long from N. to S. and 18 broad from E. to W. On the E. side, it is full of mountains covered with heath; on the S. it is tolerably well cultivated.

ILAK, or JALAK, a town of Nubia, on the Nile, supposed to be the ancient Meroe. Lon. 34. 30. E. Lat. 18. 48. N.

ILCHESTER, a town of Somersetshire, on the Yeovil. It is 16 miles S. of Wells, and 123 W. by S. of London. Lon. 2. 37. W. Lat. 50. 56. N.

ILDEFONSO, St. a celebrated royal residence of Spain, about two miles from Segovia.

ILDEFONSO, St. DE LOS ZAPOTACOS, a town of New Spain, 50 miles N. E. of Antiquiera. Lon. 27. 30. W. Lat. 17. 5. N.

ILDEFONSO'S ISLANDS, St. a cluster of islands near Terra del Fuego.

ILERAY, an island of Scotland, on the W. coast of N. Uist.

ILERDA, in ancient geography, the capital of the Ilorgetes, now called Lerida, in Catalonia, on the Segra.

ILEX, the HOLM or HOLLY TREE: a genus of the tetragynia order, and tetrandria class of plants; natural order DUMOSÆ. Calyx four-toothed; corolla wheel-shaped; style none; berry four-seeded. There are sixteen species, consisting of small trees and shrubs.

I. AQUIFOLIUM, or COMMON HOLLY, affords many varieties with variegated leaves, which are propagated by the gardeners for sale, and some years ago were in great esteem, but at present are little regarded; the old taste of filling gardens with shorn evergreens being abolished. In the disposition of clumps, however, or rather plantations, of evergreen trees and shrubs, a few, of the most lively colours, have a good effect in winter, if properly disposed. The best of these varieties are the painted-lady holly, British holly, Bradley's best holly, phyllis or cream holly, milkmaid holly, Prichet's best holly, gold-edged hedgehog holly, Chyne's holly, glory-of-the-west holly, Broaderrick's holly, Partridge's holly, Herefordshire white holly, Blinds cream holly, Longstaff's holly, Eales's holly, silver-edged hedgehog holly. All these are propagated by budding or grafting them upon stocks of the common green holly. There is also a variety of the common holly with smooth leaves: but it is often found intermixed with the prickly-leaved on the same tree, and often on the same branch there are both sorts of leaves. The common holly grows naturally in woods and forests in many parts of England, where it rises from twenty to thirty feet, and sometimes more. The leaves are placed alternate on every side of the branches; and from the base of their foot-stalks come out the flowers in clusters, standing on very short foot-stalks; each of these sustain five, six, or more flowers. The common holly is a very beautiful tree in winter; therefore deserves a place in all plantations of evergreen trees and shrubs, where its shining leaves and red berries make a fine variety. Sheep in winter are fed with croppings of holly. Birds eat the berries. The bark fermented, and washed from the woody fibres, make the common bird-lime. The plant makes an impenetrable fence, and bears cropping, though it does not in all respects answer equally well with the hawthorn. The wood is used in fineering, and is sometimes stained black to imitate ebony. Handles for knives

and cogs for mill-wheels are made of it. It is also made into bones for razors. Miller says, he has seen the floor of a room laid with compartments of holly and mahogany, which had an excellent effect.

ILFRACOMBE, a sea-port of Devonshire, with a spacious basin, formed by a good pier projecting into the Bristol channel. The high tides here allow large vessels to enter the harbour. This port employs a number of brigs and sloops, chiefly in carrying ore from Cornwall, coal from Wales, and corn to Bristol. It is seated almost opposite Swansea, in Glamorganshire, and is 49 miles N. N. W. of Exeter, and 181 W. by S. of London. Lon. 4. 5. W. Lat. 51. 14. N.

ILHEOS, a fertile province of Brazil, in the middle-division. ILHEOS, the capital of the above province, 90 miles N. E. of Porto Segaro. Lon. 41. 25. W. Lat. 15. 5. S.

ILIA, the daughter of Numitor, and mother of Romulus, the founder of Rome.

ILIAC PASSION, a kind of nervous colic, whose seat is the ilium, whereby that gut is twisted, or one part enters the cavity of the part immediately below or above; whence it is also called the volvulus, from *volvō*, to roll. The Iliac Passion is called also miserere mei, and chordapsus. The name is derived by some from the Greek verb *ειλω*, to wind or twist. See ANATOMY, and MEDICINE.

ILIAC REGION. See ANATOMY.

ILIAD, [*Ilia*, from *Ilium*], an ancient epic poem, the first and finest of those composed by Homer. The poet's design was to shew the Greeks, who were divided into several little states, how much it was their interest to preserve harmony among themselves; for which end he sets before them the calamities that befel their ancestors from the wrath of Achilles, and his misunderstanding with Agamemnon. and the advantages that afterwards accrued to them from their union. The Iliad is divided into 24 books or rhapsodies.

ILIUM, in anatomy, the third and last of the small intestines. See ANATOMY.

ILIUM, ILION, or ILIOS, in ancient geography, a name of Troy, but most commonly used by the poets, distinguished by the epithet Vetus; at a greater distance from the sea than that afterwards called Ilium Novum.

ILLE, a river of France, which rises in the department of Ille and Vilaine, near Digne, and joins the Vilaine near Rennes.

ILLE, a town of France, in the department of the Eastern Pyrenees, ten miles from Perpignan. Lon. 3. 5. E. Lat. 42. 35. N.

ILLE AND VILAINE, a department of France, comprehending part of the late province of Bretagne.

ILLECEBRUM, in botany, a genus of the monogynia order and pentandria class of plants; natural order, Holoracæ. Calyx five-leaved, and cartilaginous; no corolla; stigma simple; capsule five-valved, five-seeded. There are twenty-one species, natives of North and South America.

ILLICIUM, in botany, a genus of the pentagynia order, and dodecandria class of plants. Calyx six-leaved; petals twenty-seven; capsule several, disposed in a circle, bivalve, one-seeded. There are two species, viz. *I. anisatum*, yellow-flowered aniseed tree, and *I. floridanum*, red-flowered aniseed-tree. They greatly resemble each other. Thurnberg thinks they are not distinct species. The whole of the first mentioned plant, especially the fruit, has a pleasant aromatic smell, and a sweetish subacid taste. They are natives of China and Japan.

ILLINOIA, one of the ten New States of North America, into which the North Western Territory is proposed to be divided.

ILLINOIS, a people of North America, inhabiting a country lying near a large lake of the same name. The country is fertile: and the people plant Indian corn, on which they chiefly subsist. They are civil, active, lively, and robust; and are much less cruel in their dispositions than the other Indian nations.

ILLINOIS, a large navigable river of the United States, in the North Western Territory, formed by the conflux of the Plein and Theakiki, in Lon. 88° 42' W. and Lat. 41° 47' N.

ILLINOIS, a lake of the United States, formed by a dilatation of the above river, about 240 miles below the source of the Theakiki.

ILLUMINATI, [*Lat. i. e. Enlightened*], a name assumed by a secret society, founded on the 1st of May, 1776, by Dr. Adam Weishaupt, professor of canon law, in the University of Ingolstadt.

The avowed object of this order was, "to diffuse from secret societies, as from so many centres, the light of science over the world; to propagate the purest principles of virtue; and to re-instate mankind in the happiness which they enjoyed during the golden age fabled by the poets." Such a philanthropic object was doubtless well adapted to make a deep impression on the minds of ingenious young men; and to such alone did Dr. Weishaup at first address himself. But "the real object," (we are assured by professor Robinson and Abbé Barruel,) "was, by clandestine arts to overturn every government and every religion; to bring the sciences of civil life into contempt; and to reduce mankind to that imaginary state of nature, when they lived independent of each other on the spontaneous productions of the earth."

ILLUMINATING, a kind of miniature-painting, anciently much practised for illustrating and adorning books. Besides the writers of books there were artists called Illuminators, whose profession was to ornament and paint manuscripts. The writers of books first finished their part, and the illuminators embellished them with ornamented letters and paintings. We often find blanks left in MSS. for the illuminators which were never filled up. Some of the ancient MSS. are gilt and burnished in a style superior to later times. Their colours were excellent, and their skill in preparing them must have been very great. The practice of introducing ornaments, drawing, emblematical figures, and even portraits, into MSS. is of great antiquity. Varro wrote the lives of 700 illustrious Romans, which he enriched with their portraits, as Pliny attests in his Natural History (lib. xxxv. c. 2.) Pomponius Atticus, was the author of a work on the actions of the great men amongst the Romans, which he ornamented with their portraits. See Corn. Nepos; chap. 18. But these works have not been transmitted to posterity. There are, however, many precious documents remaining, which exhibit the advancement and decline of the arts in different ages and countries. These inestimable paintings and illuminations display the manners, customs, habits, ecclesiastical, civil, and military, weapons and instruments of war, utensils and architecture of the ancients; they are of the greatest use in illustrating many important facts relative to the history of the times in which they were executed. In these treasures of antiquity are preserved a great number of specimens of Grecian and Roman art, which were executed before the arts and sciences fell into neglect. The MSS. containing these specimens form a valuable part of the riches preserved in the principal libraries of Europe:—the Royal, Cottonian, and Harleian libraries, those in the two universities in England, the Vatican at Rome, the imperial at Vienna, the National, at Paris, St. Mark's at Venice, and many others. A very ancient MSS. of Genesis, which was in the Cottonian library, and almost destroyed by a fire in 1731, contained 250 curious paintings in water-colours: 21 fragments, which escaped the fire engraved by the society of antiquaries of London. Several specimens of curious paintings also appear in Lambecius's catalogue of the imperial library at Vienna, particularly in Vol. III. where 48 drawings of nearly equal antiquity with those in the Cottonian library are engraven; and several others may be found in various catalogues of the Italian libraries.

ILLUMINED, or **ILLUMINATI**, in church history, a term, anciently applied to such persons as had received baptism. This name was occasioned by a ceremony in the baptism of adults; which consisted in putting a lighted taper in the hand of the person baptized, as a symbol of the faith and grace he had received in the sacrament.

ILLUMINED, or **ILLUMINATI**, is also the name of a sect of heretics, who sprang up in Spain about A. D. 1575, and were called by the Spaniards Almagrados. Their principal doctrines were, that by means of a sublime manner of prayer, which they had attained to, they entered into so perfect a state, that they had no occasion for ordinances, sacraments, or good works; and that they could give way, even to the vilest actions, without sin.

ILLUSTRIOUS, or **ILLUSTRIS**, was heretofore, in the Roman empire, a title of honour peculiar to people of a certain rank. It was first given to the most distinguished among the knights, who had a right to bear the *latus clavus*: afterwards, those were entitled illustrious who held the first rank among these called *honorati*; viz. the *præfecti prætorii*, *præfecti urbis*, *treasurers*, *comites*, &c. There were, however, different degrees

among the illustrious: as in Spain they have *grandees* of the first and second class, so in Rome they had their *illustres*, whom they called *maiores*, great; and others, called *illustres minores*, less.

ILMEN, a lake of Russia, in Novogorod, which communicates with lake Ladoga, by the river Volkhof. Lon. 34. 0. E. Lat. 58. 0. N.

ILMINSTER, a market-town of Somersetshire, 26 miles S. W. of Wells.

ILSLEY, a town of Berks, 14 miles N. W. of Reading.

ILST, a town of Batavia, in the department of Eems, and late province of East Friesland, 12 miles S. by W. of Leeuwarden.

ILSTADT, a town of Bavaria, opposite Passau.

IMAGE, [*imago*, Lat.] in a religious sense, an artificial representation of some person or thing, used as an object of adoration; in which sense, it is used synonymously with idol. The use and adoration of images have been long controverted. It is plain, from the practice of the primitive church, recorded by the earlier fathers, that Christians, during the first three centuries, and the greater part of the fourth, neither worshipped images nor used them in their worship. However, the greater part of the Popish divines maintain, that the use and worship of images are as ancient as the Christian religion itself: to prove this, they alledge a decree, said to have been made in a council held by the Apostles at Antioch, commanding the faithful, that they may not err about the object of their worship, to make images of Christ and worship them. Baron. ad ann. 102. But no notice is taken of this decree, till 700 years after the Apostolic times, after the dispute about images had commenced. The first instance, that occurs in any credible author, of images among Christians, is that recorded by Tertullian de Pudicit. c. 10, of certain cups, or chalices, as Bellarmine pretends, on which was represented the parable of the good shepherd carrying the lost sheep on his shoulders: but this instance only proves, that the church, at that time, did not think emblematical figures unlawful ornaments of chalices. Another instance is taken from Eusebius, (Hist. Eccl. lib. vii. cap. 18.) who says, that in his time there were to be seen two brass-statues in the city of Paneas or Casarea Philippi; the one of a woman on her knees, with her arms stretched out, the other of a man over against her, with his hand extended to receive her: these statues were said to be the images of our Saviour and the woman whom he cured of an issue of blood. From the foot of the statue representing our Saviour, says the historian, sprung up an exotic plant, which, as soon as it grew to touch the border of his garment, was said to cure all sorts of distempers. Eusebius, however, vouches none of these things; nay, he supposes that the woman who erected this statue of our Saviour was a pagan, and ascribes it to a pagan custom. Philostorgius, (Eccl. Hist. lib. vii. c. 3.) expressly says, that this statue was carefully preserved by the Christians, but that they paid no kind of worship to it, because it is not lawful for Christians to worship brass or any other matter. The primitive Christians abstained from the worship of images, not, as the Papists pretend, from tenderness to heathen idolaters, but because they thought it unlawful in itself to make any images of the Deity. Justin Mart. Apol. ii. p. 44. Clem. Alex. Strom. 5. Strom. 1. and Protr. p. 46. Aug. de Civit. Dei. lib. vii. c. 5, and lib. iv. c. 32. Id. de Fide et Symb. c. 7. Lactant. lib. ii. c. 3. Tertull. Apol. c. 12. Arnob. lib. vi. p. 202. Tertullian, Clemens Alexandrinus, and Origen, were of opinion, that, by the second commandment, painting and engraving were unlawful to a Christian, styling them evil and wicked arts. Tert. de Idol. cap. 3. Clem. Alex. Admon. ad Gent. p. 41. Origen contra Celsum, lib. vi. p. 182. The use of images in churches as ornaments, was first introduced by some Christians in Spain, in the beginning of the fourth century; but the practice was condemned as a dangerous innovation, in a council held at Eliberis in 305. Epiphanius, in a letter preserved by Jerom, tom. ii. ep. 6, bears a strong testimony against images: and he may be considered as one of the first Iconoclasts. The custom of admitting pictures of saints and martyrs into churches (for this was the first source of image-worship) was rare in the end of the fourth century; but became common in the fifth. But they were still considered only as ornaments, and even in this view, they met with very considerable opposition. In the following century the custom of thus adorning churches became almost universal,

universal, both in the E. and W. Petavius expressly says, (de Incur. lib. xv. cap. 14.) that no statues were yet allowed in the churches; because they bore too near a resemblance to the idols of the Gentiles. Towards the close of the fourth, or beginning of the fifth century, images, which were introduced by way of ornament, and then used as an aid to devotion, began to be actually worshipped. However, it continued to be the doctrine of the church in the sixth, and in the beginning of the seventh century, that images were to be used only as helps to devotion, and not as objects of worship. The worship of them was condemned in the strongest terms by Gregory the Great; as appears by two of his letters, written in 601. From this time to the beginning of the eighth century, there occurs no instance of any worship given, or allowed to be given, to images by any council or assembly of bishops whatever. But they were commonly worshipped by the monks and populace in the beginning of the eighth century; insomuch, that in 726, when Leo published his famous edict, it had already spread into all the provinces subject to the empire.

IMAGE, in optics, a figure in the form of any object, made by rays of light issuing from the several points of it, and meeting in so many other points, either at the bottom of the eye, or on any other ground, or on any transparent medium, where there is no surface to reflect them. Thus we are said to see all objects by means of their images formed in the eye.

IMAGE, in rhetoric, signifies a lively description of any thing in a discourse. Images in discourse are defined by Longinus, to be, in general, any thoughts proper to produce expressions, and which present a kind of picture to the mind. But, in the more limited sense, he says, images are such discourses as come from us, when, by a kind of enthusiasm, or an extraordinary emotion of the soul, we seem to see the things whereof we speak, and present them before the eyes of those who hear us.

IMAGINATION, a power or faculty of the mind, whereby it conceives and forms ideas of things communicated to it by the outward organs of sense. See **METAPHYSICS**.

IMAGO, in entomology, a name given by Linnæus to the third and last state of insects, when they appear in their proper shape and colours.

IMAM, or **IMAN**, a minister in the Mohammedan church, answering to a parish-priest among us.

IMAM is also applied, by way of excellence, to the four chiefs or founders of the four principal sects among the Mohammedans. Thus Ali is the imam of the Persian sect, or sect of the Schiaites; Abubeker the imam of the Sunnites, which is the sect followed by the Turks; Saphii, or Safii, the imam of another sect, &c.

IMAUS, in ancient geography, the largest mountain of Asia, and a part of Taurus; from which the whole of India extends into a vast plain, resembling Egypt. It extends through Scythia, as far as to the Mare Glaciale, dividing it into Scythia intra Imaum, and Scythia extra Imaum, or Hither and Farther Scythia, and stretching out along the N. of India to the eastern ocean, separates it from Scythia.

IMBRICATED, among botanists, an appellation given to such leaves of plants, as are placed over one another like the tiles of a house. See **BOTANY**.

IMBROS, in ancient geography, an island of the Ægean Sea, near Thrace, 32 miles from Samothrace.

IMENSTADT, a town of Suabia, 20 miles E. of Lindau.

IMERETIA, **IMERITIA**, or **IMMERETTA**, a principality of Georgia, consisting of four provinces, between the Black Sea and the Caspian; bounded on the S. by the Turkish dominions, W. by Mingrelia, N. by Ossetia, and E. by the rest of Georgia.

IMITATION, in music, a particular way of composition wherein each part is made to imitate the other, either throughout the whole piece, which is one of the kinds of canon; or only during some measures, which is a simple imitation. Sometimes the motion or figure of the notes is only imitated, and that often by a contrary motion, which makes what they call a retrograde imitation.

IMITATION, in oratory, history, or poetry, is an endeavour to resemble a speaker or a writer in those qualities, in which we propose them as patterns. The first historians among the Romans, says Cicero, were very dry and jejune, till they began to imitate the Greeks, and then they became their rivals. It is well known

how closely Virgil has imitated Homer in his *Æneid*, Hesiod in his *Georgics*, and Theocritus in his *Eclogues*. Terence copied after Menander; and Plautus after Epicarnus, as we learn from Horace, (lib. ii. ep. ad August.) who himself owes many of his beauties to the Greek lyric poets.

IMMANENT, in logic. The schoolmen distinguish two kinds of actions, the one transient, which pass from the agent to the patient, the other immanent, which continue in the agent.

IMMANUEL. See **EMMANUEL**, and Isaiah, vii. 14. This prophecy was fulfilled by the birth of our Lord. Matt. i. 23.

IMMATERIAL, something devoid of matter, or that is pure spirit: thus God, angels, and the human soul, are immaterial beings.

IMMATERIALITY. See **METAPHYSICS**.

IMMEDIATE, whatever is capable of producing an effect without the intervention of external means; thus we say, an immediate cause, in opposition to a mediate or remote one.

IMMEMORIAL, in law, an epithet given to the time or duration of any thing, whose beginning we know nothing of. In a legal sense, a thing is said to be of time immemorial, or time out of mind, that was before the reign of king Edward II.

IMMENHAUSEN, a town of Hesse Cassel, 8 miles N.N.W. of Cassel.

IMMENSITY, an unlimited extension, or which no finite and determinate space, repeated ever so often, can equal.

IMMENSITY, in physics, is properly defined unlimited extension.

IMMERISION, in astronomy, is when a star or planet is so near the sun with regard to our observation, that we cannot see it; being, as it were, enveloped and hid in the rays of that luminary. It also denotes the beginning of an eclipse of the moon, or that moment when the moon begins to be darkened, and to enter into the shadow of the earth. The term is applied in like manner to the moons of Jupiter. The immersions are observed from the time of the conjunction of Jupiter with the sun, to the time of his opposition; and the emersions from the time of his opposition to his conjunction. The peculiar advantage of these observations is, that during eleven months of the year, they may be made at least every other day. We are much indebted to Mr. Cassini for the theory of finding the longitude by the immersions and emersions of Jupiter's satellites.

IMMERSTON, in chemistry, is a species of calcination, when any body is immersed in a fluid to be corroded: or it is a species of lotion; as when a substance is plunged into any fluid, to deprive it of a bad quality, or communicate to it a good one.

IMMOLATION, the art of sacrificing. It was a ceremony in the Roman sacrifices consisting of throwing upon the head of the victim some corn and frankincense, with the mola, or salt-cake, and a little wine.

IMMORTAL, that will last to all eternity; having in it no principle of alteration or corruption: thus God and the human soul are immortal.

IMMUNITY, [immunitas, Lat.] a privilege or exemption from some office, duty, or imposition, an exemption from tolls, &c. Immunity is more particularly understood of the liberties granted to cities and communities.

IMMUTABILITY, one of the divine attributes, founded on the absolute perfection of the Deity. The immutability of God is two-fold, physical and moral. The first consists in this, that the divine essence does not, nor possibly can, receive any alteration; and the moral immutability is founded on the perfection of his nature, whereby he always wills the same things, or such as are best.

IMOLA, a populous district of the late Cisalpine republic.

IMOLA, a city of the late Cisalpine republic, in the late province of Romagna, capital of the above district, anciently called Forum Corneli.

IMOSCHI, a district of Maritime Austria, in the late Venetian Dalmatia.

IMPACT, the simple action of one body upon another, to put it in motion. The point of impact is the point where the body acts.

IMPALE, in heraldry, is to conjoin two coats of arms pale-wise. Women impale their coats of arms with those of their husbands. See **HERALDRY**.

IMPALEMENT.

IMPALEMENT. See **EMPALEMENT.**

IMPALPABLE, that whose parts are so extremely minute that they cannot be distinguished by the senses, particularly by that of feeling.

IMPANELLING, in law, signifies the writing down or entering into a parchment, list, or schedule, the names of a jury summoned by the sheriff to appear for such public services as juries are employed in.

IMPARLANCE, in law, a petition in court for a day to consider or advise what answer the defendant shall make to the plaintiff's action; and is the continuance of the cause till another day, or a longer time given by the court.

IMPASSIBLE, that which is exempt from suffering, or cannot undergo pain or alteration. The stoics place the soul of their wise men in an impassible, or imperturbable state.

IMPATIENS, TOUCH-ME-NOT, and BALSAMINE: a genus of the monogamia order, and syngenesia class of plants; natural order, Corydalis. Calyx two-leaved; corolla five-petaled, irregular, with a cowed nectary; capsule superior, five-valved. It has twelve species.

IMPEACHMENT, in law, is a prosecution for treason and other crimes and misdemeanours. Any member of the lower house of parliament may impeach any one belonging either to that body or to the house of lords. The method of proceeding is to exhibit articles on the behalf of the commons, by whom managers are appointed to make good their charge. These articles are carried to the lords, by whom every person impeached by the commons is always tried; and if they find him guilty, no pardon under the great seal can be pleaded to such an impeachment. 12 Will. III. c. ii.

IMPECCABLES, in church history, a name given to those heretics who boasted that they were impeccable, and that there was no need of repentance: such were the Gnostics, Priscillianists, &c.

IMPECCABILITY, the state of a person who cannot sin; or a grace, privilege, or principle, which puts him out of a possibility of sinning. Divines distinguish several kinds and degrees of impeccability: that of God belongs to him essentially: that of Jesus Christ, considered as man, belongs to him by the hypostatical union; that of the blessed is a consequence of their condition: that of men is the effect of a confirmation in grace, and is rather called impeccance than impeccability, a state in which we are empowered to live without sin, but not delivered from the possibility of committing sin.

IMPEDIMENTS, in law, are such hindrances as put a stop to a person's seeking his right by a due course of law. Persons under impediments are those under age or coverture, non compos mentis, in prison, beyond sea, &c. who, by a saving in our laws, have time to claim and prosecute their rights, after the impediments are removed, in case of fines levied, &c.

IMPENETRABILITY, in physics, that property of body, whereby it cannot be pierced by another: thus, a body, which so fills a space as to exclude all others, is said to be impenetrable. See **PHYSICS.**

IMPERATIVE MOOD, one of the moods of a verb, used when we would command, intreat, or advise: thus, go, read, take pity, be advised, are imperatives in our language. But in the learned languages, this mood has a peculiar termination to distinguish it, *doce* or *docto*, teach; *lege* or *legito*, read, &c. and not only so, but the termination varies, according as we address one or more persons, as *audi* and *audite*; *αυτιςτω*, *αυτιςτωι*, *αυτιςτωις*, &c.

IMPERATOR, [Latin, *i. e.* commander,] in Roman antiquity, a title of honour conferred on victorious generals by their armies, and afterwards confirmed by the senate. Though originally no more than a military title in the republican armies, yet upon the degeneracy of the Roman republic, and assumption of the supreme power of Caesar and Augustus, it was used to express the most unlimited despotism, and a rank superior to that of King. Hence the origin of Emperor.

IMPERATORIA, MASTERWORT: a genus of the digynia order, and pentandria class of plants; natural order, Umbellata. Fruit roundish, compressed in the middle, gibbous, and surrounded with a border; petals inflex, emarginate. There is only one species, viz.

I. OSTRUTHIUM, a native of the Austrian, Styrian Alps, and other mountainous places of Italy. The root is as thick as a man's thumb, running in the ground; it is fleshy, aromatic, and has a strong acrid taste, biting the tongue like pellitory of Spain; the leaves arise immediately from the root; they have long foot-stalks, dividing into three very short ones at the top, each sustaining a trilobate leaf, indented on the border. The foot-stalks are deeply channelled, and when broken, emit a rank odour. The root has a flower similar to that of angelica, and is esteemed a good sudorific. There are instances of its having turned the ague when the bark had failed. It should be dug up in winter, and a strong infusion made in wine.

IMPERFECT, something that is defective, or that wants some of the properties found in other beings of the same kind: thus, mosses are called imperfect plants, because almost all the parts of fructification are wanting in them; and for the like reason is the appellation imperfect given to the fungi and submarine plants.

IMPERFECT NUMBERS, such whose aliquot parts taken together, do either exceed or fall short of that whole number of which they are parts: they are either abundant or deficient. Thus 12 is an abundant imperfect number, because the sum of its parts $1 + 2 + 3 + 4 + 6 = 16$, which is greater than 12. But 10 is a deficient imperfect number, because $1 + 2 + 5 = 8$ only, which is less than 10.

IMPERIAL. See **EMPEROR,** and **EMPIRE.**

IMPERIAL CHAMBER, a sovereign court, established for the affairs of the immediate states of the empire.

IMPERIAL CITIES, in the late Germanic constitution, were those which owned no other head but the emperor. These were a kind of little commonwealths; the chief magistrate whereof did homage to the emperor, but in other respects, and in the administration of justice, was sovereign. They had a right to coin money, and to keep forces and fortified places.

IMPERIAL DIET, an assembly or convention of all the states of the late Germanic empire.

IMPERIAL PARLIAMENT, a title given the United Parliament of Great Britain and Ireland, since Jan. 1, 1801, when the Union of the three kingdoms was completed.

IMPERIALE, a city of South America, in Chili, 18 miles from the South Sea, seated on a steep neck of land, N. of the Cauten.

IMPERSONAL VERBS, in Latin grammar, are verbs to which the nominative of any certain person cannot be prefixed; or, verbs destitute of the two first and primary persons, as *decet*, *oportet*, &c. The impersonal verbs of the active voice end in *t*, and those of the passive in *tur*; they are conjugated through the third person singular of almost all the tenses and moods.

IMPETIGO, in medicine, an extreme roughness and foulness of the skin, attended with an itching and plentiful scurf. It is a species of dry puriginous itch, wherein scales or scurf succeed apace; arising from saline corrosive humours thrown out upon the exterior parts of the body, by which means the internal parts are usually relieved.

IMPETRATION, [*impetratio*, from *impetro*, Lat.] the act of obtaining any thing by prayer or intreaty. The term was particularly used in the English statutes for the pre-obtaining of benefices and church-offices in England from the court of Rome, which belonged to the disposal of the king and other lay patrons of the realm; the penalty whereof is the same with that of provisors, 25 Edw. III.

IMPETUS, in mechanics, is the force with which one body strikes or impels another. See **MECHANICS,** and **PROJECTILES.**

IMPLICATION, in law, is where something is implied, that is not expressed by the parties themselves in their deeds, contracts, and agreements.

IMPLICITE, something tacitly comprised or understood; that is, contained in a discourse, clause, or proposition, not in express terms, but only by induction and consequence.

IMPORTATION, the act of bringing goods into a country from foreign parts. It has generally been considered, that for any country to carry on a profitable trade, it is necessary that the value of the goods sent out of it should be greater than that of the articles imported: this, however, is a very erroneous axiom, unless it is understood with great limitations. All articles of merchandize, imported merely for re-exportation, and also such as are

used or worked up in our own manufactures, are far from being hurtful to our commerce; and may even, in many respects, be deemed of equal profit with our own native commodities. It is therefore an excess of such importations alone as are either for mere luxury or mere necessity, or for both together, which is disadvantageous to the country, and not such importations as, like many of ours, consist of raw silk, Spanish wool, cotton wool and yarn, mohair, flax and hemp, oils, potasses, dyeing stuffs, naval stores, &c. either used in our ship-building, or worked up in our manufactures, a principal part of which are for exportation: neither can our importations of East India goods and colonial produce, which are chiefly designed to be afterwards exported, be deemed unprofitable, but are, on the contrary, some of the most lucrative branches of our foreign trade. The following statement of the total value of the imports of England, in the year 1354, furnishes a curious comparison with their present magnitude.

1831 fine cloths, at 6 <i>l.</i> per cloth, which with the customs, come to.....	11,083	12	0
397½ hundred weight of wax, at 40 <i>s.</i> per hundred weight, which, with the customs, come to.....	815	7	5
1829½ tons of wine, at 40 <i>s.</i> per ton, which, with the customs, come to	3,841	19	0
Linen-cloth, mercery, grocery, and all other wares.....	92,943	6	10
On which the customs were.....	285	18	3
Total.....	38,970	3	6

At this period, and for a long time after, foreigners were the principal importers of goods in this country; and as it was thought that many of them, after disposing of their merchandise here, returned with the value in money to their own country, which was deemed a serious injury, many laws were made against carrying out of the realm any gold or silver, either in coin, plate, or bullion; and merchant-strangers were compelled to give security that they would lay out all the money they received for the wares they imported, in English merchandize to be exported. These injudicious restrictions have been long since done away; and excepting the prohibition of some foreign manufactures, the import trade of this country is probably as free as the regulations necessary to secure the payment of heavy duties on almost every article of trade will admit.

Total official value of the imports of Great Britain, in the year 1800.

Port of London.....	13,843,172	2	10
The outports.....	9,514,642	11	10
England.....	28,357,814	14	8
Scotland.....	2,412,790	11	8
	30,770,605	6	4

IMPOSITION OF HANDS, an ecclesiastical action, by which a bishop lays his hands on the head of a person, in ordination, confirmation, or in uttering a blessing. This practice is also frequently observed by the dissenters at the ordination of their ministers, when all the ministers present place their hands on the head of him whom they are ordaining, while one of them prays for a blessing on him and his future labours. This some of them retain as an ancient practice, justified by the example of the apostles, when no extraordinary gifts are conveyed. However, they are not agreed as to the propriety of this ceremony; nor do they consider it as an essential part of ordination. Imposition of hands was a Jewish ceremony, introduced not by any divine authority, but by custom; it being the practice among those people whenever they prayed to God for any person to lay their hands on his head. Our Saviour observed the same custom, both when he conferred his blessing on children, and when he cured the sick; adding prayer to the ceremony. The apostles likewise laid hands on those upon whom they received into fellowship. The priests observed the same custom when any one was received into their body. And the apostles themselves underwent the imposition of hands afresh every time they entered upon any new design.

IMPOSSIBILITY, that which cannot be effected; it is either physical, or moral.

1. **IMPOSSIBILITY, MORAL**, is when any thing, in its own nature, is possible, but yet is attended with such difficulties, as that, all things considered, it appears impossible.

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2. **IMPOSSIBILITY, PHYSICAL**, is that which is contrary to the law of nature.

IMPOSSIBLE, not to be done, or effected. A proposition is said to be impossible, when it contains two ideas which mutually destroy each other, and which can neither be conceived nor united together. Thus it is impossible that a circle should be a square; because we conceive clearly that squareness and roundness destroy each other by the contrariety of their figure. A thing which is impossible in law, is the same with a thing impossible in nature: and if any thing in a bond or deed be impossible to be done, such deed, &c. is void. 21 Car. I.

IMPOST, in law, is particularly applied to the tax which the crown receives for merchandises imported into any port or haven.

IMPOSTS, [*imposte*, Fr.] in architecture, that part of a pillar, in vaults and arches, on which the weight of the whole building l eth. An impost, sometimes called chapitel, is a sort of plinth, or little cornice, which crowns a pier, and supports the first stone whence an arch or vault commences. The imposts are conformable to their proper orders. See **ARCHITECTURE**.

IMPOSTHUME, [*αποστημα*, an abscess,] a collection of purulent matter in a bag or cyst. An imposthume, or abscess, in any part of the body, is either owing to an obstruction of the fluids in that part which makes them change into such matter, or to a translation of it from some other part where it was generated. See **SURGERY**.

IMPOTENCE, in moral agency. Divines and philosophers distinguish two sorts of impotency; natural and moral. The first is a want of some physical principle, necessary to an action; or where a being is absolutely defective, or not free and at liberty to act: the second only imports a great difficulty; as a strong habit to the contrary, a violent passion, or the like.

IMPREGNATION, in pharmacy, is used for communicating the virtues of one medicine to another, whether by mixture, coction, digestion, &c.

IMPRESSING OF SEAMEN. The power of impressing seamen for the sea-service by the king's commission, has been a matter of great dispute, and submitted to with great reluctance. Sir Michael Foster attempts to prove, that the practice of impressing, and granting powers to the admiralty for that purpose, is of very ancient date, and has been uniformly continued by a regular series of precedents to the present time: whence he concludes it to be part of the common law. The difficulty arises hence, that no statute has expressly declared this power to be in the crown, though many of them strongly imply it. The statute 2 Rich. II. c. 4, speaks of mariners being arrested and retained for the king's service, as of a thing well known, and practised without dispute: and provides a remedy against their running away. By a later statute, if any watermen, who uses the river Thames, shall hide himself during the execution of any commission of pressing for the king's service, he is liable to heavy penalties. By another (5 Eliz. c. 6,) no fisherman shall be taken by the queen's commission to serve as a mariner; but the commission shall be first brought to two justices of the peace, inhabiting near the sea-coast where the mariners are to be taken, to the intent that the justices may choose out and return such a number of able-bodied men, as in the commission are contained, to serve her majesty. And by others, especial protections are allowed to seamen in particular circumstances, to prevent them from being impressed. Ferry-men are also said to be privileged from being impressed, at common law. All which do most evidently imply a power of impressing to reside somewhere; and if any where, it must, from the spirit of our constitution, as well as from the frequent mention of the king's commission, reside in the crown alone. This method of manning the navy can be considered as only defensible from public necessity, to which all private considerations must give way. All apprentices; the master, mate, and carpenter, and one man for every 100 tons, of vessels employed in the coal-trade, are exempt from the press.

IMPRESSION, a term applied to the species of objects which are supposed to make some mark on the senses, the mind, and the memory. The Peripatetics assert, that bodies emit species resembling them, which are conveyed to the common sensorium, and they are rendered intelligible by the active intellect; and, when thus spiritualized, are called expressions, or express species, as being expressed from others.

2 H

IMPRESSION

IMPRESSION denotes also the edition of a book, regarding the mechanical part only; whereas edition takes in also the care of the editor, who corrected or augmented the copy, adding notes, &c. to render the work more useful.

IMPRIMATUR, a Latin verb, signifying, let it be printed, much used on books printed in the sixteenth and seventeenth centuries, introducing copies of warrants for their publication, signed by the lord chancellor or other public officer, before the liberty of the press, that invaluable privilege of Britons, was thoroughly understood, and acknowledged.

IMPRISONMENT, the state of a person restrained of his liberty, and detained under the custody of another. No person is to be imprisoned but as the law directs, either by the command or order of a court of record, or by lawful warrant; or the king's process, on which one may be lawfully detained. At common law, a person could not be imprisoned unless he were guilty of some force and violence, for which his body was subject to imprisonment, as one of the highest executions. Where the law gives power to imprison, in such case it is justifiable, provided he that does it in pursuance of a statute, exactly pursues the statute in the manner of doing it; for otherwise it will be deemed false imprisonment, and of consequence it is unjustifiable. Every warrant for commitment for imprisoning a person, ought to run, "till delivered by due course of law," and not "until farther order;" which has been held ill: and thus it also is, where one is imprisoned on a warrant not mentioning any cause for which he is committed. See **ARREST**, and **COMMITMENT**.

IMPRISONMENT, FALSE. Every confinement of the person is an imprisonment, whether it be in a common prison, or in a private house, or in the stocks, or even by forcibly detaining one in the public streets. Unlawful or false imprisonment, consists in such confinement or detention without sufficient authority: which authority may arise either from some process from the courts of justice; or from some warrant from a legal power to commit, under his hand and seal, and expressing the cause of such commitment; or from some other special cause warranted, for the necessity of the thing, either by common law or act of parliament; such as the arresting of a felon by a private person without warrant, the impressing of mariners for the public service, or the apprehending of waggoners for misbehaviour in the public highways. False imprisonment also may arise by executing a lawful warrant or process at an unlawful time, as on a Sunday; or in a place privileged from arrests, as in the verge of the king's court. The remedy is of two sorts; the one removing the injury, the other making satisfaction for it. The means of removing the actual injury of false imprisonment are fourfold. 1. By writ of **MAIN-PRIZE**. 2. By writ **DE OTIO ET ATIA**. 3. By writ **DE HOMINE REPLEGIANDO**. 4. By writ of **HABEAS CORPUS**. See those articles. The satisfactory remedy for this injury of false imprisonment, is by an action of trespass *vi et armis*, usually called an action of false imprisonment; which is generally, and almost unavoidably, accompanied with a charge of assault and battery also; and therefore the party shall recover damages for the injuries he has received; and also the defendant is, as for all other injuries committed with force, or *vi et armis*, liable to pay a fine to the king for the violation of the public peace.

IMPROBATION, in Scots law, an action brought for setting any deed or writing aside upon the head of forgery.

IMPROPRIATION, is properly so called, when a benefice ecclesiastical is in the hands of a layman, and appropriation when in the hands of a bishop, college, or religious house, though sometimes these terms are coumounded. It is said there are 3843 impropriations in England. See **APPROPRIATION**.

IMPULSE, in mechanics, the single and instantaneous action or force by which a body is impelled, in contradistinction to the application of continued forces.

IMPURITY, in the law of Moses, is any legal defilement. Of these there were several sorts. Some were voluntary, as the touching a dead body, or any animal that died of itself, or any creature that was esteemed unclean; or the touching things holy, by one who was not clean, or was not a priest; the touching one who had a leprosy, one who had a gonorrhoea, or who was polluted by a dead carcase, &c. Sometimes these impurities were involuntary; as one who inadvertently touched bones, or a sepulchre, or any thing polluted; or fell into such diseases as pol-

lute, as the leprosy, &c. The beds, clothes, and moveables, which had touched anything unclean, contracted also a kind of impurity, and in some cases communicated it to others. These legal pollutions were generally removed by bathing, and lasted no longer than the evening. The person polluted plunged over head in the water, and either had his clothes on when he did so, or washed himself and his clothes separately. Other pollutions continued seven days, as that which was contracted by touching a dead body. That of women in their monthly courses lasted till this was over with them; that of women after child-birth, lasted forty days after the birth of a boy, and fifty after that of a girl. Others lasted till the person was cured. Many of these pollutions were expiated by sacrifices; and others by a water, made with the ashes of a red heifer, sacrificed on the great day of expiation. When the leper was cured, he went to the temple, and offered two birds, one of which was killed, and the other set at liberty. He who had touched a dead body, or had been present at a funeral, was to be purified with the water of expiation, upon pain of death. A woman after child-birth, offered a turtle and a lamb for her expiation; or, if poor, two turtles or two young pigeons. Those impurities, which are accurately described in the law of Moses, were only figures of those more important impurities, the sins and iniquities committed against God, or our neighbour. The saints and prophets of the Old Testament were sensible of this; and our Saviour has strongly inculcated, that, not outward and corporeal pollutions, but such inward pollutions as the violations of justice, truth, and charity, defile the soul, and render it polluted in the sight of God.

IMPUTATION, in theology, the charging to the account of one what was done by another: thus, it is maintained, that Adam's sin is imputed to all his posterity. In the same sense, the righteousness and merits of Christ are imputed to true believers.

INACCESSIBLE, not to be come at, or approached, by reason of intervening obstacles, as a river, rock, &c. It is chiefly used in speaking of heights and distances. See **MENSURATION**.

INAGUA, GREAT, and **INAGUA, LITTLE**, two islands in the Windward Passage, north-west of St. Domingo, and north-east of Cuba.

INALIENABLE. The dominions of the king, the revenues of the church, the estates of a minor, &c. are inalienable, otherwise than with a reserve of the right of redemption.

INANIMATE, that has either lost its soul, or that is not of a nature capable of having any.

INANITION, among physicians, denotes the state of the stomach when empty, in opposition to repletion.

INARCHING, in gardening, is a method of grafting, commonly called grafting by approach, and is used when the stock intended to graft on, and the tree from which the graft is to be taken, stand so near, or can be brought so near, that they can be joined together. See **GRAFTING**.

INAUGURATION, the coronation of an emperor or king, or the consecration of a prelate; so called from the ceremonies used by the Romans, when they were received into the college of augurs.

INCA, or YNCA. See **YNCA**.

INCAMERATION, a term used in the chancery of Rome, for the uniting of lands, revenues, or other rights, to the pope's domain.

INCANTATION, denotes certain ceremonies, accompanied with a formula of words, and supposed to be capable of raising devils, spirits, &c. See **CHARM**.

INCAPACITY, in the canon law, is of two kinds: 1. The want of a dispensation for age in a minor, for legitimation in a bastard, and the like: this renders the provision of a benefice void in its original. 2. Crimes and heinous offences, which annul provision at first valid.

INCARNATION, in theology, signifies the act whereby the Son of God assumed the human nature; or the mystery by which Jesus Christ, the eternal Word, was made man, to accomplish the work of our salvation. The era first used among Christians, whence they numbered their years, is the time of the incarnation, that is, of Christ's conception. This is the greatest event which ever took place in the world, and though there is a mystery in it which no man can explain; yet the fact is so clear and evident that no reasonable man who reads the sacred scriptures can doubt

the fact. But the seal of this truth by the Spirit of Christ upon the heart of the believer is the most glorious and effectual evidence.

INCARNATION, in surgery, the healing and filling up of ulcers and wounds with new flesh. See **SURGERY**.

INCARNATIVES, medicines which assist in filling up wounds or ulcers with flesh; or rather remove obstructions thereto.

INCENDIARY, in law, a bare attempt to set fire to another's dwelling-house, or outhouses, barn, or stable, unless it absolutely burns, does not fall within the description of *incendit et consumit*. But the burning and consuming of any part is sufficient; though the fire be afterwards extinguished. It must also be a malicious burning; otherwise it is only a trespass. This crime is called arson. Among the ancients, incendiaries were burnt. The punishment of arson was death by the ancient Saxon laws and Gothic constitutions: and in the reign of Edward I. incendiaries were burnt to death. The stat. 8 Henry VI. c. 6, made the wilful burning of houses, under special circumstances, high treason; but it was reduced to felony by the general acts of Edward VI. and Mary I. This offence was denied the benefit of clergy by 21 Henry VIII. c. 1, which statute was repealed by 1 Edward VI. c. 12; and arson was held to be a crime of clergy, with respect to the principal, by inference from the stat. 4 and 5 P. and M. c. 4, which expressly denied it to be accessory; though now it is expressly denied to the principal also, by 9 Geo. I. c. 22. See **ARSON**.

INCENSE, or **FRANKINCENSE**, in the materia medica, &c. a dry resinous substance, called also thus and *olibanum*. Incense is a rich perfume, with which the Pagans and Roman Catholics perfume their temples, altars, &c. The word comes from the Latin *incensum*, q. d. burnt: as taking the effect from the thing itself. The burning of incense made part of the daily service of the ancient Jewish church. The priests drew lots to know who should offer it: the destined person took a large silver-dish, in which was a censer full of incense; and being accompanied by another priest carrying some live coals from the altar, went into the temple. There, in order to give notice to the people, they struck upon an instrument of brass placed between the temple and the altar; and being returned to the altar, he who brought the fire left it there, and went away. Then the offerer of the incense having said a prayer or two, waited the signal, which was the burning of the holocaust; immediately upon which he set fire to the incense, the whole multitude continuing all the time in prayer. The quantity of incense offered each day was half a pound in the morning, and as much at night. One reason of this continual burning of incense might be, that the multitude of victims that were continually offered up, would have made the temple smell like a slaughter-house, and consequently have inspired the comers rather with disgust and aversion than awe and reverence, had it not been overpowered by the agreeable fragrance of those perfumes.

INCEPTIVE, a word used by Dr. Wallis to express such moments, or first principles, which, though of no magnitude themselves, are yet capable of producing such as are. Thus a point has no magnitude itself, but is inceptive of a line which it produces by its motion. So a line, though it have no breadth, is yet inceptive of breadth; that is, it is capable, by its motion, of producing a surface which has breadth, &c.

INCEST, [*incestum*, Lat.] unnatural and criminal conjunction of persons within degrees prohibited. Incest, by the rules of the church, was formerly very absurdly extended even to the seventh degree; but it is now restricted to the third or fourth. Most nations look on incest with horror, Persia and Egypt excepted.

INCH, [*inc*, Sax. *uncia*, Lat.] a measure of length supposed to be equal to three grains of barley laid end to end; the twelfth part of a foot.

INCHANTMENT, or **ENCHANTMENT**. See **CONJURATION**, **FASCINATION**, and **WITCHCRAFT**.

INCH-COLM, or **COLUMBA**, the isle of Columba; an island in the Frith of Forth, famous for its monastery.

INCH-MARNOCH, [*Gael. i. e. Marnoch's Isle*,] a beautiful little island of Scotland, south-west of the Isle of Bute.

INCHOATIVE VERBS, denote, according to Priscian, and other grammarians, verbs that are characterised by the termination *scio*, or *scor*, added to their primitives: as, *augesco*, from *augere*, *calesco*, from *caleo*; *dulcesco*, from *dulcis*; *irascor*, from *ira*, &c.

INCIDENCE, or **INCIDENCY**, [*incido*, to fall, Lat. *incidence*, Fr.] the direction with which one body strikes upon another; and the angle made by that line, and a perpendicular to the plane struck upon, is called the angle of incidence. See **MECHANICS**, and **OPTICS**.

INCIDENT, in a poem, is an episode, or particular action, joined to the principal action, or depending on it. A comedy should be full of agreeable incidents, to divert the spectators, and form the intrigue.

INCIDENTS, in law, a thing appertaining to, or following another, that is more worthy or principal. A court-baron is inseparably incident to a manor; and a court of pie-powders to a fair.

INCIDENT DILIGENCE, in Scotch law, a warrant granted by a lord ordinary in the court of session, for citing witnesses for proving any point, or for the production of any thing necessary for preparing the cause for a final determination, or before it goes to a general proof.

INCINERATION, in chemistry, a term applied to the burning of vegetables for the sake of their ashes: it is usually referred to the burning of kelp on the coasts for the making of mineral alkali.

INCISIVE, an appellation given to whatever cuts or divides: the fore-teeth are called *dentes incisivi*, or cutters; and medicines of an attenuating nature, incidents, or incisive medicines.

INCLINATION, is a word frequently used by mathematicians, and signifies the mutual approach, tendency, or leaning, of two lines, or two planes towards each other, so as to make an angle. Inclination of a right-line to a plane, is the acute angle, which that line makes with another right-line drawn in the plane through the point where the inclined line intersects it, and through the point where it is also cut by a perpendicular drawn from any point of the inclined line. Inclination of the axis of the earth, is the angle which it makes with the plane of the ecliptic; or the angle, contained between the planes of the equator and ecliptic. Inclination of a planet, is an arch of the circle of inclination, comprehended between the ecliptic and a plane of a planet in its orbit. See **ASTRONOMY**.

INCLINATION, in a moral sense. See **APPETITE**.

INCLINATORY NEEDLE. See **DIPPING-NEEDLE**.

INCLINED PLANE, in mechanics, a plane inclined to the horizon. See **MECHANICS**.

INCOG, or **INCOGNITO**, is applied to a person who is in any place where he would not be known: particularly to princes, or great men, when they travel without their ordinary train, or the usual marks of their distinction and quality.

INCLOSURES. Any person who shall wilfully or maliciously demolish, pull down, or otherwise destroy or damage, any fence raised or made for dividing or inclosing any common, waste, or other lands, in pursuance of any act of parliament, or shall cause or procure the same to be done, shall be guilty of felony, and transported for seven years. Prosecution to be commenced in eighteen months after the offence committed.

INCOMBUSTIBLE, that cannot be burnt, or consumed by fire. Authors talk much of an incombustible cloth, made of the asbestos. See **ASBESTUS**.

INCOMBUSTIBLES, SIMPLE. See **CHEMISTRY**.

INCOME-TAX, a direct contribution of a certain proportion of the annual gains of individuals for the public service, which has recently become an important branch of the revenue of Great Britain. An income-tax, if it could be so regulated as to bear a just proportion to the different modes in which the incomes of individuals arise, and did not extend to such amounts of income as are absolutely necessary for subsistence, would become the most equitable, as well as the most productive mode of taxation.

INCOMMENSURABLE, [from *in*, *con*, and *mensurabilis*, Latin,] not to be reduced to any measure common to both; not to be measured together, such as that the proportion of one to the other can be told.

INCOMMENSURABLE, a term in geometry, used where two lines, when compared to each other, have no common measure, how small soever, that will exactly measure them both. And in general two quantities are said to be incommensurable, when no third quantity can be found that is an aliquot part of both. Such are the diagonal and side of a square; for though each of those lines

lines have infinite aliquot parts, as the half, the third, &c. yet not any part of the one, be it ever so little, can possibly measure the other, as is demonstrated in prop. 117, lib. x. of Euclid.

INCOMMENSURABLE NUMBERS, are such as have no common divisor that will divide them both equally.

INCOMPATIBLE, that cannot subsist with another, without destroying it: thus cold and heat are incompatible in the same subject, the stronger overcoming and expelling the weaker.

INCOMPLETE, in botany, a term used to denote the sixteenth class of the Linnaean "methodus calycina," consisting of plants whose flowers want either the calyx or petals.

INCORPORATION, POWER OF. To the erection of any corporation the king's consent is necessary, either implicitly or expressly given: the king's implied consent is to be found in corporations which exist by force of the common law, to which our former kings are supposed to have given their concurrence; of this sort are all bishops, parsons, vicars, churchwardens, and some others, who by common law have ever been held to have been corporations by virtue of their office. Another method of implied consent is with regard to all corporations by prescription; such as the city of London, and many others, which have existed as corporations from time immemorial; for though the members thereof can shew no legal charter of incorporation, yet in cases of such high antiquity the law presumes there once was one, and that by variety of accidents, which a length of time may produce, the charter is lost or destroyed. The methods by which the king's consent is expressly given are either by act of parliament or charter; but the immediate creative act is usually performed by the king alone, in virtue of his royal prerogative. See **JOINT STOCK**.

INCREMENT, is the small increase of a variable quantity. Sir Isaac Newton calls these increases "moments," and observes that they are proportional to the velocity or rate of increase of the flowing or variable quantities, in an indefinitely small time. The notation of increment is different by different authors. The method of increments is a branch of analytics, in which a calculus is founded on the properties of successive values of variable quantities, and their differences, or increments. It is nearly allied to, and arises out of, the doctrine of fluxions. Mr. Emerson has the following observations on the distinction between the method of increments and fluxions. "From the method of increments," he says, "the principal foundation of the method of fluxions may be easily derived; for, as in the method of increments, the increment may be of any magnitude, so in the method of fluxions, it must be supposed infinitely small; whence all preceding and successive values of the variable quantity will be equal, from which equality the rules for performing the principal operations of fluxions are immediately deduced. That I may give the reader a more perfect idea of the nature of this method: suppose the abscissa of a curve be divided into any number of equal parts, each part of which is called the increment of the abscissa, and imagine so many parallelograms to be erected thereon, either circumscribing the curvilinear figure, or inscribing it; then the finding of the sum of all these parallelograms is the business of the method of increments. But if the parts of the abscissa be taken infinitely small, then these parallelograms degenerate into the curve; and then it is the business of the method of fluxions to find the sum of all, or the area of the curve. So that the method of increments is employed to determine the sum of any number of finite quantities; and the method of fluxions is used to find the sum of any infinite number of infinitely small ones: and this is the essential difference between these two methods." Again, he says: "There is such a near relation between the method of fluxions and that of increments, that many of the rules for the one, with little variation, serve also for the other. And here, as in the method of fluxions, some questions may be solved, and the integrals found, in finite terms; whilst in others we are forced to have recourse to infinite series for a solution. And the like difficulties will occur in the method of increments, as usually happen in fluxions. For whilst some fluxionary quantities have no fluents, but what are expressed by series, so some increments have no integrals but what infinite series afford; which will often, as in fluxions, diverge and become useless." By means of the method of increments, many curious and useful problems are easily resolved, which scarcely admit of a solution in any other way. As, suppose several series of quantities be given whose terms are all formed according to some certain law which is

given; the method of increments will find out a general series, which comprehends all particular cases, and from which all of that kind may be found. The method of increments is also of great use in finding any term of a series proposed: for the law being given by which the terms are formed, by means of this general law the method of increments will help us to this term, either expressed in finite quantities, or by an infinite series. See **EMERSON'S INCREMENTS**.

INCORPORATION, in pharmacy, is a reduction of dry substances to the consistence of a paste, by the admixture of some fluid; thus pills, boles, troches, and plasters are made by incorporation. Another incorporation is, when things of different consistences, are by digestion reduced to one common consistence.

INCORPOREAL, a thing, or substance, which is not matter; as God, angels, and the soul of man.

INCORRUPTIBLE, that cannot be corrupted. See **CORRUPTION**.

INCORRUPTIBLES, or **INCORRUPTICOLÆ**, in church history, heretics which had their original at Alexandria, in the time of the emperor Justinian. Their distinguishing tenet was that the body of Jesus Christ was incorruptible from his conception, by which they meant that after and from the time he was formed in the womb of his holy mother, he was not susceptible of any change or alteration, not even of any natural and innocent passions, as hunger, thirst, &c. so that he eat without any occasion before his death, as well as after his resurrection.

INCUBATION. See **HATCHING**.

INCUBUS, [Lat. *incubæ*, Fr.] the **NIGHT-MARE**. The incubus is a disease consisting in oppression of the breast, so very violent, that the patient cannot speak or even breathe. The Greeks call it *απαιξ*, *q. d.* leaper, or one that rushes on a person. In this disease the senses are not quite lost, but drowned and astonished, as is the understanding and imagination; so that the patient seems to think some huge weight thrown on him, ready to strangle him. Children are very liable to this distemper; so are fat people, and men of much study and application of mind; by reason the stomach in all these finds some difficulty in digestion.

INCUMBENT, [*incumbens*, Lat.] he who is in present possession of a benefice. An incumbent, or minister, resident on his benefice, is so called, because he does, or at least ought to, bend his whole study to discharge the cure of his church.

INCURVATION OF THE RAYS OF LIGHT, is their bending out of a rectilinear straight course, by refraction. See **OPTICS**.

INCUS, in anatomy, a bone of the internal ear, somewhat resembling one of the anterior dentes molares. See **ANATOMY**.

INDAPOUR, a sea-port on the S.W. coast of Sumatra. Lon. 100. 50. E. Lat. 1. 30. S.

INDEFEASIBLE, or **INDEFEAZABLE**, a term in law, for what cannot be defeated or made void; as an indefeasible estate of inheritance, &c.

INDEFINITE, or **INDETERMINATE**, that has no certain bounds; or to which the human mind cannot affix any. Descartes makes use of this word in his philosophy instead of infinite, both in numbers and quantities, to signify an inconceivable number, or a number so great that an unit cannot be added to it; and a quantity so great as not to be capable of any addition. Thus, he says, the stars visible and invisible are in number indefinite; and not as the ancients held infinite; and that quantity may be divided into an indefinite number of parts, not an infinite number.

INDEFINITE is also used in the schools to signify a thing that has but one extreme; for instance, a line drawn from any point and extended infinitely. Thus what they call eternity *a parte ante*, or eternity, *a parte post*, are indefinite durations.

INDEFINITE, in grammar, is understood of nouns, pronouns, verbs, participles, articles, &c. which are left in an uncertain indeterminate sense, and not fixed to any particular time, thing, or other circumstance.

INDELIBLE, that cannot be cancelled, or effaced. Thus baptism and ordination, according to the church of Rome, are sacraments which convey indelible characters to the persons baptized and ordained.

INDEMNITY, in law, is a writing to secure one from all damage and danger that may ensue from any act.

INDEN-HOTUN,

INDEN-HOTUN, a town of Chinese Tartary, capital of the Mantcheou Tartars, 420 miles E. N. E. of Peking.

INDENTED, in heraldry, is when the outline of an ordinary is notched like the teeth of a saw.

INDENTURE, a covenant, so named because the counterparts are indented or cut one by the other; a contract of which there is a counterpart.

INDENTURE, in law. See **DEED**.

INDEPENDENTS, a sect of Protestants so called from their maintaining that each congregation of Christians, which meets in one house for public worship, is a complete church, has full power to regulate every thing relating to religious government within itself, and is in no respect dependent upon, or accountable to, other churches. The Independents arose in England during Elizabeth's reign. The hierarchy established by her, the vestments worn by the clergy, the book of common prayer, and, above all, the sign of the cross used in administering of baptism, were very offensive to many of her subjects, who, during the persecutions of Q. Mary I. had taken refuge among the Protestants of Germany and Geneva. They thought that the church of England resembled, in these particulars, the antichristian church of Rome; and they called for a more thorough reformation, and a purer worship. From this circumstance they were stigmatized by their adversaries with the general name of Puritans. Elizabeth was not disposed to comply with their demands; and the Puritans were not united among themselves. Unanimous in nothing but in their antipathy to the forms of doctrine and discipline established by law, they were soon divided into a variety of sects. Of these the most famous was that which was formed about 1581 by Robert Brown, a man insinuating in his manners, but neither steady nor consistent in his principles and conduct. He did not much differ in point of doctrine either from the church of England or from the rest of the Puritans; but he had formed notions then new and singular, concerning the nature of the church and the rules of ecclesiastical government. He was for dividing the whole body of the faithful into separate societies or congregations; and maintained, that such a number of persons as could be contained in an ordinary place of worship ought to be considered as a church, and enjoy all the rights and privileges of an ecclesiastical community. These small societies he pronounced independent, *jure divino*, and entirely exempt from the jurisdiction of the bishops, in whose hands the court had placed the reins of spiritual government; as well as from that of presbyteries and synods, which the Puritans regarded as the supreme visible sources of ecclesiastical authority. He also maintained, that the power of governing each congregation resided in the people; and that each member had an equal share in this government, and an equal right to order matters for the good of the whole society. Hence all points both of doctrine and discipline were submitted to the discussion of the whole congregation; and whatever was supported by a majority of voices passed into a law. The congregation also elected certain brethren to the office of pastors, to perform the duties of public instruction, and divine worship; reserving, however, to themselves the power of dismissing these ministers, and reducing them to the condition of private members, whenever they should think such a step conducive to the spiritual advantage of the community. The right of the pastors to preach was not exclusive, or peculiar to them alone. Any member who thought proper to exhort or instruct the brethren, was indulged in the liberty of prophesying or preaching. The zeal with which Brown and his associates propagated these opinions was in a high degree intemperate. He affirmed, that all communion was to be broken off with those religious societies that were founded upon a different plan from his; and treated the church of England, as a spurious church, whose ministers were unlawfully ordained, whose discipline was popish and antichristian, and whose sacraments and institutions were destitute of all efficacy and virtue. The sect of this hot-headed innovator, unable to endure the severe treatment which their own violence brought upon them from an arbitrary administration, retired into the Netherlands, and founded churches at Middelbourg, Amsterdam, and Leyden; but their founder returned to England; and having renounced his principles of separation, took orders in the established church, and obtained a benefice. The Puritan exiles, whom he thus abandoned, soon split into parties, and their affairs declined. This engaged the wiser part of them to mitigate the

severity of their founder's plan, and to soften the rigour of its uncharitable decisions. The person who had the chief merit of bringing about this reformation was John Robinson, one of their pastors, a man who had much piety, and no inconsiderable portion of learning. This well meaning reformer, perceiving the defects that reigned in the discipline of Brown, and in the spirit and temper of his followers, employed his zeal and diligence in correcting them, and in new-modelling the society, so as to render it less odious to its adversaries, and less liable to the just censure of those true Christians, who look upon charity as the chief end of the commandments. Hitherto the sect had been called Brownists: But Robinson having, in his Apology, affirmed, "*Cœtum quemlibet particularem esse totum, integrum, et perfectam ecclesiam, ex suis partibus constantem, immediate et Independentem (quod alias ecclesias) sub ipso Christo*," the sect was henceforth called Independents, of which the apologist was considered as the founder. The Independents were much more commendable than the Brownists. They surpassed them both in the moderation of their sentiments, and the order of their discipline. They did not, like Brown, pour forth bitter and uncharitable invectives against the churches which were governed by rules entirely different from theirs, nor pronounce them on that account unworthy of the Christian name. On the contrary, though they considered their own form of ecclesiastical government as of divine institution, and as originally introduced by the authority of the apostles, nay by the apostles themselves, they had yet candour and charity enough to acknowledge, that true religion and solid piety might flourish in communities under the jurisdiction of bishops, or the government of synods and presbyteries. They were also much more attentive than the Brownists, in keeping on foot a regular ministry in their communities: for while the latter allowed promiscuously all ranks and orders of men to teach in public, the Independents had, and still have, a certain number of ministers, chosen respectively by the congregations where they are fixed; nor is any person among them permitted to speak in public, before he has submitted to a proper examination of his capacity and talents, and been approved of by the heads of the congregation. This society has produced divines eminent for learning, piety, and virtue. From 1642, the Independents are very frequently mentioned in the English annals. The English Independents assumed this title publicly in a piece which they published at London, in 1644, entitled "*Apologetical Narration of the Independents*." But afterwards, to avoid the odium of sedition and anarchy charged on the sect, the true and genuine Independents renounced this title, and called themselves Congregational Brethren, and their religious assemblies congregational churches. The first Independent or congregational church in England was set up in 1616, by Mr. Jacob, who had adopted the religious sentiments of Robinson. The charge alledged against them by Rapin, (in his Hist. of England, vol. ii. p. 514, fol. ed.) that they could not so much as endure ordinary ministers in the church, &c. is groundless. He was led into this mistake by confounding the Independents and Brownists. Other charges, no less unjustifiable, have been urged against the Independents, by this celebrated historian, and others. Rapin says, that they abhorred monarchy, and approved of a republican government. This might have been true with regard to many persons among them, in common with other sects; but it does not appear from any of their public writings, that republican principles formed their distinguishing characteristic. On the contrary, in a public memorial drawn up by them in 1647, they declare, that they do not disapprove of any form of civil government, but do freely acknowledge, that a kingly government, bounded by just and wholesome laws, is both allowed by God, and also a good accommodation unto men. The Independents, however, have been generally ranked among the regicides, and charged with the death of Charles I. Whether this fact be admitted or denied, no conclusion can be fairly drawn from the greater prevalence of republican principles, or from violent proceedings at that period, that can affect the distinguishing tenets and conduct of the Independents in our times. It is certain, that the present Independents are steady friends to a limited monarchy. Rapin is farther mistaken, when he represents the religious principles of the English Independents as contrary to those of all the rest of the world. It appears from two confessions of faith, one composed by Robinson, on behalf of the English Independents in Holland, and published at Leyden in

1619, entitled, "Apologia pro Exulibus Anglis, qui Browniste vulgo appellantur; and another drawn up in London in 1638, by the principal members of this community in England, entitled, "A Declaration of the Faith and Order, owned and practised by the Congregational Churches in England, agreed upon, and consented unto, by their Elders and Messengers, in their Meeting at the Savoy, Oct. 12, 1635;" as well as from other writings of the Independents, that they differed from the rest of the reformed in no single point of any consequence, except that of ecclesiastical government; and their religious doctrines were almost entirely the same with those adopted by the church of Geneva. During the administration of Cromwell, the Independents acquired very considerable reputation and influence; and he made use of them as a check to the ambition of the Presbyterians, who aimed at a very high degree of ecclesiastical power, and who had succeeded, soon after the elevation of Cromwell, in obtaining a parliamentary establishment of their own church-government. But after the restoration their cause declined, and in 1691, they entered into an association with the Presbyterians residing in and about London, comprised in nine articles, that tended to the maintenance of their respective institutions. These may be found in the second volume of Whiston's Memoirs, and the substance of them in Mosheim. At this time the Independents and Presbyterians, called from this association the United Brethren, were agreed with regard to doctrines, being generally Calvinists, and differed only with respect to ecclesiastical discipline. But at present, though the English Independents and Presbyterians form two distinct parties of Protestant Dissenters, they are distinguished by very trifling differences with regard to church-government; and the denominations are more arbitrarily used to comprehend those who differ in theological opinions. The Independents are distinguished from other Protestant communities chiefly by the two following circumstances: 1. They reject the use of all creeds and confessions drawn up by fallible men, requiring of their teachers no other test of orthodoxy than a declaration of their belief in the gospel of Jesus, and their adherence to the Scriptures as the sole standard of faith and practice. 2. They attribute no virtue whatever to the rite of ordination: for they declare, that the qualifications which constitute a regular minister of the New Testament, are, a firm belief in the gospel, a principle of sincere and unaffected piety, a competent stock of knowledge, a capacity for leading devotion and communicating instruction, a serious inclination to engage in the important employment of promoting the everlasting salvation of mankind, and ordinarily an invitation to the pastoral office from some particular society of Christians. Where these things concur, they consider a person as fitted and authorised for the discharge of every duty which belongs to the ministerial function; and they believe that the imposition of the hands of bishops or presbyters would convey to him no powers or prerogatives, of which he was not before possessed.

INDETERMINATE PROBLEM, or UNLIMITED PROBLEM, in algebra, that which admits of a great number of different answers, or of innumerable different solutions. In such problems, the number of unknown quantities concerned is greater than the number of conditions, or equations, by which they are to be found; from which it happens, that generally some other conditions or quantities are assumed to supply the defect, which, being taken at pleasure, give the same number of answers as varieties in those assumptions. Diophantus was the first writer on Indeterminate Problems, in his Algebra, first published in 1575 by Xylander. His book being wholly on this subject, such questions have been called Diophantine Problems. Des Cartes, Fermat, Frenicle, Wallis, Euler, Grange, &c. have cultivated this branch of Algebra. And Mr. John Leslie, in the second Vol. of the Edin. Philos. Trans. has given an ingenious paper on the solution of Indeterminate Problems, by means of a principle, which, though extremely simple, admits of a very extensive application. Let $A \times B$ be any compound quantity equal to another, $C \times D$, and let m be any rational number assumed at pleasure; it is manifest that, taking equimultiples, $A \times mB = C \times mD$. If, therefore, we suppose that $A = mD$, it must follow that $mB = C$, or $B = \frac{C}{m}$.

Thus two equations of a lower dimension are obtained. If these be capable of further decomposition, we may assume the

multiples n and p , and form four equations still more simple. By the repeated application of this principle, an higher equation admitting of divisors, will be resolved into those of the first order, the number of which will be one greater than that of the multiples assumed. For example, let the following problem be taken, viz. to find two rational numbers, the difference of the squares of which shall be a given number. Let the given number be the product of a and b ; then by hypothesis, $x^2 - y^2 = ab$: but these compound quantities admit of an easy resolution, for $x + y \times x - y = a \times b$. If, therefore, we suppose $x + y = ma$, we shall obtain

$$x - y = \frac{b}{m}, \text{ where } m \text{ is arbitrary, and if rational, } x \text{ and } y \text{ must also}$$

be rational. Hence the resolution of these two equations gives the values of x and y , the numbers sought, in terms of m , viz. $x = \frac{m^2 a + b}{2m}$, and $y = \frac{m^2 a - b}{2m}$. See ALGEBRA.

INDEX, in anatomy, the FORE-FINGER, so called from *indico*, I point; because that finger is generally so used; whence also the extensor indicis is called Indicator. See ANATOMY.

INDEX, in arithmetic and algebra, shews to what power any quantity is involved, and is otherwise called its Exponent.

INDEX, EXPURGATORY, a catalogue of prohibited books in the church of Rome. The first catalogue of this kind was made by the inquisitors; and afterwards approved of by the council of Trent, with some retrenchments and additions. Thus an index of heretical books being formed, it was confirmed by a bull of Clement VIII. in 1595, and printed with several introductory rules; by the fourth of which, the use of the scriptures in the vulgar tongue is forbidden to all persons without a particular licence; and by the 10th rule it is ordained, that no book shall be printed at Rome without the approbation of the Pope's vicar, or some person delegated by the Pope; nor in any other places, unless allowed by the bishop of the diocese, or some person deputed by him, or by the inquisitor of heretical pravity. The Trent index being thus published, Philip II. of Spain ordered another to be printed at Antwerp, in 1471, with considerable enlargements. Another was published in Spain in 1584; a copy of which was snatched out of the fire when the English plundered Cadiz. Afterwards there were several expurgatory indexes printed at Rome and Naples, and particularly in Spain.

INDEX OF A BOOK is that part annexed to a book, referring to the particular matters therein contained. This term is not synonymous with a table of contents. The contents of a book are only intended to give a general and summary view of what is contained in it, in the order of its division into Parts, Chapters, or Sections; and as readers generally wish to know the subject or contents of a book before they peruse it, ought always to be prefixed to the work. The index, on the other hand, is intended to point out every important particular in a book, in its alphabetical order, that the reader may at once, and without difficulty, find out any article he wishes to be informed of, that is discussed or mentioned in the work; and as these are hardly completely known even to the author, till the work is finished, the index always appears with most propriety subjoined to the work. Every book of any extent ought to have both contents and index.

INDEX OF A LOGARITHM, that which shews of how many places the absolute number, belonging to a logarithm, doth consist, and of what nature it is, whether an integer or fraction. See LOGARITHMS.

INDEX OF A GLOBE, is a little style fitted to the pole, and turning round with it, pointing to certain divisions in the hour-circle. It is sometimes fixed, the hour circle turning.

INDIA, an extensive region in Asia, which lies between 66° and 93° E. lon. and 7° and 33° N. lat. Under this name, the Europeans have erroneously understood all the countries which lie S. of Tartary, and extend from the eastern frontiers of Persia to the eastern coasts of China, and they have included likewise under the denomination of the E. Indies the islands of Japan, with all the islands in the Eastern and Indian Oceans, as far S. as New Holland. But the name of India can be applied, with propriety, to that country only which is distinguished in Asia as well as in Europe by the name of Hindoostan. The countries to the E. of the river Burrampoote, viz. Aracan, Assam, Burmah, Cambodia, Cochinchina,

China, Laos, Malacca, Pegu, Siam, and Tonquin, which geographers have hitherto distinguished by the name of the Peninsula beyond the Ganges, are no more to be considered as belonging to India, than the bordering countries of China, Thibet, Tartary, or Persia. See HINDOOSTAN.

INDIAN, belonging to the Indies, East or West.

INDIAN ARROW-ROOT. See MARANTA.

INDIAN HEAD, a cape on the E. coast of New Holland. Lon. 153. 26. E. Lat. 25. 3. S.

INDIAN INK, or CHINA INK, a valuable black for water-colours, brought from China and the East Indies, sometimes in large rolls, but most commonly in small oblong quadrangular cakes, marked with Chinese characters. Dr. Lewis analyzed this substance, and found that it is composed of fine lamp-black and animal glue. To prepare it he advises to mix the lamp-black with as much melted glue as is sufficient to give it a tenacity proper for being made into cakes. These, he says, when dry, answer as well as those imported from China. Ivory black, finely levigated, answers as well as lamp-black. The Chinese have a peculiar method of writing with it. Indian ink is also made of all other colours.

INDIANA, an extensive territory of Virginia, between the Ohio and Laurel Mountain, containing 3,500,000 acres; and extending in length from the Pennsylvania line to the Little Kanaway.

INDICATION, in physic, whatever serves to direct the physician how to act.

INDICATIVE, in grammar, the first mood, or manner, of conjugating a verb, by which we simply affirm, deny, or ask, something; as, *amant*, they love; *non amant*, they do not love; *amantne*, do they love?

INDICTION, a cycle of fifteen years. See CHRONOLOGY.

INDICTMENT, in English law, is a written accusation of one or more persons of a crime or misdemeanor, preferred to, and presented upon oath by, a grand jury. To this end, (says Blackstone), "The sheriff of every county is bound to return to every session of the peace, and every commission of oyer and terminer, and of general gaol-delivery, twenty-four good and lawful men of the county, some out of every hundred, to inquire, present, do, and execute, all those things, which, on the part of our lord the king, shall then and there be commanded them. They ought to be freeholders; but to what amount is uncertain: which seems to be *casus omisus*, and as proper to be supplied by the legislature as the qualifications of the petit jury; which were formerly equally vague and uncertain, but are now settled by several acts of parliament. However, they are usually gentlemen of the best figure in the county. As many as appear upon this pannel, are sworn upon the grand jury, to the amount of twelve at the least, and not more than twenty-three; that twelve may be a majority. Which number, as well as the constitution itself, we find exactly described so early as the laws of King Ethelred: *Exeant seniores duodecim thani, et prefatus cum eis, ut iurent super sanctuarium quod eis in manus datur, quod nolint ullum innocentem accusare, nec aliquem noxium celare*. In the time of King Richard I. (according to Hoveden), the process of electing the grand jury, ordained by that prince, was as follows: four knights were to be taken from the county at large, who choose two more out of every hundred; which two associated to themselves ten other principal freemen, and those twelve were to answer concerning all particulars relative to their own district. This number was probably found too large and inconvenient; but the traces of this institution still remain, in that some of the jury must be summoned out of every hundred. This grand jury are previously instructed in the articles of their inquiry, by a charge from the judge who presides upon the bench. They then withdraw to sit and receive indictments, which are preferred to them in the name of the king, but at the suit of any private prosecutor; and they are only to hear evidence on behalf of the prosecution: for the finding of an indictment is only in the nature of an inquiry or accusation, which is afterwards to be tried and determined; and the grand jury are only to enquire upon their oaths, whether there be sufficient cause to call upon the party to answer it. A grand jury, however, ought to be thoroughly persuaded of the truth of an indictment, so far as their evidence goes; and not to rest satisfied merely with remote probabilities: a doctrine that might be applied to very op-

pressive purposes. The grand jury are sworn to inquire only for the body of the county, *pro corpore comitatus*; and therefore they cannot regularly inquire of a fact done out of that county for which they are sworn, unless particularly enabled by act of parliament. And to so high a nicety was this matter anciently carried, that where a man was wounded in one county, and died in another, the offender was at common law indictable in neither, because no complete act of felony was done in any one of them: but by stat. 2 and 3 Ed. VI. c. 24, he is now indictable in the county where the party died. And, by stat. 2 Geo. II. c. 21, if the stroke or poisoning be in England, and the death upon the sea or out of England, or vice versa, the offenders, and their accessories, may be indicted in the county where either the death, poisoning, or stroke, shall happen. And so in some other cases; as particularly, where treason is committed out of the realm, it may be inquired of in any county within the realm, as the king shall direct, in pursuance of statutes 26 Hen. VIII. c. 13, 33; c. 23, 35; and c. 2, 5, 6; Edw. VI. c. 11. And counterfeiters, washers, or minishers, of the current coin, together with all manner of felons and their accessories, may, by stat. 26 Hen. VIII. c. 6, (confirmed and explained by 34 and 35 Hen. VIII. c. 26. § 75, 76,) be indicted and tried for those offences, if committed in any part of Wales, before the justices of gaol-delivery and of the peace, in the next adjoining county of England, where the king's writ runneth: that is, at present in the county of Hereford or Salop; and not, as it should seem, in the county of Chester or Monmouth: the one being a county-palatine where the king's writ did not run; and the other a part of Wales, in 26 Hen. VIII. Murders also, whether committed in England or in foreign parts, may, by virtue of the stat. 33 Hen. VIII. c. 23, be inquired of and tried by the king's special commission in any shire or place in the kingdom. By stat. 10 and 11 W. III. c. 25, all robberies and other capital crimes committed in Newfoundland, may be inquired of and tried in any county of England. Offences against the black act, 9 Geo. I. c. 22, may be inquired of and tried in any county of England, at the option of the prosecutor. So felonies, in destroying turnpikes, or works upon navigable rivers, erected by authority of parliament, may, by statutes 8 Geo. II. c. 20, and 13 Geo. III. c. 84, be inquired of and tried in any adjacent county. By stat. 26 Geo. II. c. 19, plundering or stealing from any vessel in distress or wrecked, or breaking any ship contrary to 12 Ann. stat. 2. c. 18, may be prosecuted either in the county where the fact is committed, or in any county next adjoining; and if committed in Wales, then in the next adjoining English county: by which is understood to be meant, such English county as by the stat. 26 Hen. VIII. above-mentioned, had before a concurrent jurisdiction of felonies committed in Wales. Felonies committed out of the realm, in burning or destroying the king's ships, magazines, or stores, may by stat. 12 Geo. III. c. 24, be inquired of and tried in any county of England, or in the place where the offence is committed. By stat. 13 Geo. III. c. 63, misdemeanors committed in India may be tried upon information or indictment in the court of king's bench in England; and a mode is marked out for examining witnesses by commission, and transmitting their depositions to the court. But, in general, all offences must be inquired into as well as tried, in the county where the fact is committed. Yet if larceny be committed in one county, and the goods carried into another, the offender may be indicted in either; for the offence is complete in both. Or he may be indicted in England for larceny in Scotland, and carrying the goods with them into England, or vice versa; or for receiving in one part of the united kingdom goods that have been stolen in another. But for robbery, burglary, and the like, he can only be indicted where the fact was actually committed: for though the carrying away and keeping of the goods is a continuation of the original taking, and is therefore larceny in the second county, yet it is not a robbery or burglary in that jurisdiction. And if a person be indicted in one county for larceny of goods originally taken in another, and be thereof convicted, or stands mute, he shall not be admitted to his clergy; provided the original taking be attended with such circumstances as would have ousted him of his clergy by virtue of any statute made previous to the year 1691. When the grand jury have heard the evidence, if they think it a groundless accusation, they used formerly to endorse on the back of the bill, *Ignoramus*; or, we know nothing of it: intimating, that though the facts might possibly

possibly be true, that truth did not appear to them. But now they assert in English more absolutely, not a true bill; or (which is the better way) not found: and then the party is discharged without farther answer. But a fresh bill may afterwards be preferred to a subsequent grand jury. If they are satisfied of the truth of the accusation, they then endorse upon it, "a true bill;" anciently, *billa vera*. The indictment is then said to be found, and the party stands indicted. But to find a bill, there must at least twelve of the jury agree: for so tender is the law of England of the lives of the subjects, that no man can be convicted at the suit of the king of any capital offence, unless by the unanimous voice of twenty-four of his equals and neighbours; that is, by twelve at least of the grand jury, in the first place, assenting to the accusation; and afterwards by the whole petit jury of twelve more, finding him guilty upon his trial. But if twelve of the grand jury assent, it is a good presentment, though some of the rest disagree. And the indictment, when so found, is publicly delivered into court. Indictments must have a precise and sufficient certainty. By stat. 1 Hen. V. c. 5, all indictments must set forth the Christian name, surname, addition of the state and degree, mystery, town, or place, and the county of the offender; and all this to identify his person. The time and place are also to be ascertained, by naming the day and township in which the fact was committed: though a mistake in these points is, in general, not held to be material, provided the time be laid previous to the finding of the indictment, and the place to be within the jurisdiction of the court; unless where the place is laid, not merely as a venue, but as part of the description of the fact. But sometimes the time may be very material, where there is any limitation in point of time assigned for the prosecution of offenders; as by the statute 7 Will. III. c. 3, which enacts, that no prosecution shall be had for any of the treasons or misprisons therein mentioned (except an assassination designed or attempted on the person of the king), unless the bill of indictment be found within three years after the offence committed: and, in case of murder, the time of the death must be laid within a year and a day after the mortal stroke was given. The offence itself must also be set forth with clearness and certainty; and in some crimes particular words of art must be used, which are so appropriated by the law to express the precise idea which it entertains of the offence, that no other words, however synonymous they may seem, are capable of doing it. Thus, in treason, the facts must be laid to be done "treasonably, and against his allegiance; anciently, *propitiore et contra ligenzie sue debitum*;" else the indictment is void. In indictments for murder, it is necessary to say that the party indicted "murdered," not "killed" or "slew," the other; which, till the late statute, was expressed in Latin by the word *murdravit*. In all indictments for felonies, the adverb "feloniously," *felonice*, must be used; and for burglaries also, *burglariter*, or, in English, "burglariously;" and all these to ascertain the intent. In rapes, the word *rapuit*, "or ravished," is necessary, and must not be expressed by any periphrasis, in order to render the crime certain. So in larcenies also, the words *felonice cepit et asportavit*, "feloniously took or carried away," are necessary to every indictment; for these only can express the very offence. Also, in indictments for murder, the length and depth of the wound should, in general, be expressed, in order that it may appear to the court to have been of a mortal nature: but if it goes through the body, then its dimensions are immaterial; for that is apparently sufficient to have been the cause of the death. Also, where a limb, or the like, is absolutely cut off, such description is needless. Lastly, in indictments, the value of the thing which is the subject or instrument of the offence must sometimes be expressed. In indictments for larcenies this is necessary, that it may appear whether it be grand or petit larceny; and whether intitled or not to the benefit of clergy. In homicides of all sorts, it is necessary: as the weapon with which it is committed is forfeited to the king as a deodand.

INDIES, *West*, a name given not only to a great number of islands in the Atlantic Ocean, lying between 59° and 86° Lon. W. and between 11° 30' and 27° 43' Lat. N. but to the whole continent of America: owing to an erroneous idea of the great Columbus, that the new world was connected with the East Indies.

INDIGETES, a name which the ancients gave to some of their gods. There are various opinions about the origin and signification of this word. Some pretend it was given to all the gods,

others, only to the demi-gods, or great men deified. Others say, it was given to the gods of the country, or such gods as were originally of the country; and others restrict it to such gods as were patrons and protectors of particular cities. Others derive it from *inde genitus*, or *in loco degens*, or from *inde* and *ago*, I live, I inhabit; which seems most probable. These *Dii indigetes* were also called *dii locales*, local gods.

INDIGO, a drug for dyeing blue, prepared from the indigo plant, or *indigofera tinctoria*, a native of the warmer parts of Asia, Africa, and America. This drug has frequently undergone various processes of adulteration with earth, ashes, and pounded slate. The genuine drug ought to be of a rich dark blue colour, approaching to black, and, when broken, to display the lustre of copper: nor should it sink in water, or leave behind any sediment, after being dissolved. The purest indigo is brought from Guatemala, in South America. Although large quantities of this dyeing material are annually produced in the British colonies, and thence imported, yet we might easily dispense with this costly drug, which, to the detriment of native productions, and especially that of wool, was first brought to Europe by the trafficking Dutch, about the middle of the sixteenth century. Indeed, there is every reason to believe, that many plants of English growth would yield excellent substitutes for indigo. Indigo is much used in washing, to impart a bluish cast to linen; painters also employ it as a water-colour; and dyers consume large quantities in the various tints of blue cloths. In March 1797, a patent was granted to Mr. Joseph Barton, chemist, for an improved method of preparing indigo for dyeing wool, &c. in a more perfect manner than has hitherto been discovered. As, however, this patent is not expired, and the process is too expensive to be attempted for the gratification of the experimenter, we refer the inquisitive reader to the ninth volume of the Repertory of Arts and Manufactures, where it is minutely described. By the 36th Geo. 3. c. 40, indigo and cochineal may be imported from any place, in British ships, or such as belong to friendly nations, free from duty, except that of convoy, until the 29th of September 1802, and to the end of the then next session of parliament.

INDIGOFERA; the **INDIGO PLANT**: a genus of the decandria order, and diadelphia class of plants; natural order, Papilionaceae. Calyx spreading; keel of the corolla, with an awl-shaped spreading spur on each side; legume linear. There are thirty-five species. The indigos are shrubs, under-shrubs, or herbs; the leaves are in some few cases simple, in more ternate, in most unequally pinnate.

I. TINCTORIA, is a native of the warm parts of Asia, Africa, and America, and from it the Indigo dye is made. The root is three or four lines thick, and more than a foot long, of a faint smell, something like parsley. From this root issues a single stem nearly of the same thickness, about two feet high, straight, hard, almost woody, covered with a bark slightly split, of a grey ash-colour towards the bottom, green in the middle, reddish at the extremity, and without appearance of pith in the inside.

INDIVIDUAL, [*individuum*, Lat.] in logic, a particular being of any species, or that which cannot be divided into two or more beings equal or alike. The usual division in logic is made into genera, those genera into species, and those species into individuals.

INDIVISIBLE, among metaphysicians, is applied to a simple being, that consists of no parts into which it may be divided: Thus, God is indivisible in all respects; as is also the human mind; not having extension, or other properties of body.

INDIVISIBLES, in geometry, the elements or principles into which any body or figure may be ultimately resolved; which elements are supposed infinitely small: thus, a line may be said to consist of points, a surface of parallel lines, and a solid of parallel and similar surfaces; and then, because each of these elements is supposed indivisible, if in any figure a line be drawn through the elements perpendicularly, the number of points in that line will be the same as the number of the elements; whence we may see that a parallelogram, prism, or cylinder, is resolvable into elements or indivisibles, all equal to each other, parallel, and like to the base; a triangle into lines parallel to the base, but decreasing in arithmetical proportion, and so are the circles which constitute the parabolic conoid, and those which constitute the plane of a circle, or surface of an isosceles-cone. A cylinder may be resolved into
cylindrical

WEST INDIES



G U L F
of
M E X I C O

Tropic of Cancer

by Father the Marquis

FLORIDA

THE Isthmus of

THE Isthmus of

THE Isthmus of

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British Miles
200

cylindrical curve indivisibles, having all the same height, and continually decreasing inwards, as the circles of the base do on which they insist. The method of indivisibles is only the ancient method of exhaustions, a little disguised and contracted. It is found of great use in shortening mathematical demonstrations, of which take the following instance in the famous proposition of Archimedes, viz. that a sphere is two-thirds of a cylinder circumscribing it. Suppose a cylinder, an hemisphere, and an inverted cone, Plate XCII. fig. 1, to have the same base and altitude, and to be cut by infinite planes all parallel to the base, of which dg is one. It is plain the square of dh will be every where equal to the square of ke (the radius of the sphere) = the square $he + eh$ square; and consequently, since circles are to one another as the squares of the radii, all the circles of the hemisphere will be equal to all those of the cylinder, deducting thence all those of the cone: wherefore the cylinder, deducting the cone, is equal to the hemisphere: but it is known that the cone is one-third of the cylinder, and consequently the sphere must be two-thirds of it.

INDORE, a city of Hindostan, in Malwa, 290 miles S.S.W. of Agra, and 352 of Delhi. Lon. 76. 11. E. Lat. 22. 56. N.

INDORSE, or **INDORSED**. See **ENDORSE**.

INDORSEMENT, in law, any thing written on the back of a deed; as a receipt for money received. There is likewise an indorsement, by way of assignment, on bills of exchange and notes of hand; which is done by writing a person's name on the back thereof.

INDOSTAN, or **HINDOSTAN**, **PROPER INDIA**, or **THE EMPIRE OF THE GREAT MOGUL**. See **HINDOOSTAN**, and **INDIA**.

INDOWMENT. See **ENDOWMENT**.

INDRAMIA, a river in the isle of Java,

INDRAPORE, or **INDRAPOUR**, a town on the W. coast of Sumatra, 100 miles N.W. of Bencoolen.

INDRE, a river of France, which rises four miles N.N.W. of Boussac, in the department of the Creuse, and joins the Loire at Rigne.

INDRE, a department of France, so named from the river which runs through it from S.E. to N.W. comprehending part of the province of Berry.

INDRE and LOIRE, a department of France, so named from the junction of the two rivers, comprehending the late province of TOURAINE, which see.

INDUCEMENT, in law, signifies what may be alledged as a motive; and, in our law, it is used specially in several cases; as there is an inducement to actions, to a traverse in pleading, and to an offence committed, &c.

INDUCTION, [*inductio*, Lat.] in logic, is when, from several particular propositions, we infer one general: as, the doctrine of the Socinians cannot be proved from the Gospels, it cannot be proved from the Acts of the Apostles, it cannot be proved from the Epistles, nor the book of Revelation; therefore it cannot be proved from the New Testament. See **LOGIC**, and **ORATORY**.

INDUCTION, in law, is the putting of a clergyman in possession of a benefice to which he is collated or presented. Induction is performed by a mandate from the bishop to the archdeacon, who usually issues out a precept to other clergymen to perform it for him. It is done by giving the clerk corporal possession of the church, as by holding the ring of the door, tolling a bell, or the like; and is a form required by law, with intent to give all the parishioners due notice and sufficient certainty of their new minister, to whom their tythes are to be paid. This, therefore, is the investiture of the temporal part of the benefice, as institution is of the spiritual. And when a clerk is thus presented, instituted, and inducted, into a rectory, he is then, and not before, in full and complete possession; and is called in law *persona impersonata*, or *parson impersonate*.

INDULGENCES, in the Romish church, are a remission of the punishment due to sins, granted by the church, and supposed to save the sinner from purgatory. According to the Romish doctrine, all the good works of the saints, over and above those which were necessary towards their own justification, are deposited, together with the infinite merits of Jesus Christ, in one inexhaustible treasury. The keys of this were committed to St. Peter, and to his successors the popes, who may open it at pleasure, and by

transferring a portion of this superabundant merit to any particular person, for a sum of money, may convey to him either the pardon of his own sins, or a release for any one in whom he is interested, from the pains of purgatory. Indulgences were first invented in the eleventh century, by Urban II. as a recompence for those who went in person upon the glorious enterprize of conquering the Holy Land. They were afterwards granted to those who hired a soldier for that purpose; and in process of time were bestowed on such as gave money for accomplishing any pious work enjoined by the pope. This power of granting indulgences has been greatly abused. Pope Leo X. in order to carry on the magnificent structure of St. Peter's at Rome, published indulgences, and plenary remission, to all who should contribute money towards it. Finding the project take, he granted to Albert, elector of Mentz, and archbishop of Magdeburg, the benefit of the indulgences of Saxony and the neighbouring parts, and farmed out those of other countries to the highest bidders; who, to make the best of their bargain, procured the ablest preachers to cry up the value of the ware. The form of these indulgences was as follows: "May our Lord Jesus Christ have mercy upon thee, and absolve thee by the merits of his most holy passion. And I, by his authority, that of his blessed apostles, Peter and Paul, and of the most holy Pope, granted and committed to me in these parts, do absolve thee, first from all ecclesiastical censures, in whatever manner they have been incurred; then from all thy sins, transgressions, and excesses, how enormous soever they may be, even from such as are reserved for the cognizance of the holy see, and as far as the keys of the holy church extend: I remit to you all punishment which you deserve in purgatory on their account; and I restore you to the holy sacraments of the church, to the unity of the faithful, and to that innocence and purity which you possessed at baptism; so that when you die, the gates of punishment shall be shut, and the gates of the paradise of delight shall be opened: and if you shall not die at present, this grace shall remain in full force when you are at the point of death. In the name of the Father, and of the Son, and of the Holy Ghost." The terms in which the retailers of indulgences described their benefits, and the necessity of purchasing them, are so extravagant, that they appear almost incredible. If any man (said they) purchases letters of indulgence, his soul may rest secure with respect to its salvation. The souls confined in purgatory, for whose redemption indulgences are purchased, as soon as the money tinkles in the chest, instantly escape from that place of torment, and ascend into heaven. That the efficacy of indulgences was so great, that the most heinous sins, even if one should violate (which was impossible) the mother of God, would be remitted and expiated by them, and the person be freed both from punishment and guilt. That this was the unspeakable gift of God, in order to reconcile men to himself. That the cross erected by the preachers of indulgences was equally efficacious with the cross of Christ. "Lo! the heavens are open; if you enter not now, when will you enter? For twelve-pence you may redeem the soul of your father out of purgatory; and are you so ungrateful, that you will not rescue your parent from torment? If you had but one coat, you ought to strip yourself instantly, and sell it, in order to purchase such benefits," &c. This monstrous abuse of indulgences contributed greatly to the reformation of religion in Germany, where Martin Luther began first to declaim against the preachers of indulgences, and afterwards against indulgences themselves. Since that period the popes have been more sparing in the exercise of this power: however, they still carry on a great trade with them to the Indies, where they are purchased at two rials a-piece, and sometimes more. The pope likewise grants indulgences to persons at the point of death; that is, he grants them, by a brief, power to choose what confessor they please, who is authorized thereby to absolve them from all their sins in general.

INDULT, and **INDULTO**, [Ital. and Fr.] privilege or exemption.

INDULT, in the church of Rome, is the power of presenting to benefices granted to certain persons by the pope. Of this kind is the indult of kings and sovereign princes in the Romish communion. By the concordat for the abolition of the pragmatic sanction, made between Francis I. and Leo X. in 1516, the French king had the power of nominating to bishoprics, and other consistorial benefices, within his realm. At the same realm, by a particu-

lar bull, the pope granted him the privilege of nominating to the churches of Brittany and Provence. In 1648 Pope Alexander VIII. and in 1668 Clement IX. granted the king an indulgence for the bishoprics of Metz, Toul, and Verdun, which had been yielded to him by the treaty of Munster.

INDULT, or **INDULTO**, in the Spanish revenue, is a duty, tax, or custom, paid for all such commodities as are imported from the West Indies in the galleons.

INDUS, a great river of India, or Hindoostan Proper, called by the natives *Sind*, *Sinde*, or *Sindeh*; formed of about ten rivers, which rise among the mountains of Persia, Tartary, and Little Thibet, N. and N. E. of Hindoostan, far remote from their sides. From the city of Attock, in Lat. 32. 27. downward to Moultan, to the conflux of the Chunaub, it is named the Attock. Below Moultan it runs in a S. W. direction through the provinces of Moultan and Sindy; and falls into the Arabian or Persian Sea, by several mouths, N. W. of the Gulf of Cutch. The Nilah, Jamal, Behat, and Lakkah, fall into it.

INEBRIANT, any thing that affects the nerves in a particular and agreeable manner, and through them alters and disturbs the functions of the mind. Inebriants are divided into natural and artificial; the former chiefly in use among the oriental and other nations, the latter principally throughout Europe.

1. **INEBRIANTS, ARTIFICIAL**, are fermented liquors from farinaceous seeds; wines, and spirits, drawn by distillation.

2. **INEBRIANTS, NATURAL**, are, 1. Opium; in use all over the east, and of which the Turks, through custom, swallow a drachm. 2. *Peganum harmala*, Syrian rue. The seeds are sold in Turkey for this purpose; and with these, as Bellonius relates, the Turkish emperor Solymán kept himself intoxicated. 3. *Maslac* of the Turks, or bague of the Persians; prepared from the dust of the male flower of hemp, or from the leaves. 4. *Bague* of the Indians, from the leaves of the *hibiscus sabdariffa*. 5. Seeds of various species of the *datura*, or thorny apple. 6. *Pinang*, or betel of the Indians. 7. Roots of black henbane. 8. The *hyoscyamus physaloides*. 9. Berries of the deadly nightshade. 10. Leaves of milfoil, are used by the Dalecarlians to render their beer intoxicating. 11. Tobacco, and several others less material, are mentioned; such as clary, saffron, and darnel.

INERTIA, [Latin.] literally implies sluggishness, inactivity, or want of motion. Hence

INERTIA OF MATTER, in philosophy, is defined by Sir Isaac Newton to be a passive principle, by which bodies persist in their motion or rest, receive motion in proportion to the force impressing it, and resist as much as they are resisted. He also defines it to be a power implanted in all matter, whereby it resists any change endeavoured to be made in its state. See **MECHANICS**.

IN ESSE is applied to things which are actually existing. Authors make a difference between a thing in *esse*, and a thing in *posse*: a thing that is not, but may be, they say is in *posse*, or *potentia*; but a thing apparent and visible is in *esse*, that is, has a real being *eo instanti*; whereas the other is casual, and at best but a possibility.

INFALISTATIO, an ancient punishment of felons, by throwing them among the rocks and sands, used in sea-port towns. Some think, that infalstatus implied some capital punishment, by exposing the malefactor upon the sands till the next tide carried him away; of which custom, it is said, there is an old tradition. However the penalty seems to take its name from the Norman *falese*, or *falesia*, which signified not the sands, but the rocks and cliffs impending on the sea-shore. *Commisit feloniam ob quam fuit suspensus, ut legatus, vel alio modo morti damnatus, &c. vel apud Dover infalstatus, apud Southampton submersus, &c.*

INFALLIBLE, that cannot err, or be deceived. One of the great controversies between the Protestants and Papists, is the infallibility which the latter attribute to the pope; though, in fact, they themselves are not agreed on that head, some placing this pretended infallibility in the pope and a general council.

INFAMY, in law, a term which extends to forgery, perjury, gross cheats, &c. by which a person is rendered incapable of being a witness or juror, even though he is pardoned for his crimes.

INFANCY, [*infantia*, Lat.] the first period of human life, pre-

vious to the age of seven years. Anatomy discovers to us, that during infancy there is much imperfection in the human frame; e. g. its parts are disproportioned, and its organs incapable of those functions which in future life they are designed to perform. The head is larger in proportion to the bulk of the body, than that of an adult. The liver and pancreas are much larger in proportion than in advanced life; their secretions are more in quantity also. The bile is very inert; the heart is stronger and larger than in future life; the quantity of blood sent through the heart of an infant, in a given time, is also more in proportion than in adults. Though these circumstances have their important usefulness, yet the imperfection attending them subjects this age to many injuries and dangers from which a more perfect state is exempted. Dr. Percival observes, in his *Essays Med. and Exp.* that of all the children who are born alive, two-thirds do not live to be two years old. Infants have a larger proportion of brain than adults, hence are most subject to nervous disorders; and hence the diagnostics of diseases are in many respects obscure and uncertain, particularly those taken from the pulse, which, from the irritability of the tender bodies of infants, is suddenly affected by a variety of accidents too numerous, and seemingly too trivial, to gain our attention. However, no very great embarrassment arises to the practitioner from hence; for the disorders in this state are generally acute, less complicated than those in adults, and are more easily discovered than is generally supposed. The great mortality among infants is in part occasioned by the erroneous practice of confining their tender bodies as soon as they behold the light, by means of tight bandages, preventing the free and natural use of their bowels and limbs. Another cause is the pernicious custom of feeding them with butter and sugar, oil of almonds, or similar unwholesome preparations. In order to obviate the abuses before mentioned, the infant's dress should be so contrived, that it be neither too warm nor too tight, and that not only the influence of the air may have its full effect, but also the motion of the body be duly facilitated. Hence a roller, about six or seven inches broad, should be made, either of linen or woollen cloth, as the season may require, though a knitted bandage would be far preferable; as, from its more elastic nature, it may with less pressure or constraint be turned round its body. It would be superfluous to enumerate the other parts of the upper dress, as every judicious parent will readily accommodate it to age and circumstances. The head should be lightly covered; and, while travelling, in cold or hot weather, a cap or hat may be safely used, but again laid aside, as soon as the infant returns to the house, or to a mild temperature, where every compression of the head is useless, and frequently hurtful. Indeed, the whole dress ought to be as loose as possible, because ruptures, and other fatal consequences, often originate from a contrary treatment. Stockings are by many considered as unnecessary articles of the dress of infants; yet, as our offspring is not intended to go bare-legged, when adults, we conceive no reason for depriving them of proper hose, especially if they can be kept dry, and be adapted to the length of the foot, both in winter and summer; though such covering will be more useful in the former season: their shoes also ought to be sufficiently wide. From the first moment of their existence, infants are liable to the attacks of disease. It deserves, however, to be remarked, that the descendants of sedentary, idle, nervous, or weak persons, are chiefly exposed; while those of the peasant and husbandman, being early inured to fatigue and hardships, are not only more healthy, but also less reduced by occasional indisposition, and better able to bear external injuries.

INFANT, in law, is a person under twenty-one years of age; whose capacities, incapacities, and privileges, are various.

1. **INFANT, IN CIVIL MATTERS**. The ages of male and female are different for different purposes. A male at twelve years old may take the oath of allegiance; at fourteen is at the years of discretion, and therefore may consent or disagree to marriage, may choose his guardian, and, if his discretion be actually proved, may make his testament of his personal estate; at seventeen may be an executor; and at twenty-one is at his own disposal, and may alienate his lands, goods, and chattels. A female also at seven years of age may be betrothed or given in marriage; at nine is entitled to dower; at twelve is at years of maturity, and therefore may consent or disagree to marriage, and, if proved to have sufficient discretion, may bequeath her personal estate; at fourteen is

at years of legal discretion, and may choose a guardian; at seventeen may be executrix; and at twenty-one may dispose of herself and her lands. So that full age in male or female is at twenty-one years, which age is completed on the day preceding the anniversary of a person's birth; who till that time is an infant, and so styled in law. Among the ancient Greeks and Romans, women were never of age, but subject to perpetual guardianship, unless when married nisi convenissent in manum viri; and, when that perpetual tutelage wore away in process of time, we find that, in females as well as males, full age was not till twenty-five years. Thus by the constitution of different kingdoms, this period, which is merely arbitrary, and juris positivi, is fixed at different times. Scotland agrees with England in this point; (both probably copying from the old Saxon constitutions on the continent, which extended the age of minority ad annum vigesimum primum, et eo usque juvenes sub tutelam reponunt;) but in Naples persons are of full age at eighteen; in France, before the revolution, with regard to marriage, not till thirty; and in Holland at twenty-five. The very disabilities of infants are privileges; in order to secure them from hurting themselves by their own improvident acts. An infant cannot be sued but under the protection, and joining the name, of his guardian; for he is to defend him against all attacks as well by law as otherwise; but he may sue either by his guardian, or prochein amy, his next friend who is not his guardian. This prochein amy may be any person who will undertake the infant's cause; and it frequently happens, that an infant, by his prochein amy, institutes a suit in equity against a fraudulent guardian. With regard to estates and civil property, an infant hath many privileges. In general, an infant shall lose nothing by non-claim, or neglect of demanding his right; nor shall any other laches or negligence be imputed to an infant, except in some very particular cases. It is generally true, that an infant can neither alienate his lands, nor do any legal act, nor make a deed, nor any manner of contract, that will bind him. But still to all these rules there are some exceptions: part of which were just now mentioned in reckoning up the different capacities which they assume at different ages: and there are others, a few of which it may not be improper to recite, as a general specimen of the whole. And, first, it is true, that infants cannot alienate their estates; but infant-trustees, or mortgagees, are enabled to convey, under the direction of the court of chancery or exchequer, or other courts of equity, the estates they hold in trust or mortgage, to such person as the court shall appoint. Also it is generally true, that an infant can do no legal act: yet an infant, who has an advowson, may present to the benefice when it becomes void. For the law in this case dispenses with one rule, in order to maintain others of far greater consequence: it permits an infant to present a clerk (who, if unfit, may be rejected by the bishop,) rather than either suffer the church to be unserved till he comes of age, or permit the infant to be debarred of his right by lapse to the bishop. An infant may also purchase lands, but his purchase is incomplete; for when he comes to age, he may either agree or disagree to it, as he thinks prudent or proper, without alleging any reason; and so may his heirs after him, if he die without having completed his agreement. It is, farther, generally true, that an infant, under twenty-one, can make no deed but what is afterwards voidable: yet in some cases he may bind himself apprentice by deed indentured or indentures, for seven years; and he may by deed or will appoint a guardian to his children, if he has any. Lastly, it is generally true, that an infant can make no other contract that will bind him: yet he may bind himself to pay for his necessary meat, drink, apparel, physic, and such other necessities; and likewise for his good teaching and instruction, whereby he may profit himself afterwards.

2. INFANT, in CRIMINAL MATTERS. The law of England does in some cases privilege an infant under the age of twenty-one, as to common misdemeanours; so as to escape fine, imprisonment, and the like: and particularly in the cases of omission, as not repairing a bridge, or a highway, and other similar offences; for, not having the command of his fortune till the age of twenty-one, he wants the capacity to do those things which the law requires. But where there is any notorious breach of the peace, a riot, battery, or the like, (which infants when full-grown are at least as liable as others to commit;) for those, an infant above the age of fourteen is equally liable to suffer, as a person of

the full age of twenty-one. With regard to capital crimes, the law is still more minute and circumspect; distinguishing with greater nicety the several degrees of age and discretion. By the ancient Saxon law, the age of twelve years was established for the age of possible discretion, when first the understanding might open; and from thence till the offender was fourteen, it was *acta pubertati proxima*, in which he might, or might not, be guilty of a crime, according to his natural capacity or incapacity. This was the dubious stage of discretion: but, under twelve, it was held, that he could not be guilty in will, neither after fourteen could he be supposed innocent, of any capital crime which he in fact committed. But by the law, as it now stands, and has stood at least ever since the time of Edward III. the capacity of doing ill; or contracting guilt, is not so much measured by years and days, as by the strength of the delinquent's understanding and judgement. For one lad of eleven years old may have as much cunning as another of fourteen; and in these cases the maxim is, that *malitia supplet aetatem*. Under seven years of age, indeed, an infant cannot be guilty of felony; for then a felonious discretion is almost an impossibility in nature: but at eight years old, he may be guilty of felony. Also, under fourteen, though an infant shall be *prima facie* adjudged to be *doli incapax*, yet if it appear to the court and jury that he was *doli capax*, and could discern between good and evil, he may be convicted and suffer death. Thus a girl of thirteen has been burnt for killing her mistress: and one boy of ten, and another of nine years old, who had killed their companions, have been sentenced to death, and he of ten years actually hanged; because it appeared upon their trials, that the one hid himself, and the other hid the body he had killed; which hiding manifested a consciousness of guilt, and a discretion to discern between good and evil. And there was an instance in the 17th century, where a boy of eight years old was tried at Abington for firing two bars; and, it appearing that he had malice, revenge, and cunning, he was found guilty, condemned, and hanged accordingly. Thus also, in very modern times, a boy of ten years old was convicted on his own confession of murdering his bedfellow; there appearing in his whole behaviour plain tokens of a mischievous disposition; and, as the sparing this boy merely on account of his tender years might be of dangerous consequence to the public, by propagating a notion that children might commit such atrocious crimes with impunity, it was unanimously agreed by all the judges, that he was a proper subject of capital punishment. But, in all such cases, the evidence of that malice, which is to supply age, ought to be strong and clear beyond all doubt and contradiction.

INFANTA, and INFANTE, are titles given to all the sons and daughters of the kings of Spain and Portugal, except the eldest; the princes being called *infantes*, and the princesses *infantas*.

INFANTRY, foot-soldiers. The term takes its origin from one of the *infantas* of Spain, who, finding that the army commanded by the king her father had been defeated by the Moors, assembled a body of foot-soldiers, and with them engaged and totally routed the enemy. In memory of this event, and to honour the foot-soldiers, who were not before held in much consideration, they received the name of infantry.

INFANTRY, HEAVY-ARMED, among the ancients, were such as wore a complete suit of armour, and engaged with broad shields and long spears. They were the flower and strength of the Grecian armies, and had the highest rank of military honour.

INFANTRY, LIGHT, among the moderns, have only been in use since 1656. They have no camp-equipage to carry, their arms and accoutrements are much lighter than those of the infantry. Light infantry are the eyes of a general, and the givers of sleep and safety to an army. Wherever there is found light cavalry, there should be light infantry. They should be accustomed to the pace of four miles an hour, as their usual marching-pace, and to be able to march at five miles an hour upon particular occasions. Most of the powers on the continent have light infantry. It is only of late that light infantry came to be used in the British army: but now every regiment has a company of light infantry, whose station is on the left of the regiment, the right being occupied by the grenadiers.

INFANTRY, LIGHT-ARMED, among the ancients, were designed for skirmishes, and for fighting at a distance. Their weapons were arrows, darts, or slings.

INFATUATE,

INFATUATE signifies to prepossess any one in favour of some person or thing that does not deserve it, so far as that he cannot easily be disabused. The word comes from the Latin *fatuus*, fool; of *farī*, to speak out, which is borrowed from the Greek *φαω*, whence *φατος*, which signifies the same with *vates* in Latin, or *prophet* in English; and the reason is, because their prophets or priests used to be seized with a kind of madness or folly, when they began to make their predictions, or deliver oracles.

INFATUATI, among the ancient Romans, persons who fancied they had seen visions, or imagined the god Faunus, whom they called *Fatuus*, had appeared to them.

INFECTION. See **CONTAGION**.

INFERIE, sacrifices offered by the Greeks and Romans to the *Dii Manes*, or the souls of deceased heroes, (see **MANES**), or even any relation or person whose memory was held in veneration. These sacrifices consisted of honey, water, wine, milk, the blood of victims, variety of balsamic unguents, chaplets, and loose flowers.

INFERNAL REGIONS. See **ELYSIUM**, **HELL**, and **TARTARUS**.

INFIDEL. See **ATHEIST**, **DEIST**, and **INFIDELITY**.

INFIDELITY, [*infidelitas*, Lat.] want of faith; disbelief of Christianity. "Of all the methods (says Mr. Vicesimus Knox, in his Essays, No. 16,) which the vanity of man has devised with a view to acquire distinction, there is none easier than that of professing a disbelief of the established religion. That which shocks the feelings of those with whom we converse, cannot fail of attracting notice; and as the vain are usually confident, they utter their doubts with an air so oracular and decisive, as induces the simple to think them profoundly wise. Audacity, with little ingenuity, will attract the eyes of spectators, and this will sufficiently answer the purpose of many among the professed unbelievers. One might be diverted, if one were not hurt, at seeing a circle of silly admirers, gaping and fixing their eyes on some half-learned and impudent prater, who throws out oblique insinuations against the Bible, the clergy, or the sacrament. These are fertile topics of wit and ingenuity; but it might mortify the vanity of some very vain writers and talkers, if they were to recollect, what is undoubtedly true, that it is a species of wit and ingenuity which not only the vilest, but the most stupid and illiterate of mankind, have frequently displayed in all its possible perfection. There is indeed no doubt, but that vanity is one of the principal causes of infidelity. It must be the sole cause of communicating it to others, by writing or conversation. For let us suppose the case of a very humane, judicious, and learned man, entertaining doubts of the truth of Christianity: if he cannot clear his doubts by examination, he will yet recollect that doubts are no certainties; and, before he endeavours to propagate his scepticism, he will ask himself these questions: 'Am I quite convinced that what I doubt of cannot possibly be true? If I am convinced of it, am I sure that the publication of my opinions will not do more harm than good? &c. I will venture to repeat (continues our author,) that all writers against Christianity, however they may affect even the extremes of benevolence, honour, philosophy, and enlargement of mind, are actuated by vanity and wickedness of heart. Their motives are as mean, selfish, narrow, and in every respect unjustifiable, as the tendency of their writings is mischievous. Their malice is often impotent, through the foolish sophistry of their arguments; but, if ever it be successful, it is highly injurious: and indeed, considering their motives and the probable consequences of their endeavours, the infidel writer is a greater enemy to society, and consequently guiltier, according to all the principles of social union, than the thief or the traitor. Persecution would, however, only promote his cause, and his proper punishment is contempt. It is probable that a great number of sceptical writers never gave themselves the trouble to read those scriptures which they warmly oppose. They hear objections, they read objections, and they find, that from men of reputed wit and ingenuity the objections often originate. They also wish to be reputed men of wit and ingenuity, and therefore eagerly adopt the language and sentiments of the order. Perhaps the vanity and pride of this class of men will render all attempts to convince them abortive; but to modest doubters, and to those whose good sense and good dispositions lead them to wish to be right it may not be useless to suggest advice,

with a view to facilitate their conviction. "The chief thing required is to free themselves from the pride of human reason. Humility (and surely our blindness and imperfections are sufficient to render us humble, if we would be reasonable,) humility will open our hearts, and belief will find admission. Sincere endeavours, seconded by prayers, will never fail to help our unbelief. But, alas! a fine, gay, sprited, liberal, and enlarged modern philosopher, would be ashamed to be found upon his knees, or with a Testament in his possession. There is scarcely any vicious act, or any vicious book, which would put him so much to the blush. A modest well-meaning man might however, one should think, divest himself of those prejudices which prevent the possibility of belief, by the following soliloquy: 'I find myself placed in a world abounding with evil and misery. Under the immediate pressure of it, I feel my heart inclining like the needle to the north, by its natural tendency, to the Deity for support. Man, of all animals, is the only one who has the sense of religion. Feeling the distinctive propensity of my nature, I look around to discover to what object, and in what manner, that part of my fellow-creatures, who live in the same society with myself, pay their adoration. I find a system of religion already established, and which has been established in the most enlightened countries of the earth near 2000 years. I resolve to examine it. It claims that respect from its antiquity and universality. Many difficulties appear on the first inspection. My reason is often startled, and my belief wavers. But I will not yet give up a point of so much importance, without further and closer attention to it. I reflect, that 2000 years is a vast space in the age of the world. How many myriads of men like myself have lived and died in the faith during that time! And were all of them fools or hypocrites? It could not have been. Can the understanding of a poor individual, just come into the world, and hardly knowing where he is, comprehend on intuition an object of such magnitude, and make the mighty discovery which has escaped millions of the wisest and most learned of mortals? Or, supposing that they all perceived the deception, am I then at last the only honest man who will confess it? I am ashamed to avow such an idea to myself. But yet, if I reject what they received, surely I avow it in the more expressive language of my conduct. Pride, I fear, is the foundation of my scepticism; and humility must form the basis of my belief. I will check my own presumption, and reject the cavils of vain and foolish philosophy. Shall a poor weak creature, who cometh up like a flower, and is cut down, who fleeth as a shadow, and never continueth in one stay, presume to pronounce decisively in that little period, in which he has scarcely time to look about him before he dies, against a system which has strong internal and external evidence of divine original, which is most useful and comfortable, and which has been admitted among a great portion of mankind during almost eighteen centuries? No, it is the first wisdom to be humble. Humility will be followed by grace, and grace by faith, and faith by salvation. It plainly appears, that I can lose nothing by belief, but some of those excessive and irregular enjoyments, which would destroy my health and life; but I may possibly secure a glory and a happiness which shall continue for ever."

INFINITE, that has neither beginning nor end; in which sense God alone is infinite. Infinite is likewise applied to that which has had a beginning, but will have no end, as angels and human souls. This makes what the schoolmen call *infinitum a parte post*; as, on the contrary, by *infinitum a parte ante*, they mean that which has an end, but had no beginning; which can be said of nothing except eternity before the creation.

INFINITE QUANTITIES. The very idea of magnitudes infinitely great, or such as exceed any assignable quantities, does include a negation of limits; yet if we nearly examine this notion, we shall find that such magnitudes are not equal among themselves, but that there are really, besides infinite length and infinite area, three several sorts of infinite solidity; all of which are quantities *sui generis*, and that those of each species are in given proportions. Infinite length, or a line infinitely long, is to be considered either as beginning at a point, and so infinitely extended one way, or else both ways from the same point; in which case the one, which is a beginning infinity, is the one-half of the whole, which is the sum of the beginning and ceasing infinity; or, as may be said, of infinity a *parte ante* and a *parte post*, which is analogous to eternity in time and duration, in which there is always as much to fol-

low as is past, from any point or moment of time; nor doth the addition or subduction of finite length, or space of time, alter the case either in infinity or eternity, since both the one and the other cannot be any part of the whole.

INFINITESIMALS, among mathematicians are defined to be infinitely small quantities. In the method of infinitesimals, the element by which any quantity increases or decreases, is supposed to be infinitely small; and is generally expressed by two or more terms, some of which are infinitely less than the rest; which being neglected as of no importance, the remaining terms form what is called the difference of the proposed quantity. The terms that are neglected in this manner, as infinitely less than the other terms of the element, are the very same which arise in consequence of the acceleration, or retardation, of the generating motion, during the infinitely small time in which the element is generated; so that the remaining terms express the elements that would have been produced in that time, if the generating motion had continued uniform: therefore those differences are accurately in the same ratio to each other as the generating motions of fluxions. And hence, though in this method infinitesimal parts of the elements are neglected, the conclusions are accurately true, without even an infinitely small error, and agree precisely with those that are deduced by the method of fluxions. For example, when DG, Plate XVII. fig. 2, the increment of the base AD, of the triangle ADE, is supposed to become infinitely little, the trapezium DGHE (the simultaneous increment of the triangle) consists of two parts, the parallelogram EG, and the triangle EIH; the latter of which is infinitely less than the former, their ratio being that of one-half DG to AD: therefore, according to this method in fluxions, the part EIH is neglected, and the remaining part, viz. the parallelogram EG, is the difference of the triangle ADE. Now EG is precisely that part of the increment of the triangle ADE which is generated by the motion with which this triangle flows, see FLUXIONS, and EIH is the part of the same increment which is generated in consequence of the acceleration of this motion, while the base, by flowing uniformly, acquires the augment DG, whether DG be supposed finite, or infinitely little.

Examp. 2. The increment DELM HG, fig. 3, of the rectangle AE, consists of the parallelograms EG, EM, and lb ; the last of which, lb , becomes infinitely less than EG or EM, when DG and LM, the increments of the sides, are supposed infinitely small; because lb is supposed to EG as LM to AL, and to EM as DG to AD; therefore, lb being neglected, the sum of the parallelograms EG and EM is the difference of the rectangle AE: and the sum of EG and EM is the space that would have been generated by the motion with which the rectangle AE flows continued uniformly, but that lb is the part of the increment of the rectangle which is generated in consequence of the acceleration of this motion, in the time that AD and AL, by flowing uniformly, acquire the augments DG and LM. The same may be observed in propositions wherein the fluxions of quantities are determined; and thus the manner of investigating the differences, or fluxions of quantities, in the method of infinitesimals, may be deduced from the principles of the method of fluxions. For instead of neglecting EIH because it is infinitely less than EG, n^o 1. (according to the usual manner of reasoning in that method) we may reject it; because we may thence conclude, that it is not produced in consequence of the generating motion DG, but of the subsequent variations of this motion. And it appears why the conclusions in the method of infinitesimals are not to be represented as if they were only near the truth, but are to be held as accurately true. In order to render the application of this method easy, some analogous principles are admitted, as that the infinitely small elements of a curve are right lines, or that a curve is a polygon of an infinite number of sides, which being produced, give the tangents of the curve; and by their inclination to each other measure the curvature. This is as if we should suppose, when the base flows uniformly, the ordinate flows with a motion which is uniform for every infinitely small part of time, and increases or decreases by infinitely small differences at the end of every such time. But however convenient this principle may be, it must be applied with caution and art on various occasions. It is usual therefore, in many cases, to resolve the element of the curve into two or more infinitely small right lines; and sometimes it is necessary, if we would avoid error, to resolve it into an infinite number of such right lines, which are

infinitesimals of the second order. In general, it is a postulatam in this method, that we may descend to the infinitesimals of any order whatever, as we find it necessary; by which means, any error that might arise in the application of it may be discovered and corrected by a proper use of this method itself. For an example of this, see Maclaurin's Fluxions, article 498. It is likewise to be observed, when the value of a quantity that is required in a philosophical problem becomes, in certain particular cases, infinitely great or infinitely little, the solution would not be always just though such magnitudes were admitted. As when it is required to find by what centripetal force a curve could be described about a fixed point that is either in the curve, or is so situated, that a tangent may be drawn from it to the curve, the value of the force is found infinite at the centre of the forces in the former case, and at the point of contact in the latter; yet it is obvious, that an infinite force could not deflect the line described by a body that should proceed from either of these points, into a curve; because the direction of its motion in either case passes through the centre of the forces, and no force, how great soever, that tends towards the centre, could cause it to change that direction. But it is to be observed, that the geometrical magnitude by which the force is measured, is no more imaginary in this than in other cases, where it becomes infinite; and philosophical problems have limitations that enter not always into the general solution given by geometry. But to obviate these scruples, which the brief manner of proceeding in the method of infinitesimals is apt to suggest to such as enter on the higher parts of the geometry, after having been accustomed to a more strict and rigid kind of demonstration in the elementary parts. To such it may seem not to be consistent with the perfect accuracy that is required in geometrical demonstration, that, in determining the first differences, any part of the element of the variable quantity should be rejected, merely because it is infinitely less than the rest, and that the same part should be afterwards employed for determining the second and higher differences, and resolving some of the most important problems. Nor can we suppose that their scruples will be removed, but rather confirmed, when they come to consider what has been advanced by some of the most celebrated writers on this method, who have expressed their sentiments concerning infinitely small quantities in the precise terms; while some of them deny their reality, and consider them only as incomparably less than finite quantities, in the same manner as a grain of sand is incomparably less than the whole earth; and others represent them, in all their orders, as no less real than finite quantities. From what has been said, it will appear that a satisfactory account may be given for the more brief way of reasoning used in the method of infinitesimals; and that when we investigate the first differences, we may reject the infinitesimal part of the element, not merely because they are infinitely less than the other parts; but because the quantities generated, and their mutual relations, depend upon the generating motions, and are discovered by them. The same infinitesimal parts of the element, however, may serve for measuring the acceleration or retardation of those motions from that term, or the powers which may be conceived to accelerate or retard them at that term: and here the infinitely small parts of the element that are of the third order, are neglected for a similar reason, being generated only in consequence of the variation of those powers from that term of the time. In this manner we presume some satisfaction may be given to the scrupulous (who may be apt to demur at the usual way of reasoning in this method) while nothing is neglected without accounting for it; and thus the harmony may appear to be more perfect between the method of fluxions and that of infinitesimals. But, however safe and convenient this method may be, some will always scruple to admit infinitely little quantities, and infinite orders of infinitesimals, into a science that boasts of the most evident and accurate principles, as well as of the most rigid demonstrations; and therefore in this article, more unexceptionable postulata have been used. In order to avoid such suppositions, Sir Isaac Newton considers the simultaneous increments of the flowing quantities as finite, and then investigates the ratio, with the limit of the various proportions, which those increments bear to each other, while he supposes them to decrease together, till they vanish; which ratio is the same with the ratio of fluxions. See FLUXIONS.

INFIRMARY, a kind of hospital, where the weak and sickly are properly taken care of. See HOSPITAL.

INFLAMMABILITY, that property in bodies, which disposes them to kindle, or catch fire. See **CALORIC**, and **COMBUSTION**.

INFLAMMABLE AIR. See **HYDROGEN GAS**.

INFLAMMATION, in medicine and surgery, a redness and swelling of any part of the body, attended with heat, pain, and symptoms of fever. See **MEDICINE**.

INFLAMMATION, in chemistry, combustion attended with flame. See **COMBUSTION**, and **CALORIC**.

INFLATION, [*inflatio*, Latin,] the state of being swelled with wind; flatulence.

INFLATION signifies also the act of stretching or filling any flaccid or distensible body with a flatulent or windy substance.

INFLECTION, **DEFACTION**, or **DEFLECTION**, in optics, is a property of light, by which, when it comes within a certain distance of any body, it will either be bent from it, or towards it; which is a kind of imperfect reflection or refraction. See **OPTICS**.

INFLECTION, or **POINT OF INFLECTION**, in the higher geometry, is a point where a curve begins to bend a contrary way. For the finding of this point, See **FLUXIONS**.

INFLECTION, in grammar, the variation of nouns and verbs, by declension and conjugation. See **DECLENSION**.

INFLORESCENCE, in botany, a term used to denote the mode of flowering; the manner in which flowers are supported on their footstalks. The various modes in which flowers are joined to the plant by the peduncles or footstalks are expressed by different terms. See **BOTANY**. The various modes of flowering are applicable to those flowers which proceed from the angle formed by the leaves and branches, as is the case in most instances, and to such also as terminate the stem and branches. In the first case, flowers are termed "axillares," that is, proceeding from the arm-pit of the leaf; in the latter "terminales," that is, the terminating the branches. Inflorescence affords a characteristic mark, by which to distinguish the species of plants, but is not used as a generic difference.

INFLUENCE, a quality supposed to flow from the heavenly bodies, either with their light or heat; to which astrologers idly ascribe all sublunary events. Alchemists also, who to this ascribe the philosopher's stone, tell us, that every thing in nature is produced by the influence of the stars, which, in their passage through the atmosphere, imbibe many of its moist parts, the grossest whereof they deposit in the sands and earths where they fall; that these, filtering through the pores of the earth, descend even to the centre, whence they are driven by the central fire back again to the surface; and in their ascent, by a natural kind of sublimation, as they find earths duly disposed, they form natural bodies, as metals, minerals, and vegetables, &c. Thus, it is pretended, that chemistry, consisting of an artificial imitation of these natural operations, and in applying active principles to passive principles, can form natural bodies, make gold, &c.

INFLUENZA, in medicine, a species of contagious catarrh, so named because it was supposed to be produced by a peculiar influence of the stars. The phenomena of contagious catarrhs have been much the same with those of the simple kind, but the disease has always been particularly remarkable for this, that it has been the most widely and generally spreading epidemic known. It has seldom appeared in any one country of Europe, without appearing successively in most of the others.

IN FORMA PAUPERIS. When any man who has a just cause of suit, either in Chancery or any of the courts of common law, will come before the Lord Keeper, Master of the Rolls, either of the Chief Justices, or Chief Baron, and make oath, that he is not worth five pounds, his debts paid; either of the said judges will, in his own proper court admit him to sue in forma pauperis, or as a poor man, and he shall have counsel, clerk, or attorney, assigned him, to do his business, without paying any fees.

INFORMATION, in law, is nearly the same in the crown office, as what in other courts is called a declaration. See **PROSECUTION**. Informations are of two sorts; first, those which are partly at the suit of the king, and partly at that of a subject; and 2ndly, such as are only in the name of the king. The former are usually brought upon penal statutes, which inflict a penalty upon conviction of the offender, one part to the use of the king, and another to the use of the informer. By the statute 31 Eliz.

c. 5, no prosecution upon any penal statute, the suit and benefit whereof are limited in part to the king, and in part to the prosecutor, can be brought by any common informer, after one year is expired since the commission of the offence; nor on behalf of the crown, after the lapse of two years longer; nor, where the forfeiture is originally given only to the king, can such prosecution be had after the expiration of two years from the commission of the offence. The informations that are exhibited in the name of the king alone, are also of two kinds: 1st, those which are truly and properly his own suits, and filed ex officio by his own immediate officer, the attorney-general. 2d, those in which, though the king is the nominal prosecutor, yet it is at the relation of some private person or common informer; and they are filed by the king's coroner and attorney in the court of king's bench, usually called the master of the crown-office, who is for this purpose the standing officer of the public. The objects of the king's own prosecutions, filed ex officio by his own attorney-general, are properly such enormous misdemeanors as peculiarly tend to disturb or endanger his government, or to molest or affront him in the regular discharge of his royal functions. For offences (says Blackstone) so high and dangerous, in the punishing or preventing of which a moment's delay would be fatal, the law has given to the crown the power of an immediate prosecution, without waiting for any previous application to any other tribunal: which power, thus necessary, not only to the ease and safety, but even to the very existence, of the executive magistrate, was originally reserved in the great plan of the English constitution, wherein provision is wisely made for the due preservation of all its parts. The objects of the other species of informations, filed by the master of the crown-office upon the complaint or relation of a private subject, are any gross and notorious misdemeanors, riots, batteries, libels, and other immoralities of an atrocious kind, not peculiarly tending to disturb the government (for those are left to the care of the attorney-general), but which, on account of their magnitude or pernicious example, deserve the most public animadversion. And when an information is filed, either thus, or by the attorney-general ex officio, it must be tried by a petit-jury of the county where the offence arises: after which if the defendant be found guilty, he must resort to the court for his punishment. See a history and vindication of this mode of prosecution in Blackstone's Commentary, vol. iv, p. 309—312.

INFORMER, [*informator*,] in law, is a person who informs against, or prosecutes in any of the king's courts, those that offend against any law or penal statute. See **INFORMATION**. Informers were very numerous both in Greece and Rome. Every corner of the streets was pestered with swarms of turbulent rascals, who made it their constant business to pick up stories and catch at every occasion to accuse persons of credit and reputation: these by the Greeks were called *Συκοφανται*: see **SYCOPHANT**. Among the Romans, informers were of two sorts, Mandatores and Delatores. These played into each other's hands; the former marked down such persons as they pretended to have found guilty of any misdeemeanor, and the other prosecuting them. What tended to increase the number of these pestilent fellows was, that the informer were entitled to a fourth part of the effects of the persons convicted. Wicked princes rewarded and countenanced this mischievous tribe; but Titus set on foot a most diligent search after them, and punished such as he found with death or banishment. Trajan also is praised by Pliny for a similar conduct.

INFRA LAPSARIANS, or **INFRA LAPSARII**, a sect of predestinarians, who maintain, that God has created a certain number of men only to be damned, without allowing them the means necessary to save themselves, if they would. They are thus called, because they hold that God's decrees were formed *infra lapsum*, after his knowledge of the fall, and in consequence thereof; in contradistinction to the Supralapsarians.

INFRA SCAPULARIS, in anatomy, one of the depressor muscles of the arm. See **ANATOMY**.

INFRA SPINATUS, in anatomy, one of the abductor-muscle of the arm. See **ANATOMY**.

INFULA, in antiquity, was a mitre worn by the Roman and Grecian priests, upon the head, from which on each hung a ribbon.

INFUNDIBULIFORM, in botany, is applied to such monopetalous or one-leaved flowers as resemble a funnel in shape, which

which have a narrow tube at one end, and gradually widen towards the limb or mouth.

INFUSION, in pharmacy, is an operation whereby the virtues of plants, roots, and the like, are drawn out, by letting them steep in some convenient fluid menstruum, without boiling them therein; as boiling dissipates the finer parts of many bitter and aromatic substances, without carefully extracting their medicinal principles.

INFUSORIA, in natural history, the fifth order of the class vermes, in the Linnæan system. They are simple microscopic animalcules. There are three divisions:

A, with external organs, of which there are five genera, viz.

Branchionus,	Trichoda,
Cercaria,	Vorticella.
Leucopera.	

B, without external organs, flattened; four genera:

Colpoda,	Gonium,
Cyclidium,	Paramecium.

C, without external organs, round; six genera:

Bacillaria,	Monas,
Bursaria,	Vibria,
Euchelis,	Volvax.

The order, Infusoria, cannot easily be distinguished from the Intestina and Mollusca, except by the minuteness of the individuals belonging to it, and their spontaneous appearance in animal and vegetable infusions, without furnishing any traces of the manner in which they are produced.

INGATESTONE, a town of Essex, 23 miles E. N. E. of London. Lon. 0. 28. E. Lat. 51. 39. N.

INGELHEIM, OBER, or UPPER, a town of Germany, 5 miles W. of Bingen, 12 miles S.W. of Mentz, and 28 N.W. of Worms.

INGENUOUS, in Roman antiquity, was an appellation given to persons born of free parents, who had never been slaves: for the children of liberti, or persons who had obtained their liberty, were called Libertini, not Ingenui; this last appellation being reserved for their children, or the third generation.

INGLUVIES, the crop or craw of granivorous birds, serving for the immediate reception of the food, where it is macerated for some time before it is transmitted to the true stomach.

INGOLDSTADT, or INGOLSTADT, a city of Germany, and the strongest in Bavaria, with a famous university and a handsome church, 5 miles N. E. of Newberg and 45 N. by W. of Munich. Lon. 11. 25. E. Lat. 48. 46. N.

INGOT, a mass of gold or silver melted down, and cast in a longitudinal hollow iron mould, which is also called an Ingot, and by corruption a Lignot.

INGRAHAM ISLES, ten islands in the South Pacific Ocean; lying between 35 and 50 leagues N. N. W. of the Marquesas islands. They were discovered by Captain Joseph Ingraham of Boston in Massachusetts, on the 19th April 1791, the anniversary of the commencement of the American War. He gave names to seven of them, viz. Washington, or Oohoona, Adams or Woa-poo, Federal Island, or Nooheeva, Franklin, or Tat too-e-tee, Hancock, Knox, and Lincoln. Lon. between 140° 19' and 141° 18' W. Lat. between 8° 3' and 9° 24' S.

INGRAHAM, PORT, a fine harbour of the United States, on the N. side of Washington. Lon. 133. 18. W. Lat. 33. 37. N.

INGRATITUDE, a crime so shameful, that there seldom was a man found who would own himself guilty of it; and, though too frequently practised, it is so abhorred by the general voice, that to an ungrateful person is imputed the guilt or the capability of all other crimes. The ungrateful are neither fit to serve their Creator, their country, nor their friends. Ingratitude perverts all the measures of religion and society, by making it dangerous to be charitable and good-natured. (See GRATITUDE.) However, it is better to expose ourselves to ingratitude, than to be wanting in charity and benevolence.

INGRESS, in astronomy, signifies the sun's entering the first scruple of one of the four cardinal signs, especially Aries. It also signifies the commencement of a transit of Venus or Mercury over the sun's disk.

INGRIA, a province of Russia, in the gulf of Finland, about 130 miles long, and 50 broad. It abounds in game and fish: and here are a great number of elks, which come in troops from Finland in the spring and autumn.

INGROSSER, any person who buys up great quantities of any commodity, before it comes to market, in order to raise the price.

INGROSSER, also a clerk who writes records or instruments of law on parchment.

INITIALER, in medicine, a machine for breathing in warm steams into the lungs, recommended by Mr. Mudge in the cure of the catarrhus cough. The body of the instrument holds about a pint; and the handle, which is fixed to the side of it, is hollow. In the lower part of the vessel, where it is soldered to the handle, is a hole, by means of which, and three others on the upper part of the handle, the water when it is poured into the inhaler, will rise to the same level in both. To the middle of the cover a flexible tube about five or six inches long is fixed, with a mouth-piece of wood or ivory. Underneath the cover there is a valve fixed, which opens and shuts the communication between the upper and internal part of the inhaler and the external air. When the mouth is applied to the end of the tube in the act of inspiration, the air rushes into the handle, and up through the body of warm water, and the lungs become, consequently, filled with hot vapours. In expiration, the mouth being still fixed to the tube, the breath, together with the steam on the surface of the water in the inhaler, is forced up through the valve in the cover. In this manner, therefore, the whole act of respiration is performed through the inhaler, without the necessity, in the act of expiration, of either breathing through the nose, or removing the pipe from the mouth.

INHERITANCE, in law, is a perpetual right or interest in lands, invested in a person and his heirs.

INHERITANCES, LAW OF. The doctrine of descents, or law of inheritances, in fee simple, is a point of the highest importance. See FEE. All the rules relating to purchases, whereby the legal course of descents is broken and altered, perpetually refer to this settled law of inheritance, as a first principle universally known, and upon which their subsequent limitations are to work. Thus a gift in tail, or to a man and the heirs of his body, is a limitation that cannot be perfectly understood, without a previous knowledge of the law of descents in fee simple. One may perceive, that this is an estate confined in its descent to such heirs only of the donee as have sprung, or shall spring, from his body: but who those heirs are, whether all his children both male and female, or the male only, and (among the males) whether the eldest, youngest, or other son alone, or all the sons together, shall be his heir; this is a point that we must resort back to the standing law of descents in fee simple to be informed of. And as this depends on the nature of kindred, and the several degrees of consanguinity, we refer the reader to the article **CONSANGUINITY**, where the true notion of this kindred or alliance in blood is particularly stated. We shall here exhibit a series of rules of inheritance, with illustrations, according to which, by the law of England, estates are transmitted from the ancestor to the heir. 1. "Inheritances shall lineally descend to the issue of the person last actually seised in infinitum, but shall never lineally ascend." To understand both this and the subsequent rules, it must be observed, that by law no inheritance can vest, nor can any person be the actual complete heir of another, till the ancestor is previously dead. Nemo est hæres viventis. Before that time, the person who is next in the line of succession is called heir apparent or heir presumptive. Heirs apparent are such whose right of inheritance is indefeasible, provided they outlive the ancestor; as the eldest son of his issue, who must, by the course of the common law, be heirs to the father whenever he happens to die. Heirs presumptive are such, who, if the ancestor should die immediately, would in the present circumstances of things be his heirs; but whose right of inheritance may be defeated by the contingency of some nearer heir being born; as a brother or nephew, whose presumptive succession may be destroyed by the birth of a child; or a daughter, whose present hopes may be hereafter cut off by the birth of a son. Nay, even if the estate hath descended, by the death of the owner, to such a brother, or nephew, or daughter; in the former cases, the estate shall be divested and taken away by the birth of a posthumous child; and in the latter, it shall also be totally divested by the birth of a posthumous son. We must also remember that no person can be properly such an ancestor as that an inheritance in lands or tenements can be derived from him, unless he hath had an actual seisin of such lands, either by his own entry, or by the pos-

session of his own or his ancestor's lessee for years, or by receiving rent from a lessee of the freehold: or unless he hath what is equivalent to corporal seisin in hereditaments that are incorporeal; such as the receipt of rent, a presentation to the church in case of an advowson, and the like. But he shall not be accounted an ancestor who hath had only a bare right or title to enter or be otherwise seised. And therefore all the cases which will be mentioned, are upon the supposition that the deceased (whose inheritance is now claimed) was the last person actually seised thereof. For the law requires this notoriety of possession, as evidence that the ancestor had that property in himself, which is now to be transmitted to his heir. Which notoriety hath succeeded in the place of the ancient feudal investiture, whereby, while feuds were precarious, the vassal on the descent of lands was formerly admitted to the lord's court (as is still the practice in Scotland); and therefore received his seisin, in the nature of a renewal of his ancestor's grant, in the presence of the feudal peers; till at length, when the right of succession became indefeasible, an entry on any part of the lands within the county (which if disputed was afterwards to be tried by those peers,) or other notorious possession, was admitted as equivalent to the formal grant of seisin, and made the tenant capable of transmitting his estate by descent. The seisin of any person thus understood, makes him the root or stock from which all future inheritance by right of blood must be derived; which is very briefly expressed in this maxim, *Seisina facit stipitem*. When therefore a person dies so seised, the inheritance first goes to his issue: as if there be Geoffrey, John, and Matthew, grandfather, father, and son; and John purchases lands, and dies; his son Matthew shall succeed him as heir, and not the grandfather Geoffrey; to whom the land shall never ascend, but shall rather escheat to the lord.

2. "The male issue shall be admitted before the female." Thus sons shall be admitted before daughters: or, as our male lawgivers have somewhat uncomplaisantly expressed it, the worthiest of blood shall be preferred. As if John Stiles had two sons, Matthew and Gilbert; and two daughters, Margaret and Charlotte, and dies; first Matthew, and (in case of his death without issue) then Gilbert shall be admitted to the succession in preference to both the daughters.

3. "Where there are two or more males in equal degree, the eldest only shall inherit; but the females all together." As, if a man hath two sons, Matthew and Gilbert, and two daughters, Margaret and Charlotte, and dies; Matthew his eldest son shall alone succeed to his estate, in exclusion of Gilbert the second son and both the daughters; but if both the sons die without issue before the father, the daughters Margaret and Charlotte shall both inherit the estate as coparceners.

4. "The lineal descendants, in infinitum, of any person deceased, shall represent their ancestor; that is, shall stand in the same place as the person himself would have done had he been living." Thus the child, grandchild, or great-grandchild (either male or female), of the eldest son succeeds before the younger son, and so in infinitum. And these representatives shall take neither more nor less, but just so much as their principals would have done. As if there be two sisters, Margaret and Charlotte; and Margaret dies, leaving six daughters; and then John Stiles the father of the two sisters dies without other issue; these six daughters shall take among them exactly the same as their mother Margaret would have done, had she been living; that is, a moiety of the lands of John Stiles in coparcenary: so that, upon partition made, if the land be divided in 12 parts, thereof Charlotte the surviving sister shall have six, and her six nieces, the daughters of Margaret, one a-piece.

5. "On failure of lineal descendants, or issue, of the person last seised, the inheritance shall descend to the blood of the first purchaser; subject to the three preceding rules." Thus, if Geoffrey Stiles purchases land, and it descends to John Stiles his son, and John dies seised thereof without issue; whoever succeeds to this inheritance must be of the blood of Geoffrey, the first purchaser of this family. The first purchaser, perquisitor, is he who first acquired the estate to his family, whether the same was transferred to him by sale, or by gift, or by any other method, except only that of descent.

6. "The collateral heir of the person last seised must be his next collateral kinsman of the whole blood." First, he must be his next collateral kinsman either personally or jure representationis; which proximity is reckoned according to the canonical degrees of consanguinity: See *CONSANGUINITY*. Therefore the brother being in the first degree, he and his descendants shall exclude the uncle and his

issue, who is only in the second. Thus, if John Stiles dies without issue, his estate shall descend to Francis his brother, who is lineally descended from Geoffrey Stiles, his next immediate ancestor or father. On failure of brethren or sisters and their issue, it shall descend to the uncle of John Stiles, the lineal descendant of his grandfather George; and so on in infinitum. But secondly, the heir need not be the nearest kinsman absolutely, but only sub modo; that is, he must be the nearest kinsman of the whole blood: for if there be a much nearer kinsman of the half-blood, a distant kinsman of the whole blood shall be admitted, and the other entirely excluded. A kinsman of the whole blood is he that is derived, not only from the same ancestor, but from the same couple of ancestors. For as every man's own blood is compounded of the bloods of his respective ancestors, he only is properly of the whole or entire blood with another who hath (so far as the distance of degrees will permit) all the same ingredients in the composition of his blood that the other hath. Thus the blood of John Stiles being composed of those of Geoffrey Stiles his father and Lucy Baker his mother, therefore his brother Francis, being descended from both the same parents, hath entirely the same blood with John Stiles; or he is his brother of the whole blood. But if, after the death of Geoffrey, Lucy Baker the mother marries a second husband, Lewis Gay, and hath issue by him: the blood of this issue, being compounded of the blood of Lucy Baker on the one part, but that of Lewis Gay on the other part, it hath therefore only half the same ingredients with that of John Stiles; so that he is only his brother of the half-blood, and for that reason they shall never inherit to each other. So also, if the father has two sons, A and B, by different wives; these two brethren are not brethren of the whole blood, and therefore shall never inherit to each other, but the estate shall rather escheat to the lord. Nay, even if the father dies, and his lands descend to his eldest son A, who enters thereon, and dies seised without issue; still B shall not be heir to this estate, because he is only of the half-blood to A, the person last seised; but had A died without entry, then B might have inherited; not as heir to A his half-brother, but as heir to their common father, who was the person last actually seised. The rule, then, amounts to this: That to keep the estate of John Stiles as nearly as possible in the line of his purchasing ancestors it must descend to the issue of the nearest couple of ancestors that have left descendants behind them; because the descendants of one ancestor only are not so likely to be in the line of that purchasing ancestor as those who are descended from two. But here a difficulty arises. In the second, third, fourth, and every superior degree, every man has many couples of ancestors, increasing according to the distances in a geometrical progression upwards, (See *CONSANGUINITY*.) the descendants of all which respective couples are (representatively) related to him in the same degree. Thus, in the second degree, the issue of George and Cecilia Stiles, and of Andrew and Esther Baker, two grandsires and grandmothers of John Stiles, are each in the same degree of propinquity; in the third degree, the respective issues of Walter and Christian Stiles, of Luke and Francis Kempe, of Herbert and Hannah Baker, and of James and Emma Thorpe, are (upon the extinction of the two inferior degrees) all equally entitled to call themselves the next kindred of the whole blood to John Stiles. To which therefore of these ancestors must we first resort, to find out descendants to be preferably called to the inheritance? In answer to this, and to avoid the confusion and uncertainty that might arise between the several flocks wherein the purchasing ancestor may be sought for, 7. The 7th and last rule is, "That in collateral inheritances the male stocks shall be preferred to the female (that is kindred derived from the blood of the male ancestors shall be admitted before those from the blood of the female);—unless where the lands have in fact descended from a female."—Thus the relations on the father's side are admitted in infinitum, before those of the mother's side are admitted at all; and the relations of the father's father, before those of the father's mother: and so on. For the original and progress of the above canons, the reasons upon which they are founded, and their agreement with the laws of other nations, see *Blackstone's Commentaries*, vol. ii. We shall conclude with exemplifying the rules themselves by a short sketch of the manner in which we must search for the heir of a person, as John Stiles, who dies seised of land which he acquired, and which therefore he held as a feud of

indefinite

undefined antiquity. See Plate LXXXIX. In the first place succeeds the eldest son, Matthew Stiles, or his issue, (N^o 1):—if his line be extinct, then Gilbert Stiles and the other sons respectively, in order of birth, or their issue, (N^o 2):—in default of these, all the daughters together, Margaret and Charlotte Stiles, or their issue, (N^o 3):—On the failure of the descendants of John Stiles himself, the issue of Geoffrey and Lucy Stiles, his parents, is called in: viz. first, Francis Stiles, the eldest brother of the whole blood, or his issue, (N^o 4):—then Oliver Stiles, and the other whole brothers respectively, in order of birth, or their issue, (N^o 5):—then the sisters of the whole blood altogether, Bridget and Alice Stiles, or their issue, together, (N^o 6):—In defect of these, the issue of George and Cecilia Stiles, his father's parents; respect being still had to their age and sex, (N^o 7):—then the issue of Walter and Christian Stiles, the parents of his paternal grandfather, (N^o 8):—then the issue of Richard and Anne Stiles, the parents of his paternal grandfather's father, (N^o 9):—and so on in the paternal grandfather's paternal line, or blood of Walter Stiles, in infinitum. In defect of these, the issue of William and Jane Smith, the parents of his paternal grandfather's mother, (N^o 10):—and so on in the paternal grandfather's maternal line, or blood of Christian Smith, in infinitum; till both the immediate bloods of George Stiles, the paternal grandfather, are spent. Then we must resort to the issue of Luke and Frances Kempe, the parents of John Stiles' paternal grandmother, (N^o 11):—then to the issue of Thomas and Sarah Kempe, the parents of his paternal grandmother's father, (N^o 12):—and so on in the paternal grandmother's paternal line, or blood of Luke Kempe, in infinitum. In default of which, we must call in the issue of Charles and Mary Holland, the parents of his paternal grandmother's mother, (N^o 13):—and so on in the paternal grandmother's maternal line, or blood of Frances Holland, in infinitum; till both the immediate bloods of Cecilia Kempe, the paternal grandmother, are also spent. Whereby the paternal blood of John Stiles entirely failing, recourse must then, and not before, be had to his maternal relations; or the blood of the Bakers (N^o 14, 15, 16), Willis (N^o 17), Thorpes (N^o 18, 19), and Whites (N^o 20); in the same regular successive order as in the paternal line. It is to be remembered, that during this whole process, John Stiles is the person supposed to have been last actually seised in the estate. For if ever it comes to be vested in any other person, as heir to John Stiles, a new order of succession must be observed upon the death of such heir; since he, by his own seisin, now becomes himself an ancestor, or stiles, and must be put in the place of John Stiles. The figures therefore denote the order in which the several classes would succeed to John Stiles, and not to each other; and before we search for an heir in any of the higher figures, (as N^o 8,) we must first be assured that all the lower classes (from N^o 1 to 7,) were extinct at John Stiles's decease.

INHIBITION, in Scots law, a diligence obtained at the suit of a creditor against his debtor, prohibiting him from selling or contracting debts upon his estate to the creditor's prejudice.

INJECTION, in medicine, signifies the forcibly throwing of certain liquid medicines into the body by a syringe, tube, clyster-pipe, or the like.

INJECTION, in surgery, the throwing in of some liquor or medicine into a vein opened by incision. This practice, and that of Transfusion, or the conveying the arterial blood of one man, or other animal, into another, were once greatly practised, but are now very properly laid aside.

INJECTION, ANATOMICAL, the filling the vessels of a human, or other animal body, with some coloured substance, in order to make their figures and ramifications visible.

INIS, an Irish word signifying an island, which makes part of the names of many islands on the coast of Ireland, and of some in Scotland: as,

INISBERG, two islands of Ireland, 1. on the N. W. coast, of Donegal: 2. on the W. coast of Kerry.

INISHAE and **INISHARN**, two islands on the W. coast of Galway.

INISH-CHONNEL, an island of Scotland, in Loch-Aw.

INISHERKAN, an island of Cork, on the W. side of Baltimore harbour, six miles in circumference. Lon. 9. 19. W. Lat. 51. 24. N.

INISMURRY, an island between Sligo and Donegal Bays. Lon. 8. 33. W. Lat. 54. 26. N.

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INISTIOGHE, a borough of Ireland in Kilkenny, Leinster; 13 miles S. W. of Kilkenny, and 63 from Dublin.

INISTUISCAR, an island on the W. coast of Kerry. Lon. 10. 26. W. Lat. 52. 8. N.

INJUNCTION, in law, a writ generally grounded upon an interlocutory order or decree out of the court of chancery or exchequer, sometimes to give possession to the plaintiff, for want of the defendant's appearance; sometimes to the king's ordinary court, and sometimes to the court Christian, to stop proceedings in a cause, upon suggestion made, that the rigour of the law, if it take place, is against equity and conscience in that case, that the complainant is not able to make his defence in these courts, for want of witnesses, &c. or that they act erroneously, denying him some just advantage.

INJURY, in law, any wrong done to a man's person, reputation, or goods. See **ASSAULT**.

INK, a black fluid employed in writing, and usually prepared with an infusion of galls, copperas, and gum-arabic. The chief requisites for the making of good ink, are, 1. Limpidity, so that it may flow freely from the pen. 2. A deep, uniform, and black colour. 3. Durability, so that the letters be not liable to be effaced by age; and 4. It should be divested of any corrosive quality, by which the substances of the paper may be destroyed, or the writing rendered in any degree illegible. No ink, however, hitherto used, possesses all these properties; hence several ingenious chemists have been induced to make experiments, in order to render it more perfect. M. Ribaucourt, in the "Annales de Chimie," directs eight ounces of Aleppo galls, and four ounces of logwood, to be boiled in twelve pounds of water, till the quantity is reduced to one-half; when the liquor should be strained through a linen or hair-sieve into a proper vessel. Four ounces of sulphate of iron (green vitriol): three ounces of gum-arabic; one ounce of sulphate of copper (blue vitriol); and a similar quantity of sugar-candy, are now to be added: the liquid should be frequently shaken, to facilitate the solution of the salts. As soon as these ingredients are perfectly dissolved, the composition is suffered to subside for twenty-four hours; when the ink may be decanted from the gross sediment, and preserved for use in glass or stone bottles, well stopped. This ink exhibits a purplish-black colour in the bottles; but the writing performed with it, is said to be of a beautiful black cast, which it retains, unaltered, for a considerable length of time. Each quart of the preparation contains:

	oz.	drs.	grs.
Of galls.....	2	5	20
Green vitriol.....	1	2	40
Logwood.....	1	2	40
Gum.....	1	0	0
Blue vitriol.....	0	2	40
Sugar-candy.....	0	2	40

M. Ribaucourt is of opinion, that ink thus prepared, may be preserved several years in a state of perfection, without depositing either galls or iron. The ink commonly used, is manufactured by stationers, according to Dr. Lewis's recipe; but it is ill calculated for keeping, as it deposits a black sediment, while the fluid itself is of a pale colour. Each quart of this ink contains;

	oz.	drs.	grs.
Of galls.....	3	0	0
Green vitriol.....	1	0	0
Logwood.....	0	5	24
Gum.....	1	0	0

Neither blue vitriol nor sugar are employed in this preparation. As, however, both the ink made after the latter method, and that compounded according to other recipes, are not adapted to resist the effects of acids, and are consequently by no means fit for records, deeds, and other documents, M. Westrumb recommends the following ingredients, as being well calculated to remedy this inconvenience. He directs one ounce of Brazil-wood, and a similar quantity of gall-nuts, to be boiled in forty-six ounces (somewhat less than three pints) of water, till the whole be reduced to thirty-two ounces, or about two quarts. This decoction is to be poured, while hot, upon half an ounce of copperas, or green vitriol: a quarter of an ounce of gum-arabic, and a similar quantity of white sugar. As soon as a perfect solution of these substances has taken place, one ounce and a quarter of indigo, finely pulverized,

is to be added; together with three quarters of an ounce of the purest lamp-black, previously diluted in one ounce of the best brandy. The whole is to be well incorporated; and, after it has subsided, M. Westrum asserts that it will form an ink absolutely indestructible by acids. A more simple composition, is that proposed by M. Bosse, who directs one ounce of Brazil-wood to be boiled in twelve ounces of water with half an ounce of alum, till the liquid be reduced to eight ounces; when one ounce of calcined manganese is to be mixed with half an ounce of gum-arabic, and added to the liquor, which should be previously decanted, in order to render it perfectly limpid. This preparation is said to possess the property of being indelible by the use of any kind of acid, and to be superior to that proposed by M. Westrum. A durable ink may also be prepared by washing paper, parchment, &c. with the Prussic acid, which will not in the least injure either of these substances. The materials, thus prepared, may be written on with common ink, and a ground of Prussian blue will be formed beneath every stroke, which will remain long after the black has decayed by the influence of the air, or been destroyed by acids. The latest, and perhaps most simple, preparation of black ink, is that contrived by Van Mons, who observed that sulphate of iron, or green vitriol, when calcined till it became white, uniformly afforded a very beautiful black precipitate. According to his experiments, the following ingredients produced an excellent writing ink: four ounces of galls, two ounces and a half of calcined vitriol of iron perfectly white, and two pints of water. The whole was infused in a cold place for twenty-four hours: adding ten drachms of pulverized gum-arabic, and preserving it in a glass-bottle, or glazed earthen vessel, slightly covered with paper.

INK, INDIAN. See **INDIAN INK.**

INK-POWDER is prepared chiefly from the acid salt of galls, which may be obtained by the following process: Take two ounces of pulverized galls, and infuse them in twelve ounces of rain or river-water; expose the whole for a few days to a warm temperature, and stir it occasionally: after having extracted the colouring matter, filter the solution, and suffer it to stand in the open air for several weeks, in a vessel slightly covered. A sediment will then be gradually formed; which, after removing the mouldy skin from the top of the liquor, should be carefully collected. Hot water is next poured on this sediment, when it is again filtered and evaporated to dryness: thus, a grey crystalline salt will be produced, that is, the essential basis of black ink; and which may be still more purified by repeated solution, filtration, and evaporation. If one drachm of this salt of galls be triturated with an equal quantity of the purest vitriol of iron, and about twenty grains of perfectly dry gum-arabic, a composition will be obtained, which, on adding a proportionate quantity of warm water, instantly affords an excellent black ink.

INK, BLUE. One ounce of the finest indigo is first levigated in a glass-mortar; then four ounces of the most concentrated vitriolic acid are very gradually poured on the powder; and, on every addition, it is stirred with a glass-pestle, so that the whole mixture will require several hours. Such precaution is indispensable, as otherwise the heat generated on adding the vitriolic acid, would impair the brightness of the colour. After standing from twelve to eighteen hours, in a moderately warm place, this dense mixture must be diluted with water; not by adding this fluid to the composition, but by introducing small portions of the latter into a vessel containing such a quantity of water as may be requisite to produce a lighter or darker shade. In general from thirty to forty parts of water will be necessary to reduce it to a fine blue liquid. This diluted solution of indigo is, however, in too caustic a state to be employed either as a blue dye, or as writing-ink. Hence the vitriolic acid ought to be divested of its corrosive quality, by means of such a substance as may form a chemical combination with the acid, and not precipitate the indigo. If the solution be intended merely for colouring or writing on paper, it will be sufficient to add pulverized chalk in small portions, till it cease to effervesce; because a large quantity of this powder, at a time, would cause the liquid to rise above the brim of the vessel. It is easy to ascertain the point of saturation; for, when the powder of chalk scattered on the surface no longer produces any bubbles, the solution should be suffered to stand for twenty-four hours, then filtered through blotting paper, and preserved in bot-

tles. If, however, this preparation be designed for dyeing silk, such as stockings, &c. it will be preferable to neutralize the vitriolic acid by the addition of aluminous earth, instead of chalk, as the former renders the colour more durable. And, if the solution is to be used for painting on silk, it ought to be previously mixed with gum-tragacanth.

INK, GREEN. Take a glass-retort containing about one quart; pour into it one pint of distilled vinegar; place it over a sand-heat, and when it begins to boil, introduce into the liquid small portions of powdered verdigrease, till a saturated solution is obtained, or till no more colouring matter can be dissolved. In order to keep the latter suspended, and prevent the formation of crystals, it will be requisite to add about the sixth part of gum-arabic, in proportion to the verdigrease. For preparing the red and yellow ink, see the articles **RED**, and **YELLOW**.

INK, PRINTING, or PRINTERS', differs greatly from every other species. It is an oily matter of the consistence of an ointment, the composition of which is, at present, very imperfectly known, excepting to the few who are employed in its manufacture. The following recipe, however, has been found to make printing ink of a tolerably good quality: Let two quarts of linseed-oil be boiled in a vessel capable of holding a triple quantity, over a strong fire, till it emit a thick smoke. It is then to be kindled with a piece of paper, and suffered to burn for the space of a minute, when the flames must be extinguished, by closing the vessel. As soon as the oil becomes cool, two pounds of black resin, and one pound of hard soap, cut into thin slices, are to be added; the mixture again placed over the fire; and, when the ingredients are perfectly dissolved, a pound of lamp-black, previously sifted, must be incorporated with the mixture; after which the whole is to be finely ground on a marble-stone. This method of making printers'-ink is acknowledged to be preferable to the different recipes hitherto published. It is, however, much inferior in beauty of colour to the ink generally used, and is apt to adhere to the types, so as to make an indistinct impression. Good printers'-ink, which is easily worked, without daubing or tearing the paper, while it imparts a fine colour, is a desideratum that will amply repay the attention and time bestowed upon its preparation. See **PRINTING**.

INK, SYMPATHETIC, a liquid employed for writing on paper, so that it may retain its natural whiteness after the letters are formed, till it is held near the fire, rubbed with another liquor, or some other expedient is used to render the characters legible. Sympathetic inks are prepared from various substances, such as bismuth, lead, &c. Thus, a solution of common sugar of lead in water, if employed with a clean pen, will remain concealed till it is wetted with a solution of the liver of sulphur, or is exposed to the vapours of such liquid; in which case it will assume a deeper or lighter brown shade, in proportion to the strength of the sulphureous gas. By the same process, words written with a solution of bismuth in spirit of nitre, will appear of a deep black colour. Another sympathetic ink may be easily prepared, by diluting oil of vitriol with a sufficient quantity of water, to prevent the paper from being corroded. Letters drawn with this fluid are invisible when dry, but, on being held near the fire, they assume a perfectly black colour. The juices of lemons, or onions; a solution of sal ammoniac, &c. will answer a similar purpose, though their application is more difficult, and they afterwards require a greater degree of heat. On the subject of removing or discharging spots, occasioned by different inks on linen, silk, or woollen cloth, we shall treat under the article **SPOTS**.

INK-STONES, a kind of small round stones of a black, white, red, grey, or yellow, colour, containing a quantity of native martial vitriol, whence they derive the property of making ink, and thence their name. They are almost entirely soluble in water, and besides their other ingredients, contain also a portion of copper and zinc.

INLAND NAVIGATION. See **CANAL**.

INLAND TRADE, that kind of trade carried on between the different parts of the same kingdom, whether over land, or by means of inland navigation.

INMATES, those that be admitted to dwell for their money jointly with another man, though in several rooms of his mansion-house, passing in and out by one door. Inmates, being usually supposed to be poor, and not able to maintain a whole house themselves,

themselves, are inquirable in a court-leet. No owner or occupier of a cottage shall suffer any inmates therein, or more families than one to inhabit there, on pain of forfeiting 10s. per month to the lord of the leet.

INN, a river of Germany in Austria, which runs into the Danube, near Efferding.

INN, a river of Germany, which rises in the country of the Grisons, at the foot of Mount Septimerberg. It runs N. E. through Tirol, by Inspruc, and, continuing its course N. E. through Bavaria, passes by Kufstein, Vasseburg, Brannaw, and other towns, and falls into the Danube between Passau and Instadt.

INNS, houses of entertainment for travellers. They are licensed and regulated by justices of the peace, who oblige the landlord to enter into recognizances for keeping good order. If a person who keeps a common inn, refuses to receive a traveller into his house as a guest, or to find him victuals and lodging on his tendering a reasonable price for them, he is liable to an action of damages, and may be indicted and fined at the king's suit. The rates of all commodities sold by inn-keepers, (says Blackstone,) according to our ancient laws, may be assessed: and inn-keepers not selling their hay, oats, beans, &c. and all manner of victuals at reasonable prices, without taking any thing for litter, may be fined and imprisoned, &c. by 21 Jac. I. c. 21. Where an inn-keeper harbours thieves, persons of infamous character, or suffers any disorders in his house, or sets up a new inn where there is no need of one, to the hindrance of ancient and well-governed inns, he is indictable and fineable: and by statute, such inn may be suppressed. Action upon the case lies against an inn-keeper, if a theft be committed on his guest by a servant of the inn, or any other person not belonging to the guest; though it be otherwise where the guest is not a traveller, but one of the same town or village, for there the inn-keeper is not chargeable; nor is the master of a private tavern answerable for the robbery committed on his guest: it is said that even though the travelling guest does not deliver his goods, &c. into the inn-keeper's possession, yet if they are stolen, he is chargeable. An inn-keeper is not answerable for any thing out of his inn, but only for such as are within it; yet, where he of his own accord puts the guest's horse to grass, and the horse is stolen, he is answerable, he not having his guest's orders for putting such horse to grass. The inn-keeper may justify the stopping of the horse, or other thing of his guest, for his reckoning, and may retain the same till it be paid. Where a person brings his horse to an inn, and leaves him in the stable, the inn-keeper may detain him till such time as the owner pays for his keeping; and if the horse eats out as much as he is worth, after a reasonable appraisement made, he may sell the horse and pay himself; but when a guest brings several horses to an inn, and afterwards takes them all away except one, this horse so left may not be sold for payment of the debt for the others; for every horse is to be sold, only to make satisfaction for what is due for his own meat.

INNS, also signify colleges of municipal or common law: the old English word for houses of noblemen, bishops, and others of extraordinary note, being of the same signification with the French word *hotel*.

INNS OF CHANCERY were probably so called, because anciently inhabited by such clerks as chiefly studied the forming of writs, which regularly belonged to the cursitors, who are officers of chancery. The first of these is Thavies Inn, begun in the reign of Edward III. and since purchased by the society of Lincoln's Inn. Besides this, there are New Inn, Symond's Inn, Clement's Inn, Clifford's Inn, anciently the house of Lord Clifford; Staple Inn, belonging to the merchants of the staple; Lion's Inn, anciently a common inn with the sign of the lion; Furnival's Inn, and Bernard's Inn. These were formerly preparatory colleges for younger students; and many were entered here, before they were admitted into the inns of court. Now they are mostly taken up by attorneys, solicitors, &c. They all belong to some of the inns of court, who formerly used to send yearly some of their barristers to read to them.

INNS OF COURT are so called, because the students there are to serve and attend the courts of judicature; or else, because anciently these colleges received none but the sons of noblemen, and better sort of gentlemen, who were to be qualified to serve

the king in his court; as Fortescue affirms. In his time, he says, there were about 2000 students in the inns of court and chancery, all of whom were filii nobilium, or gentlemen born. But this custom has gradually fallen into disuse; so that in the reign of Queen Elizabeth, Sir Edward Coke does not reckon above 1000 students, and the number at present is considerably less; for which judge Blackstone assigns the following reasons: 1. Because the Inns of Chancery, being now almost totally filled by the inferior branches of the profession, are neither commodious nor proper for the resort of gentlemen of any rank or figure; so that there are very rarely any young students entered at the inns of chancery. 2. Because in the inns of court all sorts of regimen and academical superintendence, either with regard to morals or studies, are found impracticable, and therefore entirely neglected. 3. Because persons of birth and fortune, after having finished their usual courses at the universities, have seldom leisure or resolution sufficient to enter upon a new scheme of study at a new place of instruction; wherefore few gentlemen now resort to the inns of court, but such for whom the knowledge of practice is absolutely necessary in such as are intended for the profession. These inns of court, justly famed for the production of men of learning in the law, are governed by masters, principals, benchers, stewards, and other officers; and have public halls for exercises, readings, &c. which the students are obliged to attend and perform for a certain number of years, before they can be admitted to plead at the bar. These societies have not, however, any judicial authority over their members; but instead of this they have certain orders among themselves, which have by consent the force of laws. For lighter offences persons are only excommunicated, or put out of commons; for greater, they lose their chambers, and are expelled the college; and when once expelled out of one society, they are never received by any of the others. The gentlemen in these societies may be divided into benchers, outer barristers, inner barristers, and students. The four principal inns of court, are the Inner Temple and Middle Temple, heretofore the dwelling of the Knights Templars, purchased by some professors of the common law about 300 years ago; Lincoln's Inn, and Gray's Inn, anciently belonging to the earls of Lincoln and Gray. The other inns are the two Serjeants Inns.

INNATE IDEAS, those supposed to be stamped on the mind, from the first moment of its existence, and which it constantly brings into the world with it; a doctrine which Mr. Locke has completely refuted.

INNISFALLEN, an island of Ireland, in the lake of Killarney, county of Kerry, and province of Munster: in which are the ruins of a very ancient religious house, founded by St. Finian, the patron-saint of these parts, to whom the cathedral of Aghadoe is also dedicated.

INNISKILLING, a town of Ireland, in the county of Fermanagh, Ulster, lying between three lakes, 24 miles E. of Ballyshannon, and 79 N.W. of Dublin.

INNOCENT, a name assumed by thirteen popes of Rome, none of whom merited it.

INNOCENTS'-DAY, a festival of the Christian church, observed on December 28, in memory of the massacre of the innocent children by the command of Herod.

INNOMINATA OSSA, in anatomy, three bones, which compose the extreme part of the trunk of a human body. See **ANATOMY**.

INUENDO, [*innucenda*, from *inuo*, Lat.] an oblique hint. The term is used in writs, declarations, and pleadings, to ascertain a person or thing which was named, but left doubtful, before; as, he (*innucendo* the plaintiff) did so and so; mention being before made of another person.

INO, in fabulous history, a daughter of Cadmus and Harmonia, who nursed Bacchus.

INOA, festivals in memory of Ino, celebrated yearly with sports and sacrifices at Coriuth, at Megara, (where she was first worshipped,) and in Laconia.

INOCARPUS, in botany, a genus of the monogynia order, and decandria class of plants. Corolla funnel-shaped; calyx bi-lobed; stamina placed in a double series; fruit a monospermous plum. It has but one species.

INOCULATION, or **BUDDING**, in horticulture, an operation performed on apricots, nectarines, plums, cherries, or other

stone fruit-trees, and also upon oranges and jasmines. It is reputed to be superior to every other species of grafting, and is effected in the following manner: A sharp knife, with a flat handle, must be first procured, in order to raise the bark of the stock for the insertion of the bud. Next, some strong bass should be soaked in water, in order to increase its strength, and to render it more pliable. The cuttings being then separated from the trees that are to be propagated, a smooth part of the stock must be selected, about five or six inches above the surface of the soil, if intended for dwarfs; but if designed for standards, they should be budded at least five feet above the ground. An horizontal incision is now to be made across the bark of the stock, from the middle of which a perpendicular slit should be drawn, about two inches in length. The leaf is next cut off the bud, the foot-stalk remaining entire; and a cross-cut is made about an inch beneath the eye, after which the bud is to be cut off, with part of the wood adhering to it. The bark of the stock is then to be gently raised with the handle of the knife, and the bud inserted exactly between the rind and the wood of the stock; after which they are bound closely with the bass, care being taken to leave the eye of the bud open. In the course of three weeks, or a month, after the inoculation is performed, those buds which have a fresh and flourishing appearance will be joined, when the bandage ought to be removed. In the succeeding month of March, the stock must be cut off in a sloping direction, about three inches above the bud: the shoot proceeding from it should now be fastened to the remainder of the stock for one year, after which the latter ought to be removed by the knife, immediately above the bud. The proper season for this operation, is from the middle of June to that of August. The fruit-tree first inoculated, is generally the apricot, and at length the orange-tree, which, however, ought not to be budded till the end of August. For this purpose, cloudy and moist weather is the most propitious; for, if the inoculation be attempted in the middle of the day, the shoots will perspire so rapidly as to leave the buds destitute of moisture.

INOCULATION, in medicine, is the transferring of distempers from one subject to another, particularly of the small, and cow-pox. The practice of inoculation is of great antiquity in the East, whence it was introduced into Britain, early in the 18th century; though not without many struggles, and violent opposition, under the frivolous pretext, that it was contrary to the principles of Christianity, and usurping the sacred prerogatives of the Creator. On account of its superior utility, however, it has at length triumphed, and is now almost generally adopted. The curious reader, who is desirous to become acquainted with these objections, will find them stated, together with a defence of inoculation, in Dr. Lettson's Medical Memoirs. Various methods have been adopted, for the artificial communication of the small-pox; the most effectual of which appears to be that of making a puncture in the skin, or removing the epidermis of the upper arm with the point of a lancet, dipped with variolous matter. See **MEDICINE**, **SMALL-POX**, and **VACCINATION**.

INORDINATE PROPORTION, is where there are three magnitudes in one rank, and three others proportional to them in another, and you compare them in a different order. Thus suppose the numbers in one rank to be 2, 3, 9; and those of the other rank 8, 24, 36; which are compared in a different order, viz. 2 : 3 :: 24 : 36; and 3 : 9 :: 8 : 24. Then rejecting the mean terms of each rank, you conclude 2 : 9 :: 8 : 36.

INOSULATION, in anatomy, the same with anastomosis. See **ANASTOMOSIS**.

INOWSLADISLOW, a strong town of Poland, capital of Cujavia, 39 miles N. E. of Gnesna, and 90 W. of Warsaw.

INQUEST, in law, signifies an inquiry made by a jury, in a civil or criminal cause, by examining witnesses. See **CORONER**, and **JURY**.

INQUIRENDO, in law, an authority given to one or more persons, to inquire into something for the advantage of the king.

INQUISITION, [*inquisitio*, Lat.] in the church of Rome, a tribunal in several Roman Catholic countries, erected by the popes for the examination and punishment of heretics. This court was founded in the 13th century by father Dominic and his followers, who were sent by Pope Innocent III. with orders to execute the Catholic princes and people to extirpate heretics, to

search into their number and quality, and to transmit a faithful account thereof to Rome. Hence they were called inquisitors; and this gave birth to the formidable tribunal of the inquisition, which was received in all Italy and the dominions of Spain, except Naples and the Low Countries. This diabolical tribunal takes cognizance of heresy, Judaism, Mohammedanism, sodomy, and polygamy; and the people stand in so much fear of it, that parents deliver up their children, husbands their wives, and masters their servants, to its officers, without daring to murmur. The prisoners are kept for a long time, till they themselves turn their own accusers, and declare the cause of their imprisonment; for they are neither told their crime, nor confronted with witnesses. As soon as they are imprisoned, their friends go into mourning, and speak of them as dead, not daring to solicit their pardon, lest they should be brought in as accomplices. When there is no shadow of proof against the pretended criminal, he is discharged after suffering the most cruel tortures, a tedious and dreadful imprisonment, and the loss of the greatest part of his effects. The sentence against the prisoners is pronounced publicly, and with extraordinary solemnity. In Portugal, they erect a theatre capable of holding 3000 persons; in which they place a rich altar, and raise seats in each side in the form of an amphitheatre. There the prisoners are placed; and over against them is a high chair, whither they are called, one by one, to hear their doom, from one of the inquisitors. These unhappy people know what they are to suffer by the clothes they wear that day. Those who appear in their own clothes are discharged upon payment of a fine: those who have a *santo benito*, or straight yellow coat without sleeves, charged with St. Andrew's cross, have their lives, but forfeit all their effects; those who have the resemblance of flames, made of red serge, sewed upon their *santo benito*, without any cross, are pardoned, but threatened to be burnt if ever they relapse: but those who, besides these flames, have on their *santo benito* their own pictures, surrounded with figures of devils, are condemned to expire in the flames. The inquisitors, who are ecclesiastics, do not pronounce the sentence of death; but form and read an act, in which they say, that the criminal being convicted of such a crime, by his own confession, is with much reluctance delivered to the secular power to be punished according to his demerits: and this writing they give to the seven judges who attend at the right side of the altar, who immediately pass sentence.

INQUISITION, in law, a manner of proceeding by way of search or examination used on the king's behalf, in cases of out-lawry, treason, felony, self murder, &c. to discover lands, goods, and the like, forfeited to the crown. Inquisition is also had upon extents of lands, tenements, &c. writs of elegit, and where judgement being had by default, damages and costs are recovered.

INQUISITORS, in law, persons who have power by their office to make inquiry in certain cases; as sheriffs, and coroners on view of the body, &c.

INROLLMENT, in law, the registering, recording, or entering in the rolls of the Chancery, King's Bench, Common Pleas, or Exchequer, or by the clerk of the peace in the records of the quarter-sessions, of any lawful act; a statute or recognizance acknowledged, a deed of bargain and sale of lands, and the like. But the inrolling of a deed does not make it a record, though it thereby becomes a deed recorded; for there is a difference between a matter of record and a thing recorded to be kept in memory; a record being the entry in parchment of judicial matters controverted in a court of record, and whereof the court takes notice, whereas an inrollment of a deed is a private act of the parties concerned, of which the court takes no cognizance at the time of doing it, although the court permits it.

INSCRIBED, in geometry. A figure is said to be inscribed in another, when all its angles touch the side or planes of the other figure.

INSCRIPTION, [*inscriptio*, Lat.] in law, an obligation made in writing, whereby the accuser binds himself to undergo the same punishment, if he shall not prove the crime which he objects to the party accused, in his accusatory libel, as the defendant himself ought to suffer if the same be proved.

INSCRIPTION is also a title or writing affixed to any thing to give some farther knowledge of it, or to transmit some important truth to posterity. Antiquaries are very curious in examining ancient inscriptions found on stones and other monuments of antiquity.

tiquity. Sanchoniathon, contemporary, as it is said, with Gideon, drew most of the memoirs whereof his history is composed, from inscriptions which he found in the temples and on columns, both among the Heathens and the Hebrews. It appears that the ancients engraved upon pillars the principles of sciences, as well as the history of the world. Those mentioned by Herodotus shew, that this was the first way of instructing people, and of transmitting histories and sciences to posterity. This is confirmed by Plato in his *Hippias*; wherein he says, that Pisistratus engraved on stone-pillars precepts useful for husbandmen. Pliny assures us, that the first public monuments were made of plates of lead; and that the treaties of confederacy concluded between the Romans and the Jews were written upon plates of brass; that (says he) the Jews might have something to put them in mind of the peace and confederacy concluded with the Romans. The Greeks and Romans were great dealers in inscriptions, and were extremely fond of being mentioned in them: and hence we find so many in those countries of ancient learning, that large volumes have been composed on them; as the collection of Gruter, &c. Since Gruter's collection, Th. Reinesius has compiled another huge volume of inscriptions. M. Fabretti published another volume at Rome in 1699, wherein he has corrected abundance of errors which had escaped Gruter, Reinesius, and other antiquaries, &c. and added a great number of inscriptions omitted by them. Since all these, Grævius has published a complete collection of inscriptions, in three volumes, folio.

INSECTA, or **INSECTS**, in natural history, are small animals, commonly supposed to be exsanguinous; and distinguished by certain incisions, or indentings in their bodies, whence the name. See **ENTOMOLOGY**, and **ZOOLOGY**. A kind of bellows has been invented by Mr. Green, of her Majesty's flower-garden, Kew, for the purpose of destroying the red spider, and other noxious insects in hot-houses and pineries, with the fumes of burning tobacco. The same noxious vermin may likewise be exterminated by burning (when the hot-house is shut,) matches moistened with a spirituous tincture of assaefetida, and rolled in a powder consisting of equal parts of sulphur and Scotch snuff. It will also be of service to wash the frames of hot-houses, &c. with four ounces of sublimate, dissolved in two gallons of water; but this operation should be performed with the utmost caution, on account of the corrosive properties of the mercury. In the *Annales de Chimie*, M. Tatin gives an account of a compound which he has successfully used for exterminating insects. He directs one pound and three quarters of the best black soap; a similar quantity of flowers of sulphur; two pounds of any kind of mushrooms; and fifteen gallons of rain or river-water, to be employed. The fluid is to be divided into two equal parts, one of which is put into a barrel, together with the soap and mushrooms, after the latter have been somewhat bruised. The other half is to be boiled in a kettle with the sulphur inclosed in a bag, and fixed to the bottom of the vessel, by means of a stone or other weight. These ingredients are to be boiled twenty minutes, during which the sulphur should be well agitated with a stick, that the water may be the better impregnated. When the liquid is taken from the fire, it is to be poured into the barrel, and stirred daily, till the mixture become in a high degree fetid: for, the older and stronger the composition is, the more speedy and powerful will be its effects. The liquor is to be sprinkled on the plants infested with insects: great numbers of which it destroys on the first application; it will, however, be necessary to repeat the aspersion, in order to exterminate ants, or other vermin that breed beneath the soil: and, for this purpose, from two to eight pints are required, according to the depth and extent of their nests. Although insects are very injurious to vegetation, yet Dr. Darwin is of opinion that they may be rendered extensively useful as a manure. Hence, in the summer-months, he recommends heaps of dung to be supplied with water, for promoting the propagation, and nourishment of myriads of vermin; which, when suffered to decay on the soil, would greatly contribute to its fertility. The catching and preservation of insects, for the collections of naturalists, is indeed a necessary practice, though it has at all times been branded with cruelty. Hence, in stating the most proper methods of effecting this purpose, we shall likewise point out the easiest expedients to deprive them of life. Beetles, and other insects of the same class, may be caught either with a gauze-net, or with a pair

of pincers covered with gauze. As soon as they are secured, if will be adviseable to immerse them either in hot water, or in spirits of wine, where they will be instantaneously killed: next, they may be fixed to a piece of cork, in a creeping direction, and exposed to the air till all their moisture be evaporated. Bugs, crickets, and other insects of the hemipterous class, may be put to death in the manner just mentioned, or by pouring a drop of ethereal oil of turpentine on their heads. Moths, butterflies, and all other flies which are furnished with membranous wings, may be taken with gauze-nets; then pierced through the shoulders between the fore-wings, with a pin; and, after gently squeezing the breast of the insect, it will immediately perish. Lobsters, scorpions, or such vermin as have no wings, may be preserved in spirits; and the various other kinds of insects may either be killed with oil of turpentine, or the fumes of sulphur. After the insects are deprived of all moisture, they should be placed in the boxes or cabinets where they are to remain; these should be kept very dry, and closely shut, to prevent the depredations of small vermin. The bottoms ought likewise to be covered with pitch and paper on the surface; or, they may be preferably lined with cork, which should previously be impregnated with corrosive sublimate, in a strong solution of sal ammoniac.

INSECTOLOGY, [from *insectum*, Lat. and *λογος*, a discourse,] the science of entomology: a treatise on insects. See **ENTOMOLOGY**.

INSERTION, in anatomy, the close conjunction of the vessels, tendons, fibres, and membranes, of the body with some other parts.

INSINUATION OF A WILL, among civilians, is the first production of it, or the leaving it with the register, in order to its probate. See **WILL**.

INSOLATION, in chemistry, a term sometimes made use of to denote that exposure to the sun, which is made in order to promote the chemical action of one substance upon another: one of the most striking experiments of this kind is that of the exposure of vegetables, as fresh-gathered cabbage-leaves, in a glass-jar of water, to the rays of the sun, by the action of which a large quantity of pure oxygen gas is obtained.

INSOLUBILITY, in chemistry, the property of not dissolving in a fluid. If substances in their liquid state be made to act on each other, their action will meet with little foreign resistance, and will be, in a great measure, proportioned to their affinity and quantity; but if one of them be solid, and be farther insoluble in the fluid, which is the medium of action, it will present but few points of contact, and its energy will be very small.

INSPECTION, **TRIAL BY**, or **BY EXAMINATION**, is when, for the greater expedition of a cause, in some point or issue, being either the principal question, or arising collaterally out of it, but being evidently the object of sense, the judges of the court, upon the testimony of their own senses, shall decide the point in dispute. For, where the affirmative or negative of a question is matter of such obvious determination, it is not thought necessary to summon a jury to decide it; who are properly called in to inform the conscience of the court of dubious facts: and therefore, when the fact, from its nature, must be evident to the court, either from ocular demonstration or other irrefragable proof, there the law departs from its usual resort, the verdict of twelve men, and relies on the judgement of the court alone. As in case of a suit to reverse a fine for non-age of the cognizor, or to set aside a statute or recognition entered into by an infant; here, and in other cases of the like sort, a writ shall issue to the sheriff, commanding him that he constrain the said party to appear, that it may be ascertained by the view of his body by the king's justices, whether he be of full age or not: *Ut per aspectum corporis sui constare poterit justiciariis nostris, si predictus an sit plenæ ætatis necne*. If, however, the court has, upon inspection, any doubt of the age of the party (as may frequently be the case,) it may proceed to take proofs of the part; and particularly may examine the infant himself upon an oath of *voir dire*, *veritatem dicere*; that is, to make true answers to such questions as the court shall demand of him: or the court may examine his mother, his god-father, or the like.

INSPECTOR, [Heb. *חזן*, *huzen*,] in the Jewish synagogue, an officer whose business consists particularly in inspecting the prayers and lessons, in preparing and shewing them to the reader,

and standing by him to see he reads right; and if he mistakes, to correct him.

INSPECTORS, in the Roman law, were such persons as examined the quality and value of lands and effects, in order to the adjusting or proportioning taxes and impositions to every man's estate.

INSPIRATION, among divines, implies the conveying of certain extraordinary and supernatural notices or motions into the soul, or any supernatural influence of God upon the mind of a rational creature, whereby he is directed and incited to act according to the mind of God. Thus the prophets spoke by divine inspiration. Some authors reduce the inspiration of the sacred writers to a particular care of Providence, which prevented any thing they had said from failing or coming to nought; maintaining, that they never were really inspired either with knowledge or expression. According to M. Simon, inspiration is no more than a direction of the Holy Spirit, which never permitted the sacred writers to be mistaken. Theological writers have enumerated several kinds of inspiration: such as, 1. Inspiration of superintendency, in which God so influences and directs the mind of any person, as to keep him more secure from error in some various and complex discourse, than he would have been merely by the use of his natural faculties; 2. Plenary superintendent inspiration, which excludes any mixture of error at all from the performance so superintended; 3. Inspiration of elevation, where the faculties act in a regular, and, as it seems, in a common manner, yet are raised to an extraordinary degree, so that the composure shall, upon the whole, have more of the true sublime or pathetic, than natural genius could have given; and, 4. Inspiration of suggestion, when the use of the faculties is superseded, and God speaks directly to the mind, making such discoveries to it as it could not otherwise have obtained, and dictating the very words in which such discoveries are to be communicated, if they are designed as a message to others. It is generally allowed that the New Testament was written by a superintendent inspiration; for without this the discourses and doctrines of Christ could not have been faithfully recorded by the evangelists and apostles; nor could they have assumed the authority of speaking the words of Christ, and evinced this authority by the actual exercise of miraculous powers. Besides, the sacred writings bear many obvious internal marks of their divine original, in the excellence of their doctrines, the spirituality and elevation of their design, the majesty and simplicity of their style, the agreement of their various parts, and their efficacy on mankind. In discoursing upon the argument concerning the inspiration of the scripture, the learned Du Pin alleges the testimony of the Jews, the authority of our Saviour and his apostles, and the universal consent of the Christian church. 1. It cannot be in the least doubted, but that the ancient Jews were thoroughly persuaded that the books in their canon were written by prophets divinely inspired: they looked upon the law of Moses as the law of God himself, and on the pentateuch as the foundation of their religion: they had even the evidence of their senses, that Moses was sent by God, that he conversed familiarly with him, and was assisted by him in an extraordinary manner; witness the many miracles which God wrought by him, and his divine providence and protection being vouchsafed to him in an unusual manner; so that, upon the whole, they had all imaginable evidence that the laws and historical narrations of Moses were all of them penned by inspiration from heaven. As to the other canonical books collected by Ezra, it cannot be questioned, with any colour of reason, but that Ezra, in drawing up his canon and sacred books, made choice of those which had the character of divinely inspired writings, and had been always acknowledged as such by the universal consent of the Jewish nation; and the synagogue looked upon this canonical system as prophetic and divinely inspired. See **CANON**, and **BIBLE**. 2. From the unexceptionable testimony of the Jews, M. Du Pin proceeds to alledge the authority of our Saviour and his apostles. It is upon the evidence of these books that our Saviour proves himself to be the Messiah, and by them that he confutes the Jews. The apostles followed their master's doctrine in this as well as in all other things: these books they made use of to authorise the gospel they preached, and to prove that the prophecies concerning the Messiah were fulfilled in the person of Jesus Christ. 3. From these authorities he proceeds to the testimony of the primitive church:

those who were instructed by our Saviour and his apostles had not only the same regard for the books of the Old Testament as the Jews themselves had, but likewise by universal consent received the gospels and epistles of the apostles as writings penned by the inspiration of the Holy Ghost. The primitive Christians being fully persuaded of this truth, received the apostles' doctrine with intire submission, and looked upon it as no other than the instruction of Jesus Christ and of God himself. See **CHRISTIAN RELIGION**.

INSPIRATION, among the Heathen. The priests and priestesses were said to be divinely inspired when they gave oracles. The poets also laid claim to it; and therefore always invoked Apollo and the Muses, at the beginning of any great work.

INSPIRATION, in physis, is that action of the breast, by which the air is admitted within the lungs; in which sense inspiration is a branch of respiration, and stands opposed to expiration. This admission of the air depends immediately on its spring or elasticity, at the time when the cavity of the breast is enlarged by the elevation of the thorax and abdomen, particularly by the motion of the diaphragm downwards; so that the air does not enter the lungs, because they are dilated; but these dilate, because the air enters within them. Nor is it the dilatation of the breast which draws in the air, as is commonly thought, though this is a condition absolutely necessary to inspiration; but an actual intrusion of the air into the lungs. See **RESPIRATION**.

INSBRUCK, or **YNNSEBRUGG**, a city of Germany, in the circle of Austria, and capital of the county of Tirol, so named from the Inn which runs by it. Insbruck is 27 miles N.W. of Brixen. Lon. 11. 27. E. Lat. 47. 13. N.

INSTALMENT, derived from the Latin *in*, and *stallum*, a term used for a seat in the church, in the choir, or a seat or bench in a court of justice, &c. Vossius is of opinion the word is of German origin. It is chiefly used for the induction of a dean, prebendary, or other ecclesiastical dignitary, into the possession of his stall, or proper seat, in the cathedral church to which he belongs: sometimes also called installation. It is likewise used for the ceremony, whereby the knights of the garter are placed in their rank, in the chapel of St. George at Windsor.

INSTAURATION is by some derived from the old Latin, *instaurum*, which signified the stock of things necessary for the tilling and managing of grounds; as cattle, tools, harness, &c. But the word *instaurum* is only of the middle age: *instauratio* is of much greater antiquity, and by some derived from *instar*, like; as importing a thing being brought to its former likeness, or appearance. See **RESTAURATION**.

INSTEP, in the manege, is that part of a horse's hind-legs, which reaches from the ham to the pastern-joint.

INSTINCT, a certain power or disposition of mind, by which, independent of all instruction or experience, without deliberation, and without having any end in view, animals are unerringly directed to do spontaneously whatever is necessary for the preservation of the individual, or the continuation of the kind. "Instinct," says the late Lord Monboddo, in his *Ancient Metaphysics*, "is a determination given by Almighty Wisdom to the mind of the brute, to act in such or such a way, upon such or such an occasion, without intelligence, without knowledge of good or ill, and without knowing for what end or purpose he acts." Such in the human species is the instinct of sucking exerted immediately after birth; and such in the inferior creation is the instinct by which insects invariably deposit their eggs in situations most favourable for hatching and affording nourishment to their future progeny. These operations are necessary for the preservation of the individual, and the continuation of the kind; but neither the infant nor the insect knows that they are necessary: they both act without having any end in view, and act uniformly without instruction, and without experience. "Instinct," says Mr. Smellie, in his *Philosophy of Natural History*, "should be limited to such actions as every individual of a species exerts without the aid either of experience or imitation." This is a very just distinction, though it would be no easy task to reconcile it with the theory and principles advanced by the same author in that work. The Rev. Dr. Gleig's remark on this subject (*Encyclopedia Britannica*, article *instinct*), is equally just, "that no faculty, which is capable of improvement, by observation and experience, can in propriety of speech be termed instinct. Instinct being a positive determination, given to the

the minds of animals by the author of nature for certain purposes, must necessarily be perfect, when viewed in connection with those purposes; and, therefore, to talk as Mr. Smellie does, of the improvement of instinct, is to perplex the understanding by a perversion of language." The doctor observes elsewhere with equal justice, "that no action, whether of man or brute, which is deliberately performed with a view to consequences, can with any propriety be said to proceed from instinct; for such actions are the effect of reason influenced by motives. Deliberation and instinct are obviously incompatible. To say (with Mr. Smellie), "that when we are stimulated by a particular instinct, instead of instantly obeying the impulse, another instinct arises in opposition, creates hesitation, and often totally extinguishes the original motive to action," is either to affirm what is apparently not true, or it is a gross perversion of language. Motives opposed to each other may create hesitation, and a powerful motive may counterbalance a feeble instinct; but of two or more instincts operating at the same time, and opposing each other, we have no conception. Instinct, if we choose to speak a language that is intelligible, means a certain impulse under the direction of *Suprême Wisdom*; and it is very little probable that such wisdom should give opposite impulses at the same instant. In the natural works of animals, which are confessedly under the influence of instinct, we perceive no symptoms of deliberation; but every one, when not interrupted by external violence, proceeds without hesitation in the direct road, to the end of which the animal itself knows nothing. The same would be the case with man, were he under the guidance of instinct: and it is vain to say that the instinct of fear is daily counteracted by ambition and resentment, till it be proved that fear, ambition, and resentment, are really instincts." Many systems have been adopted to explain the principles which produce and direct the spontaneous actions of brutes. Some of the ancient philosophers ascribed to brutes an understanding differing only in degree from that of man, and attributed their inferiority to the want of proper bodily organs. This system has been strenuously supported by M. Helvétius, *De l'Esprit*, tom. i. p. 2, &c. Cudworth endeavoured to explain the instinct of animals by a certain plastic nature. Des Cartes thought that all the actions of brutes might be explained by the simple laws of mechanism, and considered them as machines totally devoid of life and sentiment, but so curiously constructed by the Creator, that the mere impressions of light, sound, and other external agents on their organs, produced a series of motions in them, and caused them to execute those various operations, which had before been ascribed to an internal principle of life and spontaneity. But the actions and manners of brutes, which are totally incompatible with the mere principles of mechanism, evince the absurdity of this opinion. M. Buffon adopts the opinion of Des Cartes in part, but allows them life, and the faculty of distinguishing between pleasure and pain, together with a strong inclination to the former, and aversion from the latter. By these inclinations and aversions he undertakes to account for all, even the most striking operations of animals. The pre-established harmony of Leibnitz has also been applied to explain the actions of brutes. Others have considered the actions of animals as produced by the constant and immediate influence of the divine energy, directing all their inclinations and motions: such appears to have been the opinion of Mr. Addison, in the second volume of the *Spectator*. The late ingenious Hermann Samuel Reimar, professor of philosophy at Hamburg, has enumerated and exposed these and other opinions, with regard to the instinct of animals, in his *Observations Physiques*, &c. published in two volumes, 12mo. at Amsterdam and Paris, 1770; and, defining instinct, in the most comprehensive sense of the word, to be every natural inclination, accompanied with a power, in animals, to perform certain actions, divides instincts into three heads. The first, which he calls mechanical instincts, belong to the body, considered as an organized substance, and are exercised blindly and independently of the will of the animal. Such are those which produce the motion of the heart and lungs, the contraction and dilatation of the pupil, digestion, &c. The second class comprehends those which he terms representative instincts, which consist partly in the power of perceiving external objects by their impression on the senses, and partly on the faculty of rendering the ideas of these objects present to the mind by the powers of imagination, or of memory, in a lax sense of the word. The third and principal class

comprehends all those which M. Reimar called spontaneous. This species is not attended with any power of reflection, determining the animal to decide freely between two different modes of action present to his imagination; nor is it merely corporeal or mechanical. It is put into action by the natural principle of self-love, or by a love of pleasure and aversion to pain, producing a voluntary inclination in animals, to perform certain actions which tend to their well-being and preservation. To the performance of these actions, they are particularly prompted by their sensations, &c. For a farther account of M. Reimar's System, we refer to his work, or the abstract of it, in the *Monthly Review*, vol. xiv. p. 533. Concerning human instincts, philosophers differ widely in opinion; some maintaining that man is endowed with a greater number of instincts than any species of brutes; whilst others deny that in human nature there is any power or propensity at all which can properly be called instinctive. "This diversity of opinion," says the Rev. Dr. Gleig, "may easily be traced to its source. There are not many original thinkers. The greater part of even those who are called philosophers, implicitly adopt the opinions of certain masters whose authority they deem sufficient to supply the place of argument; and having chosen their respective guides, each maintains with zeal what his master taught, or is supposed to have taught. When Locke so successfully attacked the doctrine of innate ideas and innate principles of speculative truth, he was thought by many to have overturned at the same time all innate principles whatever; to have divested the human mind of every passion, affection, and instinct; and to have left it in nothing but the powers of sensation, memory, and intellect. Such, we are persuaded, was not his intention; nor is there any thing in his immortal work, which, when interpreted with candour, appears to have such a tendency. Great part of his *Essay on Human Understanding* has been very generally misunderstood. Much of its merit, however, was soon discovered; and mankind, finding philosophy disencumbered of the barbarous jargon of the schools, and built upon a few self-evident principles, implicitly embraced every opinion advanced, or which they supposed to be advanced, by that illustrious author; especially if that opinion was contrary to any part of the scholastic system, which had so long been employed to perplex the understanding and to veil absurdity. Hence arose many philosophers of eminence, both at home and abroad, who maintained, as they imagined, upon the principles of Locke, that in the human mind there are no instincts, but that every thing which had been usually called by that name is resolved into association and habit. This doctrine was attacked by Lord Shaftesbury, who introduced into the theory of mind, as faculties derived from nature, a sense of beauty, a sense of honour, and a sense of ridicule; and these he considered as the tests of speculative truth and moral rectitude. His lordship's principles were in part adopted by Mr. Hutchinson of Glasgow, who published a system of moral philosophy, founded upon a sense of instinct, to which he gave the name of the moral sense: and the undoubted merit of his work procured him many followers. It being now discovered, or at least supposed, that the human mind is endowed with instinctive principles of action, a sect of philosophers soon arose, who maintained with much vehemence that it is likewise endowed with instinctive principles of belief; and who built a system of metaphysics; if such it may be called, upon a number of innate, distinct, and independent senses. The rise of this sect is well known. Berkeley and Hume had adopted Locke's doctrine respecting the origin of our ideas; and had thence deduced consequences supposed to be dangerous in themselves, but which, it was thought, could not be denied without refusing the principles from which they were inferred. The foundation of the instinctive system being thus laid, the system itself was rapidly carried to a height far beyond what seems to have been the intention of its excellent author; and reason was well nigh banished from the regions of philosophy. For such a proceeding it is not difficult to assign the cause. The instinctive scheme requires much less labour of investigation than the system of Locke and the ancients: for upon the principles of it, when carried to its utmost extent, every phenomenon in human nature is thought to be sufficiently accounted for, by supposing it the effect of a particular instinct implanted in the mind for that very purpose. Hence in some popular works of philosophy we have a detail of so many distinct internal senses, that it requires no small strength of memory to retain

tain their very names; besides the moral sense, we have the sense of beauty, the sense of deformity, the sense of honour, the hoarding sense, and many others which it is needless here to mention. Dr. Gleig proceeds to inquire, "Whether or not there be instinctive principles in man?" "But (adds he) in order to proceed upon sure grounds, it will be proper to consider, first, such actions of the inferior animals as are generally allowed to be instinctive: for an attempt has been lately made to prove, that even these actions are the offspring of reason influenced by motives; and that instinct, as above defined, is a mere imaginary principle, which has no existence either in man or brute. Caterpillars, it is said, when shaken off a tree in every direction, instantly turn round towards the trunk and climb up, though they had never formerly been on the surface of the ground. This is a striking instance of instinct. On the tree, and not upon the ground, the caterpillar finds its food. If, therefore, it did not turn and climb up the trunk, it would inevitably perish; but surely the caterpillar knows not that such an exertion is necessary to its preservation; and, therefore, it acts not from motives, but from blind impulse. The bee and the beaver are endowed with an instinct which has the appearance of foresight. They build magazines, and fill them with provisions; but the foresight is not theirs. Neither bees nor beavers know any thing of futurity. The solitary wasp digs holes in the sand, in each of which she deposits an egg. Though she certainly knows not that an animal is to proceed from that egg, and still less if possible that this animal must be nourished with other animals, she collects a few small green worms, which she rolls up in a circular form, and fixes in the hole in such a manner that they cannot move. When the wasp-worm is hatched, it is amply stored with the food destined for its support. The green worms are devoured in succession; and the number deposited is exactly proportioned to the time necessary for the growth and transformation of the wasp-worm into a fly; when it issues from the hole, and is capable of procuring its own nourishment. This instinct of the parent wasp is the more remarkable, that she feeds not upon flesh herself. Birds of the same species, unless restrained, uniformly build their nests of the same materials, and in the same form and situation, though they inhabit very different climates; and the form and situation are always suited to their nature, and calculated to afford them shelter and protection. When danger, or any other circumstance peculiar to certain countries, renders a deviation from the common form or situation of nests necessary, that deviation is made in an equal degree, and in the very same manner, by all the birds of one species; and it is never found to extend beyond the limits of the country where alone it can serve any good purpose. When removed by necessity from their eggs, birds return to them with haste and anxiety, and shift them so as to heat them equally; and it is worthy of observation, that their haste to return is always in proportion to the cold of the climate. But do birds reason, and all of the same species reason equally well, upon the nature and extent of danger, and upon the means by which it can be best avoided? Have birds any notion of equality, or do they know that heat is necessary for incubation? No in all these operations men recognize the intentions of nature; but they are hid from the animals themselves, and therefore cannot operate upon them as motives. Of the instinct of animals we shall give one instance more in the elegant and perspicuous language of Dr. Reid. "Every manufacturing art among men (says that able writer) was invented by some man, improved by others, and brought to perfection by time and experience. Men learn to work in it by long practice, which produces a habit. The arts of men vary in every age, and in every nation, and are found only in those men who have been taught them. The manufactures of animals differ from those of men in many striking particulars. No animal of the species can claim the invention; no animal ever introduced any new improvement, or any variation from the former practice; every one of the species has equal skill from the beginning, without teaching, without experience, and without habit; every one has its art by a kind of inspiration. I do not mean that it is inspired with the principles or rules of the art, but with the ability of working in it to perfection, without any knowledge of its principles, rules, or end. The work of every animal is indeed like the works of nature, perfect in its kind, and can bear the most critical examination of the mechanic or the mathematician,

of which a honey-comb is a striking instance. Bees, it is well known, construct their combs with small cells on both sides, fit both for holding their store of honey, and for rearing their young. There are only three possible figures of the cells, which can make them all equal and similar, without any useless interstices. These are the equilateral triangle, the square, and the regular hexagon. Of the three, the hexagon is the most proper, both for convenience and strength. Bees, as if they knew this, make their cells regular hexagons. As the combs have cells on both sides, the cells may either be exactly opposite, having partition against partition, or the bottom of a cell may rest upon the partitions between the cells on the other side, which will serve as a buttress to strengthen it. The last way is the best for strength; accordingly the bottom of each cell rests against the point where three partitions meet on the other side, which gives it all the strength possible. The bottom of a cell may either be one plane, perpendicular to the side-partitions; or it may be composed of several planes, meeting in a solid angle in the middle-point. It is only in one of these two ways that all the cells can be similar without losing room. And for the same intention, the planes, of which the bottom is composed, if there be more than one, must be three in number, and neither more nor fewer. It has been demonstrated, that by making the bottoms of the cells to consist of three planes meeting in a point, there is a saving of material and labour no way inconsiderable. The bees, as if acquainted with these principles of solid geometry, follow them most accurately; the bottom of each cell being composed of three planes, which make obtuse angles with the side-partitions, and with one another, and meet in a point in the middle of the bottom; the three angles of this bottom being supported by three partitions on the other side of the comb, and the point of it by the common intersection of these three partitions. One instance more of the mathematical skill displayed in the structure of a honey-comb deserves to be mentioned. It is a curious mathematical problem, at what precise angle the three planes which compose the bottom of a cell ought to meet, in order to make the greatest possible saving of material and labour. This is one of those problems belonging to the higher parts of mathematics, which are called problems of maxima and minima. The celebrated McLaurin resolved it by a fluxionary calculation, which is to be found in the Transactions of the Royal Society of London, and determined precisely the angle required. Upon the most exact mensuration which the subject could admit, he afterwards found, that it is the very angle in which the three planes in the bottom of the cell of a honey-comb do actually meet. Shall we ask here, who taught the bees the properties of solids, and to resolve problems of maxima and minima? If a honeycomb were a work of human art, every man of common sense would conclude, without hesitation, that he who invented the construction must have understood the principles on which it was constructed. We need not say that bees know none of these things. They work most geometrically without any knowledge of geometry; somewhat like a child, who, by turning the handle of an organ, makes good music without any knowledge of music. The art is not in the child, but in him who made the organ. In like manner, when a bee makes its comb so geometrically, the geometry is not in the bee, but in that Great Geometrician who made the bee, and made all things in number, weight, and measure." On the whole, it is evident, that the structure of a honeycomb, is an effect of instinct which cannot be confounded with the operations of reason.

INSTITUTE, in Scots law, when by disposition or deed of entail a number of persons are called to the succession of an estate one after another, the person first named is called the institute, the others substitutes.

INSTITUTES, in literary history, a book containing the elements of the Roman law. The institutes are divided into books; and contain an abridgement of the whole body of the civil law, being designed for the use of students. See Law.

INSTITUTION, in the canon and common law, signifies the investing of a clerk with the spiritualities of a rectory, &c. which is done by the bishop, who uses the following formula: "I institute you rector of such a church with the cure of souls, and receive your care and mine."

INSTITUTIONS, in literary matters, denote a system of the elements

nents or rules of any art or science. Thus physical, or medicinal institutions, are such as teach the necessary præcognita to the practice of medicine, or the cure of diseases.

INSTRUMENT, in general, signifies whatever is subservient to a cause in producing any effect.

INSTRUMENT, in law, is used to signify some public act, or authentic deed, by means whereof any truth is made apparent, or any right or title established, in a court of justice.

INSTRUMENT, NOTORIAL, in Scots law, any fact certified in writing, under the hand of a notary public.

INSTRUMENTS, PHILOSOPHICAL, MATHEMATICAL, &c. See CAMERA, MICROSCOPE, TELESCOPE, ORRERY, QUADRANT, COMPASSES, BALANCE, PUMPS, HYDRONETER, ELECTRICITY, MENSURATION, HYDROSTATICS, PNEUMATICS, MECHANICS, OPTICS, &c.

INSULATED, in architecture, an appellation given to such columns as stand alone.

INSULATED, in electrical experiments. When any body is prevented from communicating with the earth by the interposition of an electric body, it is said to be insulated. See **ELECTRICITY**.

INSURANCE, or ENSURANCE, in law and commerce, a contract, whereby one party engages to pay the losses which the other may sustain, for a stipulated premium or consideration. The most common sorts are, insurance against fire, insurance against loss at sea, insurance for lives, and insurance of debts.

1. *Against fire*: for which purposes various offices are established in Britain: the principal of them is, probably, the Sun Fire-office. This class is divided into three species, namely:

1. *Common Insurances*: buildings, the whole external walls of which are of brick or stone, with coverings of slate, tiles, or metals, and in which no hazardous trades are carried on, or hazardous goods deposited. In this division are also comprised goods which are not hazardous, and which may be kept in such buildings.

2. *Hazardous Insurances*: which include buildings covered with slate, tile, or metal, whether built of timber, plaster, timber and plaster, brick and timber; and also buildings, the external walls of which are not wholly of brick or stone, and in which no hazardous trades are carried on, or hazardous goods are deposited; and brick or stone buildings with the coverings above-mentioned, containing hazardous trades or wares. Also goods, deposited in all timber, plaster, timber and plaster; and brick and timber-buildings; hemp, flax, pitch, tar, cotton, turpentine, resin, oil, spirits, and the like, are classed among hazardous insurances, as likewise are the trades or manufactories using the last-mentioned articles.

3. *Doubly Hazardous Insurances*: namely, all the buildings mentioned in the preceding section, however covered, if they be occupied by hazardous trades or goods; and all thatched buildings. Ships, vessels, barges, and other craft, together with their cargoes; glass, china, earthen-ware, pottery, bottles, bottled liquors in trade, ornaments, shells, fossils, ores, medals, curiosities, oil of vitriol, cork, statuary, and figures in wax, plaster, and marble; are all included in this subdivision, to which may be added the trade of boat-builders, cart-grease-makers, cork-cutters, varnish, flambeau, and lamp-black-makers, hartshorn, and vitriol-works, oil, silk, and linen, manufacturers, and japanners. Such are the species into which insurances against fire are divided: and that our readers may form some estimate of the expence of insuring goods, &c. against loss or damage by fire, we have subjoined the following brief table, in which the different annual rates, payable at the British Fire office in the Strand, may be seen at one view. Beside these rates, however, there is a duty of three shillings to be paid to government, for every policy of insurance where the sum insured does not amount to 1000*l.*; and of six shillings, if it amount to 1000*l.* or upwards.

		Com.		Haz.		Doub. Haz.		
	<i>l.</i>	<i>s.</i>	<i>d.</i>	<i>s.</i>	<i>d.</i>	<i>s.</i>	<i>d.</i>	
Any sum not exceeding	1000	2	0	3	0	5	0	} per cent.
	2000	2	6	4	0	6	0	
	3000	2	6	5	0	7	0	
	5000	3	0	5	0			

When the sum insured is large, a higher premium per cent. is demanded; and money, papers, pictures, gunpowder, and jewels, VOL. III.—No. 115.

are excluded. If an article be falsely described, in order that it may be insured at a lower premium, the policy is justly void. An insurance made on the same subject at different offices, must be specified by indorsement on the policy; and, in case of loss, the offices pay a sum in proportion: as well as all the expences incurred in attempting to extinguish fire, or to save goods, even though the endeavours should not be attended with success. And if the value of an article be partially insured, and receive damage by fire, the society is bound to make restitution only to the extent of the sum for which the premium is paid.

11. *Against loss at Sea*: is a most beneficial institution, for promoting the security of trade, and preventing the ruin of individuals; and is now conducted by a regular system of rules, established by the interposition of the legislature, the decision of the courts of justice, and the practice of merchants. It is carried on to the best advantage by public companies, or by a considerable number of private persons, each of whom only engages for a small sum, on the same vessel. There are two public companies established by authority of parliament, viz. the London and Royal Exchange Insurance-Companies. For procuring subscription by private persons, brokers are generally employed, who extend the policy or contract of insurance, procure subscriptions, and assist at settling losses. They are intitled to an allowance for their trouble, generally five per cent on premiums, and two per cent on losses. The parties who engage to pay the damage are called the insurers, or under-writers: the parties for whose security they engage are called the insured; and the premium is understood to be paid at the times of insuring. On this subject, we shall consider, 1. What is necessary to render an insurance valid: 2. When the risk commences, and when it terminates: 3. What constitutes a total or a partial loss: 4. What proof of loss is necessary: and, 5. How the loss is adjusted.

1. To render an insurance valid, the insured must have property really at stake; the voyage must take place under the circumstances agreed on; the dangers insured against must not be contrary to law; and a candid account must be given of circumstances which enhance the danger. 1. The condition of possessing property was required by stat. 19 Geo. 2. c. 37, in order to prevent ships from being fraudulently destroyed when insured above their value; and to discourage a practice which had become common, of converting policies to the purpose of mere wagers. In transactions of this kind, as the insured had no property, and could claim no indemnification for partial damage; so the insurers, having lost their wager by the ship's being lost, could claim no abatement, though part was saved; accordingly, the policies contained clauses of interest or no interest, free from average, and without benefit of salvage. All such policies are declared invalid. This restriction does not extend to privateers, nor to ships trading to the Spanish or Portuguese plantations. Insurances are commonly made as interest shall appear; and it is incumbent on the insured to prove the value of his property. The value of the goods may be proved by the invoices; and the coquet must be produced, if required, to instruct that the goods were actually shipped. It is admitted to value the ship at prime cost and charges, deducting the freights that have been drawn since purchased, if the proprietors choose to stand to that rule; but they are not restricted to it. Sometimes the value of the ship or goods is expressed in the policy; and this value must be admitted, although it be higher than the true one: but it is incumbent on the insured to prove that he had property at stake; and, if the property be trifling in comparison of the sum insured, the insurance will be set aside, as an evasion of the statute. Expected profits, and bounty on the whale-fishery, if specified in the policy, may be insured. When the value is less than the sum insured, the owners may claim a return of premium for the excess. If there be several policies on the same subject, of different dates, the earlier one is valid, and the others must be vacated. If they be of the same date, they must be vacated in equal proportions. When a policy is vacated, in whole or in part, the under-writers have a right to retain half per cent for their trouble. In the case of a cargo intended for A, but afterwards sent to B, both expected it, and insured, and B claimed for the value on its being lost. The under-writers answered, that it was a double insurance, and they ought only to pay their proportion. Judgement was given, finding them liable for the whole, and reserving to them any demand competent against the under-writers who insured.

ed for A. Fraudulently to cast away or destroy a ship insured above its value, is felony. 2. If the ship does not proceed on the voyage, or if, being warranted to depart with convoy, it departs without convoy, the insurance must be vacated. If the extent of a trading voyage be uncertain, the longest one in contemplation is described in the policy, and it is agreed that part of the premium shall be returned if the voyage be shortened. In like manner, in time of war, when insurance is made without condition of convoy, it is agreed that part of the premium be returned in case it sail with convoy. When a ship is warranted to depart with convoy, it is understood from the usual place of convoy (e. g. the Downs), and it is insured till it arrive there. The common proof of sailing with convoy is the production of sailing orders; but, if a ship be prevented by the weather from receiving the sailing orders, other proof may be admitted. A ship was insured from the Thames to Halifax, warranted to sail from Portsmouth with convoy. The convoy had sailed before the ship arrived there, and the underwriters declined to insure it, without convoy, for the rest of the voyage. They were found liable to return part of the premium, retaining only in proportion to the accustomed rate from London to Portsmouth. This decision seems to establish the following principle, that, when the voyage performed is only part of that described in the policy, and when the risk can be proportioned, the under-writers are bound to return part of the premium, though there be no agreement for that purpose. But, if a ship, insured only against the hazards of the sea, be taken by the enemy, the insured have no right to claim a return of premium, though the capture happen soon, under pretence that little sea-hazard was incurred. If a ship deviates from the voyage described in the policy without necessity, it sets aside the insurance. An intention to deviate is not sufficient to set it aside; there must be an actual deviation; and, even in that case, the insurers are liable for damages sustained before deviation. It is no deviation to go out of the way to the accustomed place of convoy, nor to the nearest place where necessary repairs may be had. Deviation, for the purpose of smuggling, if without the knowledge of the owners, does not set aside the insurance, nor when the master is forced by the crew to return. In insurances to the East Indies, and home, the insurers are understood to take the risk of detention in the country, and of country-voyages. 3. Insurance of prohibited goods, against the risk of seizure by the government, is unlawful, and invalid. The insurers, insured, brokers, and all accessories, are liable to the fine of 500l. 4. If the insured have any information of more than common danger, they must reveal every such circumstance to the insurers, otherwise the policy is set aside. This rule is established for the preservation of good faith; and there are several strong decisions in support of it. If a ship be spoke to leaky at sea, or if there be a report of its being lost, these circumstances must be communicated to the insurers. Even the concealment of a false report of loss vitiates the insurance; and if the ship be afterwards lost, though in a different manner, the insured will recover nothing. In a voyage from Carolina to London, another ship had sailed ten days after that which was insured, and arrived seven days before the insurance was made; and the concealment of this circumstance, though the fact was not proved to the satisfaction of the jury, was considered as sufficient to set it aside. Also, during the continuance of the American war, a ship being insured from Portugal by the month, without descending on the voyage, sailed for North America, and was taken by a provincial privateer. The insurers refused to pay, because the hazardous destination was concealed; and it was only upon proof of the insured being equally ignorant of it that they were found liable. But the insured are not obliged to take notice of general perils, which the insurers may be understood to have had in contemplation; dangerous navigation, West Indian hurricanes, enterprizes of the enemy, and the like. Insurance is not set aside by a mistake in the name of the ship, of the master, or the like. Insurance may be made on an uncertain ship; on any ship that the goods may be loaded on; on any ship that A shall sail in from Virginia. In this last case, the policy is not transferred to a ship which A goes on board during the voyage.

2. If a ship be insured at and from a port, the insurance commences immediately if the ship be there, or at its arrival there. If it be damaged when preparing for a voyage, the insurers are liable; but not if the voyage be laid aside for several years, with consent

of the owners. Insurance from a port commences when the ship breaks ground; and, if it set sail, and be driven back and lost in the port, the insurers are liable. Insurance on goods generally continues till they be landed; but, if they be sold after the ship's arrival, and freight contracted to another port, the insurance is concluded. Goods sent on board another ship or lighter are not at the risk of the insurer; but goods sent ashore in the long boat are. Insurance on freight commences when the goods are put on board. Goods from the East Indies, insured to Gibraltar, and to be re-shipped from thence to Britain, were put on board a store-ship at Gibraltar, to wait an opportunity of re-shipping, and were lost: the custom of putting goods aboard a store-ship being proved, the insurers were found liable. Loss of sails ashore, when the ship is repairing, is comprehended within the insurance. What is necessarily understood, is insured, as well as what is expressed; the essential means and intermediate steps, as well as the end. Ships performing quarantine are at the risk of the insurer.

3. The insurers are liable for a total loss when the subject perishes through any of the perils insured against. Baratro, though it properly signifies running away with the ship, extends to any kind of fraud in the master or mariners. Insurance against detention of princes does not extend to ships that are seized for transgressing the laws of foreign countries. The insurers are also liable for a total loss, when damage is sustained, and the remaining property abandoned or vested in the insurers. If a ship be stranded, or taken, and kept by the enemy, or detained by any foreign power, or seized for the service of the government, the proprietors have a right to abandon. But, if a ship be taken by the enemy, and be retaken, or makes its escape, before action against the insurers; have the insured a right to abandon, or must they only claim for the damages sustained as an average loss? There are opposite decisions, according as the circumstance of the case were strong. When the ship was long detained, the goods perishable, the voyage entirely lost, or so disturbed, that the pursuit of it was not worth the freight, or when the damage exceeds half the value of the thing, they have been found intitled to abandon; (Goss against Withers, two Burrow, 683.) But, if the voyage be completed with little trouble or delay, they are not intitled; (Hamilton against Mendez, two Burrow, 1198.) The insured cannot claim, as for a total loss, on an offer to abandon, when the case is, in its nature, only partial; for, if this were permitted, they might devolve the loss occasioned by bad markets on the insurers. And, in all cases the insured have their option to abandon, or not. They may retain their property if they please, and claim for an average loss; and they must make their option before they claim. If the goods be so much damaged, that their value is less than the freight, the insurers are accountable as for a total loss. The insurers are liable for general average, when the property is charged with contribution; and for particular average, when the property is damaged, or part of it destroyed. If the damage be sustained through the fault of the ship, the owners of the goods may have recourse, either against the master or insurers; and, if the insurers be charged, they stand in the place of the owners, and have recourse against the master. In order to prevent the insurers from being troubled with frivolous demands for average, it is generally stipulated, that none shall be charged under five per cent or some other determined rate; and corn, flax, fruit, fish, and like perishable goods, are warranted free from average, unless general or the ship be stranded. In order to encourage every effort to save the ship, the insurers are liable for charges laid out with the design, although the subject perish. Thus, they may be charged with more than the sum insured. In case of goods being damaged the proportion of the sum insured, for which the underwriters are liable, is regulated by the proportion of the prices which the sound and damaged goods fetch at the port of destination. The prime cost of the goods is not considered, nor the necessity of immediate sale, in consequence of damage. Although the damaged good sell above prime cost, the insurers are liable.

4. If a ship be lost, and the crew saved, the loss is proved by the evidence of the crew. If damage be sustained, the extent is proved by an examination of the subject damaged, at the ship's arrival; and the cause by the evidence of the crew. If the ship be stranded, evidence must be taken at the place where stranded documents of loss must be laid before the under-writers, with a convenient speed; and, if these be sufficiently clear, the loss should

be immediately settled. The under-writers generally grant their notes at a month or six weeks date for their proportions. If a ship be not heard of for a certain time, it is presumed lost; and the under-writers are liable to pay the sums insured, the property being abandoned to them in the event of the ship's return. Six months are allowed for a voyage to any part of Europe, a year to America, and two years to the East Indies. By the ordinance of Hamburg, if a ship be three months beyond the usual time of performing a voyage, the under-writers may be desired to pay 92 per cent on an abandon. If they decline it, they are allowed fourteen months more, and then they must pay the full value. A ship insured against the hazards of the sea, but not against the enemy, if never heard of, is presumed lost at sea.

5. That the manner of settling losses may be understood, we must explain what is meant by covering property. We mentioned already, that insurances for greater sums than the insured had really at stake, were contrary to law: but some latitude is allowed in that respect; for if the owner were to insure no more than the exact value of his property he would lose the premium of insurance, and the abatement, if any was agreed on. For example, if he has goods on board to the value of 100l. insured at five per cent to abate two per cent in case of loss; then, if a total loss happen, he recovers 98l. from the insurers, of which five pounds being applied to replace the premium, the nett sum saved is only 93l.; but, if the value on board be only 93l. and the sum insured 100l. he would be fully indemnified for the loss; and his property in that case is said to be covered. To find how much should be insured to cover any sum, subtract the amount of the premium and abatement (if any,) from 100l. As the remainder is to 100l. so is the value, to the sum which covers it. In case of a total loss, if the sum insured be not greater than that which covers the property, the insurers must pay it all. If greater, they pay what covers the property, and return the premium on the overplus. Partial losses are regulated by this principle, that whereas the owner is not fully indemnified, in case of a total loss, unless he covers his property, therefore he should only be indemnified for a partial loss in the same proportion; and, if it be not fully insured, he is considered as insurer himself for the part not covered, and must bear a suitable proportion of the loss. Therefore the value of the property is proved, and the sum required to cover it computed. If that sum be all insured, the under-writers pay the whole damage; if only part be insured, they pay their share, which is computed by the following rule; as the sum which covers the property is to the sum insured, so is the whole damage to the part for which the insurers are liable. For example, if the value of the property be 360l. the sum insured 300l. the premium eight per cent, and abatement two per cent; then the sum which should be insured to cover the property is 400l.; and, if damage be sustained to the extent of 200l. the owners will recover 150l. If a voyage be insured out and home, the premium outward must be considered as part of the value on the homeward property, and the sum necessary to cover it computed accordingly. For example, to 100l. out and home, at five per cent each voyage, abatement two per cent, we compute thus: 93 : 100 :: L. 100 : L. 107 : 10 : 6, to be insured outward, premium on L. 107 : 10 : 6 outwards, at five per cent, L. 5 : 7 : 6 : 93 : 100 :: L. 105 : 7 : 6 : L. 113 : 6s. to be insured home; the premium on which is L. 5 : 13 : 6; and, if the ship be lost on the homeward voyage,

From the sum insured home.....	L. 113 6 0
Subtract the discount, 2 per cent.....	2 5 3

Sum for which the insurers are liable.....	L. 111 — 9
Insurance out.....	L. 5 7 6
Insurance home.....	5 13 3
	11 — 9

Covered property.....	L. 100 — —
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III. *For lives.* Insurance upon life is a contract by which the insurer, for a certain sum proportioned to the age, health, and profession of the person whose life is to be insured, engages that the person shall not die within a certain period, or if he do, the underwriter will pay a sum of money to the person to whom the policy is granted. The value of insurances upon lives, depends

upon the probability of the continuance of any proposed life or lives, during any proposed term. See **ANNUITIES**. On many occasions, the premiums paid to insurers have been higher than any computation founded on the probabilities of human life, will warrant. By virtue of insurance for life, on the demise of the party insured, a sum of money becomes due to the person for whose benefit the insurance was made. In this respect also, several societies grant policies of insurance for certain premiums: of this kind is the society which meets at Black-Friars bridge, and which has justly styled itself the Equitable Society for Assurances on Lives and Survivorships. The business transacted by this society is so extensive, and it is governed so entirely by calculations, founded on the best rules and observations, that it cannot but prove one of the greatest public benefits. It was established in 1762, in consequence of proposals which had been made, and lectures recommending such a design, which had been read by Mr. Dodson, the author of the Mathematical Repository. It assures any sums, or reversionary annuities, on any life or lives for any number of years, as well as for the whole continuance of the lives; and in any manner that may be best adapted to the views of the persons assured: that is, either by making the assured sums payable certainly at the failure of any given lives; or on condition of survivorship; and also, either by taking the price of the assurance in one perfect payment, or in annual payment, during any single or joint lives or any terms, less than the whole possible duration of the lives. Any persons, for instance, who depend on incomes which must be lost when they die, or who are only tenants for life in estates, may, if they want to borrow money, be enabled to give sufficient security, by assuring such sums as they want to borrow in this society, and assigning the policy; in consequence of which the lender will, during the term of the assurance, be guarded against all danger of losing his principal by the death of the borrower. In the same way, clergymen, counsellors, persons holding any places of profit, traders, and others, who have families, whose subsistence depends on the continuance of their lives, may here be enabled to make some provision for their families after their decease. All persons, who enjoy annuities for the lives of others, may here secure themselves against the loss they would sustain, should they survive the persons on whose lives the annuities depend, by making assurances which should intitle them to any sums payable on condition their survivorship should take place. Any person entitled to an estate, annuity, legacy, or office, after another person, provided he survives, may here secure some equivalent for his family at his decease, provided he does not survive. Husbands may, in this society, secure annuities for their wives, provided they should leave them widows. Parents, by assuring the lives of their children when infants, till they attain a given age, may secure for them, should they live to that age, such sums as may be necessary to put them out to apprenticeships, or to make capitals, or fortunes, for them, with which to set out in business or to marry. Any persons, apprehensive of being left without support in old age, when incapable of labour, may, in this society, purchase an annuity, to commence at any future year of his life; and to continue during the remainder of his life; and he may do this at a very small expence, if he is young, and willing to wait for the commencement of his annuity till he is 55 or 60 years of age. And indeed there are no kinds of assurances on lives and survivorships, but what are made by this society. The same is done by other societies, of which there are several conducted on a similar plan, as,

1. The Royal Exchange Assurance, incorporated originally for Sea Insurances, but by its second charter, dated 29th April 1721, empowered to assure lives. By repeated reductions in 1790 and 1797, its terms are brought very near to those above stated.
2. The Westminster Society, established in 1792. Its terms are nearly the same with both the preceding. Since this time the number of such offices has been considerably increased, and though each has some peculiarity, they all require nearly the same annual premium. As a specimen, we have, in the following table, stated the rates of insurance on lives, fixed by the Westminster Society (No. 429, Strand), which was established in 1792: it is calculated to shew the premiums for insuring one hundred pounds, upon the life of a healthy person, from the age of eight to sixty-seven years, within the limits of Europe, but not upon the seas, viz.

Age.

Age.	Premium per cent. for one year.	Premium per cent. per annum, for an insurance for seven years.	Premium per cent. per annum, for the whole continuance of life.
	<i>l. s. d.</i>	<i>l. s. d.</i>	<i>l. s. d.</i>
8 to 14	0 17 9	1 1 5	1 17 7
20	1 7 3	1 9 5	2 3 7
25	1 10 7	1 12 1	2 8 1
30	1 13 3	1 14 11	2 13 4
35	1 16 4	1 18 10	2 19 10
40	2 0 8	2 4 1	3 7 11
45	2 6 8	2 10 10	3 17 11
50	2 15 1	3 0 8	4 10 10
55	3 5 0	3 12 0	5 6 4
60	3 18 1	4 7 1	6 7 4
65	4 15 2	5 10 10	7 16 9
66	5 0 1	5 17 7	8 4 1
67	5 5 6	6 5 2	8 12 1

Thus, a life not exceeding the age of 30 years, may be insured for 100*l.* to be paid in case of death within one year, for..... } *l. s. d.*
 Within seven years, by paying annually till the insured shall die, or the seven years be elapsed..... } 1 13 3
 Whenever the death shall happen, by paying annually till that event..... } 1 14 11
 } 2 13 4

These rates are computed from the probabilities of life, according to the Northampton bills of mortality; the mode of calculating them is explained by Dr. Price in his Treatise on Reversionary Payments, and by Mr. Morgan in a very useful work entitled the Doctrine of Annuities and Assurances on Lives and Survivorships stated and explained. Persons who are engaged in military or naval service, or who have not had the small-pox, or are subject to the gout, are charged an additional premium, supposed to be adequate to the additional risk. Policies of assurances on lives generally contain clauses to the following effect. Conditions of assurance made by persons on their own lives. The assurance to be void if the person whose life is assured shall depart beyond the limits of Europe, shall die upon the seas (except in his Majesty's packets passing between Great Britain and Ireland); or shall enter into or engage in any military or naval service whatever, without the previous consent of the assurers; or shall die by suicide, duelling, or the hand of justice; or shall not be, at the time the assurance is made in good health.—Conditions of assurance made by persons on the lives of others. The assurance to be void if the person whose life is assured shall depart beyond the limits of Europe, shall die upon the seas (except in his Majesty's packets passing between Great Britain and Ireland); or shall enter into or engage in any military or naval service whatever, without the previous consent of the assurers; or shall not be, at the time the assurance is made, in good health. Any person making an assurance on the life of another must be interested therein, speculative assurances being prohibited by 14 George III. c. 48. Another method of insuring for the benefit of survivors, consists in paying an annual premium for a certain sum recoverable on the death of one person named out of two; but, as this mode of securing a competency is doubtless more objectionable to the party that is obliged to pay the annual premium, than either the preceding simple, or subsequent double chance of obtaining an equitable reimbursement, we have been induced to subjoin the following table, which exhibits the premium of insurance of one hundred pounds, payable when either of two persons, shall die within the limits of Europe, but not upon the seas.

Age.	<i>l. s. d.</i>	Age.	<i>l. s. d.</i>
10	2 17 1	40	5 11 9
15	3 5 0	45	6 7 4
20	3 13 11	50	7 7 8
25	4 0 10	55	8 12 2
30	4 8 11	60	10 4 9
35	4 19 0	67	13 15 8

INTACTÆ, the same with Asymptotes. See ASYMPTOTE, and CONIC SECTIONS.

INTAGLIOS, precious stones on which are engraved the heads of great men, inscriptions, and the like. They are often set in rings, seals, &c.

INTCHEN-OUEI, a town of Chinese Tartary 330 miles E. N. E. of Peking.

INTEGER, in arithmetic, a whole number, in contradistinction to a fraction.

INTEGRAL, or INTEGRANT, in philosophy, appellations given to parts of bodies which are of a similar nature with the whole: thus, filings of iron have the same nature and properties as bars of iron. Bodies may be reduced into their integrant parts by triture or grinding, limitation or filing, solution, amalgamation, &c.

INTEGRAL CALCULUS. See CALCULUS.

INTEGUMENTS, [from *intego*, to cover,] in physiology, denote the common coverings which invest the body, as the cutis, &c. The common integuments are the skin, with the fat and cellular membrane adhering to it. The word is also used for the coats or tunics of the eye. See ANATOMY.

INTELLECT, [*intellectus*, Lat.] the intelligent mind; the power of understanding. See LOGIC, and METAPHYSICS.

INTENDMENT, in law, the design, or true meaning, of a person or thing, which frequently supplies what is not fully expressed; but though the intent of parties in deeds and contracts is much regarded by the law, yet it cannot take place against the rules of law.

INTENDMENT OF CRIMES, in cases of treason, where the intention is proved by circumstances, is punishable in the same manner as if it were put in execution. So, if a person enter a house in the night-time, with an intent to commit burglary, it is felony: also, an assault with an intent to commit a robbery on the highway is made felony, and punished with transportation, 7 Geo. II. cap. 21.

INTENSITY, in physics, the degree or rate of power, or energy of any acting quality, as of heat and cold, &c.

INTENTION, in medicine, that judgement or method of cure which a physician forms to himself from a due examination of symptoms.

INTENTION, in physics, the increase of the power or energy of any quality; as heat, cold, &c. by which it stands opposed to remission, which signifies its decrease or diminution.

INTER, a Latin preposition, signifying *between*, which makes part or a great number of compound words in the English, French, and other modern languages, as well as in the Latin.

INTERAMNA, in ancient geography, a town of the Cisappennine Umbria; so called from its situation between rivers, or in an island in the river Nar, now called Terni. Lon. 13. 38. E. Lat. 42. 40. N.

INTERAMNA, or INTERAMNIA, PRÆTUTIANORUM, a town in the territory of the Præutiani, a part of Picenum; now called Teramo, in the Abruzzo of Naples. Lon. 15. E. Lat. 42. 40. N.

INTERCALARY DAY, in chronology, the odd day in leap-year, so called from *calare*, to proclaim, it being proclaimed by the priests with a loud voice.

INTERCATIA, in ancient geography, a town of the Vaccæi in Hispania Citra. It was situated to the S. E. of Asturica, and is now in ruins.

INTERCESSIO, or INTERCESSION, was used in ancient Rome, for the act of a tribune of the people, or other magistrate, by which he inhibited the acts of other magistrates; or even, in case of the tribunes, the decrees of the senate. Veto was the solemn word used by the tribunes, when they inhibited any decree of the senate, or law proposed to the people. The general law of these intercessions was, that any magistrate might inhibit the acts of his equal or inferior; but the tribunes had the sole prerogative of controlling the acts of every other magistrate, yet could not be controlled themselves by any.

INTERCESSOR, [from *inter* and *cedo*, I go between,] a person who intercedes for another.

INTERCESSOR, in the Roman law, was the name of an officer, whom the governors of provinces appointed principally to raise taxes and other duties.

INTERCESSOR is also a term heretofore applied to such bishops

as, during the vacancy of a see, administered the bishopric, till a successor to the deceased bishop had been elected. The third council of Carthage calls these Interventors.

INTERCOLUMNIATION, in architecture, denotes the space between two columns, which is always to be proportioned to the height and bulk of the columns.

INTERCOMMONING, in law, is when the commons of two manors lie together, and the inhabitants of both have, time out of mind, caused their cattle to feed promiscuously on them.

INTERCOSTAL, in anatomy, an appellation given to such muscles, nerves, arteries, and veins, as lie between the ribs. See **ANATOMY**.

INTERDICT, an ecclesiastical censure, by which the church of Rome forbids the performance of divine service in a kingdom, province, town, &c. Interdicts were often executed in France, Italy, and Germany; and in 1170, pope Alexander III. put all England under an interdict, forbidding the clergy to perform any part of divine service, except baptizing of infants, taking confessions, and giving absolution to dying penitents. But this censure being liable to promote libertinism and a neglect of religion, the succeeding popes very seldom made use of it. There was also an interdict of persons, who were deprived of the benefit of attending on divine service. Particular persons were also anciently interdicted of fire and water, which signified a banishment for some particular offence: by their censure no person was allowed to receive them, or allow them fire or water; and being thus wholly deprived of the two necessary elements of life, they were doubtless under a kind of civil death.

INTEREST, is the premium or money paid for the loan or use of money; and is distinguished into two kinds, simple and compound. Simple interest is that which is paid for the principal, or sum lent, at a certain rate or allowance made by law, or agreement of parties, so much for 100*l.* lent out for one year; and more or less proportionally for greater or less sums, and for more or less time. For example, if it is 5*l.* to 100*l.* for one year, it is 2*l.* 10*s.* for half a year, and 10*l.* for two years; also 10*l.* for one year of 200*l.* and 5*l.* for half a year; and so on, for other sums and times. See **ARITHMETIC**. Many good and learned men have in former times very much perplexed themselves and other people by raising doubts about the legality of interest in foro conscientie. The enemies to interest in general make no distinction between that and usury, holding an increase of money to be indefensibly usurious. And this they ground as well on the prohibition of it by the law of Moses among the Jews, as upon what is laid down by Aristotle, that money is naturally barren; and to make it breed money is preposterous, and a perversion of the end of its institution, which was only to serve the purposes of exchange, and not of increase. Hence divines have branded the practice of taking interest, as contrary to the divine law both natural and revealed; (See **ASATOCISM**) and the canon law has prescribed the taking of any the least increase for the loan of money as a mortal sin. But, in answer to this, it may be observed, that the Mosaic precept was clearly a political, and not a moral, precept. It only prohibited the Jews from taking usury from their brethren the Jews, but in express words permitted them to take it of a stranger: which proves that the taking of moderate usury, or a reward for the use, for so the word signifies, is not malum in se, since it was allowed where any but an Israelite was concerned. As to Aristotle's reason, deduced from the natural barrenness of money, the same may with equal force be alleged of houses, which never breed houses; and many other things, which nobody doubts it is lawful to make profit of, by letting them to hire. Though money was originally used only for the purposes of exchange, yet the laws of any state may be justified in permitting it to be turned to the purposes of profit, if the convenience of society (the great end for which money was invented) require it. And that the allowance of moderate interest tends greatly to the benefit of the public, especially in a trading country, will appear from that generally acknowledged principle, that commerce cannot subsist without mutual and extensive credit. Unless money therefore can be borrowed, trade cannot be carried on: and if no premium were allowed for the hire of money, few persons would care to lend it: or at least the ease of borrowing at a short warning (which is the life of commerce) would be entirely at an end. Thus, in the dark ages of monkish superstition and civil tyranny,

when interest was laid under a total interdict, commerce was also at its lowest ebb, and fell entirely into the hands of the Jews and Lombards: but when men's minds began to be more enlarged, when true religion and real liberty revived, commerce grew again into credit; and again introduced with it all its inseparable companion, the doctrine of loans upon interest. And, indeed, considered abstractedly from this its use, since all other conveniences of life may be either bought, or hired, but money can only be hired, there seems no greater impropriety in taking a recompence for the hire of this, than of any other convenience. If one borrow 100*l.* to employ in a beneficial trade, it is but equitable that the lender should have a proportion of the gains. To demand an exorbitant price is equally contrary to conscience, for the loan of a horse, or the loan of a sum of money; but a reasonable equivalent for the temporary inconvenience which the owner may feel by the want of it, and for the hazard of his losing it entirely, is not more immoral in the one case than in the other. Indeed the absolute prohibition of lending upon any, even moderate interest, introduces the very inconvenience which it seems meant to remedy. The necessity of individuals will make borrowing unavoidable. Without some profit by law, there will be but few lenders: and those principally bad men, who will break through the law, and take a profit; and then will endeavour to indemnify themselves from the danger of the penalty, by making that profit exorbitant. Thus, while all degrees of profit were discountenanced, we find more complaints of usury, and more flagrant instances of oppression, than in modern times when money may be easily had at a low interest. A capital distinction must therefore be made between a moderate and exorbitant profit; to the former of which we usually give the name of interest, to the latter the truly odious appellation of usury; the former is necessary in every civil state; if it were but to exclude the latter, which ought never to be tolerated in any well-regulated society. For, as the whole of this matter is well summed up by Grotius, "if the compensation allowed by law does not exceed the proportion of the hazard run, or the want felt, by the loan, its allowance is neither repugnant to the revealed nor to the natural law: but if it exceeds those bounds, it is then oppressive usury; and though the municipal laws may give it impunity, they never can make it just." The exorbitance or moderation of interest, for the money lent, depends upon two circumstances; the inconvenience of parting with it for the present, and the hazard of losing it entirely. The inconvenience to individual lenders can never be estimated by laws; the rate therefore of general interest must depend upon the usual or general inconvenience. This results entirely from the quantity of specie or current money in the kingdom: for, the more specie there is circulating in any nation, the greater superfluity there will be, beyond what is necessary to carry on the business of exchange, and the common concerns of life. In every nation, or public community, there is a certain quantity of money thus necessary: which a person well skilled in political arithmetic might perhaps calculate as exactly, as a private banker can the demand for running cash in his own shop: all above this necessary quantity may be spared, or lent, without much inconvenience to the respective lenders; and the greater this national superfluity is, the more numerous will be the lenders, and the lower ought the rate of the national interest to be: but where there is not enough, or barely enough, circulating cash, to answer the ordinary uses of the public, interest will be proportionably high; for lenders will be but few, as few can submit to the inconvenience of lending. So also the hazard of an entire loss has its weight in the regulation of interest: hence, the better the security, the lower will the interest be; the rate of interest being generally, in a compound ratio, formed out of the inconvenience and the hazard. And as, if there were no inconvenience, there should be no interest but what is equivalent to the hazard; so, if there were no hazard, there ought to be no interest, save only what arises from the mere inconvenience of lending. Thus, if the quantity of specie in a nation be such, that the general inconvenience of lending for a year is computed to amount to three per cent, a man that has money by him will perhaps lend it upon good personal security at five per cent, allowing two for the hazard run; he will lend it upon bonded security, or mortgage, at four per cent, the hazard being proportionably less; but he will lend it to the state, on the inmaintainance of which all his property depends, at three per

cent, the hazard being none at all. But sometimes the hazard may be greater than the rate of interest allowed by law will compensate. This gives rise to the practice, 1. Of bottomry, or respondentia. 2. Of policies of insurance. See BOTTOMRY, and INSURANCE. Upon the two principles of inconvenience and hazard, compared together, different nations have at different times established different rates of interest. The Romans at one time allowed centissimæ, one per cent monthly, or twelve per cent per annum, to be taken for common loans; but Justinian reduced it to trientes, or one-third of the as or centissimæ, that is, four per cent; but allowed higher interest to be taken of merchants, because there the hazard was greater. Grotius informs us, that in Holland the rate of interest was then 8 per cent in common loans, but 12 to merchants. Our law establishes one standard for all alike, where the pledge or security itself is not put in jeopardy; lest, under the general pretence of vague and indeterminate hazards, a door should be opened to fraud and usury: leaving specific hazards to be provided against by specific insurances, or by loans upon respondentia or bottomry. But as to the rate of legal interest, it has varied and decreased for 200 years past, according as the quantity of specie in the kingdom has increased by accessions of trade, the introduction of paper credit, and other circumstances. The statute 37 Hen. VIII. c. 9, confined interest to ten per cent, and so did the statute 13 Eliz. c. 8. But as, through the encouragements given in her reign to commerce, the nation grew more wealthy; so, under her successor, the statute 21 Jac. 1. c. 17, reduced it to eight per cent; as did the statute 12 Car. II. c. 13, to six; and lastly, by the statute 12 Ann. st. 2. c. 16, it was brought down to five per cent yearly, which is now the extremity of legal interest that can be taken. But yet, if a contract which carries interest be made in a foreign country, our courts will direct the payment of interest according to the law of that country in which the contract was made. Thus Irish, American, Turkish, and Indian interest, have been allowed in our courts to the amount of even 12 per cent. For the moderation or exorbitance of interest depends upon local circumstances; and the refusal to enforce such contracts would put a stop to all foreign trade. And, by stat. 14 Geo. III. c. 79, all mortgages and other securities upon estates or other property in Ireland or the plantations, bearing interest not exceeding six per cent, shall be legal; though executed in the kingdom of Great Britain; unless the money lent shall be known at the time to exceed the value of the thing in pledge; in which case also, to prevent usurious contracts at home under colour of such foreign securities, the borrower shall forfeit treble the sum so borrowed.

INTEREST, COMPOUND, is that which is paid for any principal sum, and the simple interest due upon it for any time, accumulated into one principal sum. Example: if 100*l.* is lent out for one year at 6*l.* and if at the end of that year the 6*l.* due of interest be added to the principal, and the sum 106*l.* be considered as a new principal bearing interest for the next year (or whatever less time it remains unpaid) this is called compound interest, because there is interest upon interest, which may go on by adding this second year's interest of 106*l.* to the principal 106*l.* and making the whole a principal for the next year. See ARITHMETIC, and USURY. The only case, in which Compound Interest is allowed by the laws of Great Britain, is that of Annuities. See ANNUITIES, and SURVIVORSHIP.

INTERLACKEN, a town of the Helvetic Republic, in the canton of Bern, 28 miles S. S. W. of Lucern.

INTERLOCUTOR. In Scots law, the sentence or judgement of a court of law, is commonly called an interlocutor before decree is extracted.

INTERLOCUTORY DECREE. In English law, in a suit in equity, if any matter of fact be strongly controverted, the fact is usually directed to be tried at the bar of the court of king's bench, or at the assizes, upon a feigned issue. If a question of mere law arises in the course of a cause, it is the practice of the court of chancery to refer it to the opinion of the judges of the court of king's bench, upon a case stated for the purpose. In such cases, interlocutory decrees or orders are made.

INTERLOCUTORY JUDGEMENTS are such as are given in the middle of a cause, upon some plea, proceeding on default, which is only intermediate, and does not finally determine or complete the suit. But the interlocutory judgements most usually spoken of, are those incomplete judgements, whereby the right of the plaintiff

is established but the quantum of damages sustained by him is not ascertained, which is the province of a jury. In such a case a writ of enquiry issues to the sheriff, who summons a jury, enquires of the damages, and returns to the court the inquisition so taken, whereupon the plaintiff's attorney taxes costs, and signs final judgement.

INTERLOCUTORY ORDER, that which decides not the cause, but only settles some intervening matter relating to the cause. As, where an order is made in chancery, for the plaintiff to have an injunction, to quit possession till the hearing of the cause; this order, not being final, is called interlocutory.

INTERLOPERS, those who without due authority hinder the trade of a company or corporation lawfully established, by dealing in the same articles.

INTERLUDE, an entertainment exhibited on the theatre between the acts of a play.

INTERMEDIATES, in chemistry, substances put into combination to cause an affinity which would not take place without it. Thus an alkali united with oil will cause the oil to unite with water; in this case the alkali is the intermediate.

INTERMITTENT, [*intermittens*, Lat.] in medicine, a term applied to such fevers as go off and soon return again, in opposition to those which are continual. See MEDICINE.

INTERNAL ANGLE, an angle made within any figure, by the sides of it: also the two angles formed between two parallels, by a line intersecting them, on each side of the intersecting line.

INTEROSSEUS, in anatomy, an appellation given to the muscles which move the fingers and toes, from their being situated between the bones of those parts. See ANATOMY.

INTERPOLATION, among critics, denotes a spurious passage inserted into the writings of some ancient author.

INTERPOLATION, in the modern algebra, is used for finding an intermediate term of a series, its place in the series being given. See ALGEBRA, and SERIES. The method of interpolation was first invented by Mr. Briggs, and applied by him to the calculation of logarithms, &c. in his *Arithmetica Logarithmica*, and his *Trigonometria Britannica*; where he explains, and fully applies, the method of interpolation by differences. His principles were followed by Reginald and Mouton in France, and by Cotes and others in England. Wallis made use of the method of interpolation in various parts of his works; as his arithmetic of infinites, and his algebra, for quadratures, &c. The same was also happily applied by Newton in various ways: by it he investigated his binomial theorem, and quadratures of the circle, ellipse, hyperbola: see Wallis's Algebra, chap. 85, &c. Newton also, in lemma 5, lib. 3, Princip. gave a most elegant solution of the problem for drawing a curve line through the extremities of any number of given ordinates; and in the subsequent proposition, applied the solution of this problem to that of finding from certain observed places of a comet, its place at any given intermediate time. And Dr. Waring, who adds, that a solution still more elegant, on some accounts, has been since discovered by Messrs. Nichol and Stirling has also resolved the same problem, and rendered it more general, without having recourse to finding the successive differences. Philosophical Transactions, vol. 69, part 1, art. 7. Mr. Stirling pursued this branch as a distinct science, in a separate treatise, entitled *Tractatus de Summatione et Interpolatione Serierum Infinitarum*, in 1730. When the first, second, or other successive differences of the terms of a series become at last equal, the interpolation of any term of such a series may be found by Newton's differential method. When the algebraic equation of a series is given, the term required, whether it be a primary or intermediate one, may be found by the resolution of affected equations; but when that equation is not given, as it often happens, the value of the term sought must be exhibited by a converging series, or by the quadrature of curves. See Stirling's *Tractatus*, p. 86. Meyer, in Act. Petr. tom. 2, p. 180.

INTERPOSITION, in astronomy. The eclipse of the sun is occasioned by an interposition of the moon between the sun and us; and that of the moon by the interposition of the earth between the sun and moon. See ECLIPSE.

INTERPRETER, a person who explains the thoughts, words, or writings, of some other, which before were unintelligible. The word, according to Isidore, is derived from *inter* and *partes*, as signifying

signifying a person in the middle betwixt two parties, to make them mutually understand each other; others derive it from *inter* and *præs*, i. e. *fidejussor*; *q. d.* a person who serves as security between two others who do not understand one another.

INTERREGNUM, the time during which the throne is vacant, in elective kingdoms; for in such as are hereditary, like ours, there is no such thing as an interregnum.

INTERREX, the magistrate who governs during an interregnum. This magistrate was established in old Rome, and was almost as ancient as the city itself: after the death of Romulus there was an interregnum of a year, during which the senators were each interrex in their turn, five days a piece.

INTERROGATION, [*Ἐρωτησις*, Gr.] in rhetoric, is a figure in which the speaker introduces a thing by way of question, to make its truth more conspicuous. This figure is suited to express most passions and emotions of the mind; it serves also to press and bear down an adversary, and generally adds an uncommon briskness, action, force, and variety, to discourse. See **ORATORY**.

INTERROGATIVE, a pronoun used in asking questions: as, who? what? which? whether?

INTERROGATORY, in law, a particular question demanded of a witness examined in a cause, especially in the Court of Chancery. These interrogatories must be exhibited by the parties in suit on each side; which are either direct for the party that produces them, or counter, on behalf of the adverse party; and generally both plaintiff and defendant may exhibit, direct, and counter, or cross, interrogatories. They must be pertinent, and only to the points necessary; and either drawn or perused by counsel, and signed by them.

INTERSCENDENT, in algebra, is applied to quantities, when the exponents of their powers are radical quantities. Thus $\sqrt[2]{x}$, $\sqrt[3]{x}$, &c. are interscendent quantities.

INTERSECTION, in mathematics, the cutting of one line, or plane, by another; or the point or line wherein two lines, or two planes, cut each other. The mutual intersection of two planes is a right line. The centre of a circle is in the intersection of two diameters. The central point of a regular or irregular figure of four sides, is the point of intersection of the two diagonals. The equinoxes happen when the sun is in the intersections of the equator and ecliptic.

INTERSTELLAR, [*inter* and *stella*, Lat.] a term used to express those parts of the universe that are beyond the limits of our solar system. In the Interstellar regions, it is supposed there are many other systems of planets moving round the fixed stars, as the centres of their respective motions. And, as it is probable that each fixed star is thus a sun to a number of habitable orbs, or earths, that move round it, the Interstellar world must be infinitely the greatest part of the universe. See **ASTRONOMY**.

INTERVAL, space between places; vacuity, or space unoccupied. It is derived from *intervallum*, which, according to Isidore, signifies the space inter fossum et murum, i. e. between the ditch and the wall. Others say that the stakes or piles, driven into the ground in the ancient Roman bulwarks, were called valla; and the interstices, or vacancy between them, intervalla.

INTERVAL, in music, the distance between any given sound and another. Strictly speaking, it is neither measured by any common standard of extension nor duration; but either by immediate sensation, or by computing the difference between the numbers of vibrations produced by two or more sonorous bodies, in the act of sounding, during the same given time. As the vibrations are slower and fewer during the same instant, for example, the sound is proportionally lower or graver; on the contrary, as during the same period the vibrations increase in number and velocity, the sounds are proportionably higher or more acute. An interval in music, therefore, is properly the difference between the number of vibrations produced by one sonorous body of a certain magnitude and texture, and of those produced by another of a different magnitude and texture in the same time.

INTERVALS are divided into consonant and dissonant. A consonant interval is that whose extremes, or whose highest and lowest sounds, when simultaneously heard, coalesce in the ear, and produce an agreeable sensation called by Lord Kames a tertium quid. A dissonant interval, on the contrary, is that whose extremes, simultaneously heard, far from coalescing in the ear, and

producing one agreeable sensation, are each of them plainly distinguished from the other, produce a grating effect upon the sense, and repel each other with an irreconcilable hostility. In proportion as the vibrations of different sonorous bodies, are of the same given time, the chords are more or less perfect, and consequently the intervals more or less consonant. When these vibrations never coincide at all in the same given time, the discord is consummate, and consequently the interval absolutely dissonant.

INTERVALS are not only divided according to their natures, but also with respect to their degrees. In this view, they are either enharmonic, chromatic, or diatonic. Of these, therefore, in their order, from the least to the greatest. An enharmonic interval is what they call the eighth part of a tone, or the difference between a major and minor semitone, generally distinguished by the name of a comma. See **MUSIC**. A chromatic interval consists properly of a minor semitone, but may also admit the major. A diatonic interval consists of a semitone-major at least, but may consist of any number of tones within the octave. When an octave higher or lower is assumed, it is obvious that we enter into another scale which is either higher or lower, but still a repetition of the former degrees of sound.

INTERVALS again are either simple or compound. All the intervals within any one octave are simple; such as the second major or minor, the third, the fourth, the fifth, the sixth, the seventh, &c. of these afterwards. All intervals whose extremes are contained in different octaves, such as the ninth, the tenth, the eleventh, the twelfth, the thirteenth, the fourteenth, the fifteenth, &c. may be termed compound intervals. The semitone either exactly or nearly divides the tone into two equal parts. In the theory of harmonical computation three kinds of semitones are recognized, viz. the greatest, the intermediate, and the smallest, semitone. But in practice, to which these explications are chiefly adapted, the semitone is only distinguished into major and minor. The semitone-major is the difference between the third major and the fourth, as EF. Its ratio is as fifteen to sixteen, and it forms the least of all diatonic intervals. The semitone-minor consists of the difference between the third major and minor; it may be marked in the same degree by a sharp or a flat, and it only forms a chromatic interval; its ratio is as twenty-four to twenty-five. Though some distinction is made between these semitones by the manner of marking them, yet on the organ and harpsichord no distinction can be made; nor is there any thing more common for us than to say, that D sharp in rising is E flat in descending, and so through the whole diapason above or below; besides, the semitone is sometimes major and sometimes minor, sometimes diatonic and sometimes chromatic, according to the different modes in which we compose or practise; yet in practice these are called semitones minor, which are marked by sharps or flats, without changing the degree; and semitones major are those which form the interval of a second. With respect to the three semitones recognized in theory, the greatest semitone is the difference between a tone major and a semitone minor; and its ratio is as twenty-five to twenty-seven. The intermediate semitone is the difference between a semitone major and a tone major; and its ratio is as 128 to 135. In a word, the small semitone consists of the difference between the greatest and the intermediate semitone; and its ratio is as 125 to 128. Of all these intervals, there is only the semitone major, which is sometimes admitted as a second in harmony. The interval of a tone which characterises the diatonic species of composition, is either major or minor. The former consists of the difference between the fourth and fifth; and its ratio is as eight to nine: and the latter, whose ratio is as nine to ten, results from the difference between the third minor and the fourth. Seconds are distinguished into four kinds: two of which are not in practice sufficiently momentous to be mentioned. The second major is synonymous with the intervals of a tone; but as that tone may be either major or minor, its ratio may be either as eight to nine, or as nine to ten. The second minor consists of the distance from B to C, or from EF; and its ratio is as fifteen to sixteen. The third is so called, because it consists of two gradations, or three diatonic sounds, as from G to B ascending, or from A to C inclusive of the extremes; of which the first is a third major, composed of two full tones, and its ratio as four to five; the second, a third minor consisting of a tone and a semitone major, and its ratio as five to six. The fourth has by some been reckoned an imperfect,

feet, but more justly by others, a perfect, chord. It consists of three diatonic degrees, but takes its name from the four different sounds of which it is formed; or, in other words, the number by which it is denominated includes the extremes. It is composed of a tone major, a tone minor, and a semitone major, as from C to F ascending; its ratio as three to four. The fifth next to the octave is, perhaps, the most perfect interval, as least susceptible of alteration. The number from whence it assumes its name likewise includes its extremes. It consists of two tones major, one minor, and a semitone major, as from A to E ascending; its ratio is as two to three. The sixth is not found among the natural order of consonances, but only admitted by combination. It is not here necessary to mention its various distinctions and uses, as we only give an account of intervals in general. The sixth major consists of four tones and a semitone major, as from G to E ascending; its ratio is as three to five. The sixth minor contains three tones and two semitones major, as from E to C ascending; its ratio is as five to eight. The seventh, as a reduplication of the second, is a dissonance. When major, it consists diatonically of five tones, three major, and two minor; and a major semitone, as from C to B ascending; its ratio is as eight to fifteen. When minor, it consists of four tones, three major and one minor, and two major semitones, as from E to D ascending; its ratio is as five to nine. The octave is the most perfect of all chords, and in many cases hardly to be distinguished by the ear from an unison; that is to say, from that coincidence of sound produced by two musical strings, whose matter, lengths, diameters, and tensions, are the same. As the vibrations of two strings in unison during any given time, are precisely coincident; so whilst the lowest extreme of the octave vibrates once, the highest vibrates twice; and consequently its ratio is as one to two, as from c to C ascending. It consists of six full tones, and two semitones major. Its name is derived from the Latin *octo*, eight; because that number likewise includes its extremes. It may likewise be divided into twelve semitones. It contains the whole diatonic scale; and every series above or below consists only of the same returning sound. From whence the natures, distances, and powers, of every interval greater than the octave, as the ninth, the tenth, the eleventh, the twelfth, the thirteenth, the fourteenth, the fifteenth, the triple octave, &c. may easily be computed. See *MUSIC*.

INTESTATE, in law, a person that dies without making a will; in which case, a distribution of his personal estate, after his debts and funeral charges are paid, is to be made among the wife and children of the deceased, or from want of such, among the next of kin. Here the statute, immediately upon the intestate's death, vests an interest in the persons entitled, so that if one dies before the distribution, his share is to go to his executors and administrators, and not to the survivors of the next akin to the intestate. See *ADMINISTRATOR*.

INTESTINA, in the Linnæan System, the first of the five orders of vermes or worms. See *ZOOLOGY*.

INTESTINAL CANAL. See *ANATOMY*.

INTESTINES, [*intestina*, Lat.] those hollow, membranous, cylindrical parts, extended from the right orifice of the stomach to the anus; by which the chyle is conveyed to the lacteals, and the excrements are voided. See *ANATOMY*.

INTONATION, in music, the action of sounding the notes in the scale with the voice, or any other given order of musical tones. Intonation may be either true or false, either too high or too low, either too sharp or too flat; and then intonation, attended with an epithet, must be understood concerning the manner of performing the notes.

INTORSION, in botany, a term used to denote the bending of any of the parts of a plant towards one side.

INTOXICATION, or DRUNKENNESS, is that state in which, from the intemperate drinking of liquors, reason has lost its powers, and the person intoxicated is unable to govern himself. This odious vice is but too prevalent among the lower order of people, who, under the erroneous idea of drowning, cares indulge themselves in strong liquors; and by gradually acquiring habits of intemperance, not only undermine their constitution, but also become a disgrace to society. And we are sorry to have to say that this wicked practice is not only indulged by the vulgar, but also by those whose professions lead us to expect a very different conduct. Drunkenness has different effects on different constitu-

tions; some it makes gay, some sullen, and some furious. 1. It betrays many persons either into extravagancies of anger, or sins of lewdness. 2. It disqualifies men for the duties of their station, both by the temporary disorder of their faculties, and at length by a constant incapacity and stupefaction. 3. It is attended with expences, which can often be ill spared. 4. It occasions uneasiness to the family of the drunkard. 5. It shortens life. To these consequences of drunkenness must be added the peculiar danger and mischief of the example. The ancient Lacedæmonians used to make their slaves drunk, to give their children an aversion and horror for the vice. The Indians hold drunkenness a species of madness; and in their language, the same term (*rangam*), that signifies drunkard, signifies also a phrenetic. It is a direct violation of the law of God, and is repeatedly forbidden in the sacred scriptures. See Eph. v. 18. Rom. xiii. 13. 1 Cor. vi. 9, 10. 1 Thes. v. 7, 8. The state of intoxication greatly resembles that of an incipient palsy or apoplexy. Inebriated persons stagger in all directions; they stammer; every thing appears double; their tongue is in a manner paralytic, and they are often deprived of the faculty of speech. This imbecillity extends to the mind, which is thus rendered totally incapable of reflection. As the brain is overcharged with blood, the vessels pressing on that part are very liable to burst, from the least accidental concussion; and the unfortunate victim of such folly may expire, while he remains insensible of his danger. Drunkenness may be considered as a breach of the law of Nature, which directs us to preserve the use of our reason, and by the English law it is considered as an aggravation rather than an excuse for any criminal behaviour. A drunkard, says Sir Edward Coke, who is voluntarius demon, has no privilege thereby; but what ill soever he doth, his drunkenness doth aggravate it: nam omne crimen ebrietas, et incendit, et detegit. The real use of strong liquors, and the abuse of them by drinking to excess, depend much upon the temperature of the climate. The same indulgence which may be necessary to make the blood circulate freely in Norway would make an Italian mad. By the law of this country, any person who is found intoxicated incurs a penalty of five shillings, or, in case of non-payment, is to be set in the stocks. Those who are guilty of it a second time may be bound in a certain sum for their good behaviour; and, if any alehouse-keeper be convicted of the offence, he is liable to be deprived of his licence for the term of three years. These are wholesome regulations, and it is sincerely to be wished that they were more frequently enforced, as well for the benefit of individuals, as on account of the national character.

INTRADOS, in architecture, the interior and lower side or curve, of the arch of a bridge in contradistinction from the extrados, or exterior curve, or line, on the upper side of the arch.

INTRENCHMENT, in the military art, is any work that fortifies a post against an enemy. It is generally used for a ditch or trench with a parapet. Intrenchments are sometimes made of fascines with earth thrown over them, of gabions, hogheads, or bags filled with earth, to cover the men from the enemy's fire.

INTRIGUE, is used to signify the nodus, or plot, of a play or romance; or that point wherein the principal characters are most embarrassed, through the artifice and opposition of certain persons, or the unfortunate falling out of certain accidents and circumstances. In a tragedy, comedy, or an epic poem, there are always two designs. The first and principal is that of the hero of the piece: the second contains the designs of all those who oppose him. These opposite causes produce opposite effects, viz. the efforts of the hero, for the execution of his design, and the efforts of those who thwart it. As those causes and designs are the beginning of the action, so these efforts are the middle, and there form a knot or difficulty which is called the intrigue, that makes the greatest part of the poem.

INTRODUCTION. See *ORATORY*.

INTRINSIC, a term applied to the inner, real, and genuine values, properties, &c. of any thing, in opposition to their extrinsic or apparent values, &c.

INTRUSION, in law, obtains where an ancestor dies seized of an estate, or inheritance which is expectant upon an estate for life, and the tenant for life dies; after which a stranger enters before the heir, in which case he is said to intrude. Bracton says, that intrusion signifies any unlawful entry upon lands, &c. by a person who has no right to the same, in prejudice of the person to whom they

they are legally descended. The difference between an intruder and an abator, according to Fitzherbert, is this, viz. that an abator enters into lands, &c. void by the death of a tenant in fee, whilst an intruder enters on lands void by the death of a tenant for life or years.

INTUITION, [*intueor*, Lat.] among the logicians, is the act whereby the mind perceives the agreement or disagreement of two ideas, immediately by themselves, without the intervention of any other; in which case the mind perceives the truth as the eye does the light, only by being directed towards it. See **LOGIC**.

INTUITIVE EVIDENCE, is that which results from intuition. Dr. Campbell distinguishes different sorts of intuitive evidence: one resulting purely from intellection, or that faculty which others have called intuition; another kind arising from consciousness; and a third sort from that new-named faculty common sense, which this ingenious writer, as well as several others, contend to be a distinct original source of knowledge, whilst others refer its supposed office to the intuitive power of the understanding.

INVECTED, in heraldry, denotes a thing fluted or furrowed. Inverted is just the reverse of ingrailed, in which the points are turned outward to the field, whereas when invected they are turned inward to the ordinary, and the small semicircles outward to the field.

INVECTIVE, in rhetoric, differs from reproof, as the latter proceeds from a friend, and is intended for the good of the person reproofed; whereas the invective is the work of an enemy, and entirely designed to vex and give uneasiness to the person against whom it is directed.

INVENTION, denotes the act of finding any thing new, or even the thing thus found. Invention is, according to lord Bacon, of two very different kinds, the one of arts and sciences, the other of arguments and discourse: the former he sets down as absolutely deficient. That the other part of knowledge is wanting, says he, seems clear; for logic professes not, nor pretends, to invent either mechanical or liberal arts; nor to deduce the operations of the one, or the axioms of the other: but only leaves us this instruction, "To believe every artist in his own art." His lordship further maintains, that men are hitherto more obliged to brutes than reason for inventions. As to the invention of arts, continues our author, we are rather beholden to the wild goat for chirurgery, to the nightingale for music, to the stork for clysters, to the accidental flying off of a pot's cover for artillery, and, in a word, to chance, or any thing else, rather than logic. Invention is therefore used for a subtilty of mind, or somewhat peculiar in a man's genius, which leads him to the discovery of things new; whence we say a man of invention. Invention, according to Du Bos, is that part which constitutes the principal merit of works, and distinguishes the great genius from the simple artist.

INVENTION, subtilty of mind, or somewhat peculiar to a man's genius, which leads him to a discovery of things new; in which sense we say, a man of invention.

INVENTION, in painting, is the choice which the painter makes of the objects that are to enter the composition of his piece. See **PAINTING**.

INVENTION, in poetry, is applied to whatever the poet adds to the history of the subject he has chosen; as well as to the new turn he gives it. See **POETRY**.

INVENTION, in rhetoric, signifies the finding out and choosing of certain arguments, which the orator is to use for the proving or illustrating his point, moving their passions, or conciliating the minds of his hearers. Invention, according to Cicero, is the principal part of oratory; he wrote four books De Inventionem, whereof we have but two remaining. See **ORATORY**.

INVENTIONS OF ARTS. See **ART**, **CHRONOLOGY**, and the history of the sciences in their order.

IN VENTRE SA MERE, is where a woman is with child at the time of her husband's death; which child, if he had been born, would be heir to the land of the husband. A devise to an infant in ventre sa mere, is good, by way of future executory devise. And where a daughter comes into land by descent, the son, born after, shall put her out, and have the land.

INVENTORY, in law, a catalogue made, of all a deceased person's goods and chattels, at the time of his death, with their value appraised by indifferent persons, which every executor or administrator is obliged to exhibit to the ordinary at such time as he

shall appoint. By 21 Hen. VIII. c. 5, executors and administrators are to deliver in upon oath to the ordinary, indented inventories, one part of which is to remain with the ordinary, and the other part with the executor or administrator; this is required for the benefit of the creditors and legatees, that the executor or administrator may not conceal any part of the personal estate from them. The statute ordains, that the inventory shall be exhibited within three months after the person's decease; yet it may be done afterwards, for the ordinary may dispense with the time, and even with its being ever exhibited, as in cases where the creditors are paid, and the will is executed.

INVER, or **INNER**, a Gaelic word signifying entrance, or mouth, which makes part of the names of a great number of towns, villages, and parishes, in Scotland, situated either at the mouth of a river, or at the entrance of a small river into a larger one.

INVERARAY, or **INVERARY**, a royal borough of Scotland, capital of Argyleshire, pleasantly situated on a small bay formed by the junction of the Ary or Aoreidh with Loch-Fyne. It is forty-five miles N. W. of Glasgow, and seventy-five of Edinburgh. Lon. 5. 0. W. Lat. 56. 16. N.

INVERKEITHING, a royal borough of Scotland, in Fife-shire, on the N. coast of the Frith of Forth, eighteen miles N. W. of Edinburgh. Lon. 3. 25. W. Lat. 57. 0. N.

INVERNESS, or **INVERNESSHIRE**, a county of Scotland, bounded on the N. by Rosshire, on the E. by the shires of Nairne, Murray, and Aberdeen; on the S. by those of Perth and Argyll; and on the W. by the Atlantic Ocean. Its extent from N. to S. is above fifty miles; from E. to W. about eighty. The northern part of this county is very mountainous and barren. In the district of Glenelg are seen the ruins of several ancient circular towers, similar to those in the Western Isles, Sutherland, and Ross, shires; concerning the uses of which antiquaries are not agreed. In their outward appearance, they are round and tapering like glass-houses. In the heart of the wall, which is perpendicular within, there are horizontal galleries going quite round, and connected by stairs. These ascend toward the top, which is open. They are all built of stone, without lime or mortar of any kind. They have no opening outward, except the doors and the top; but there are several in the inside, as windows to the galleries. From Bernera Barracks, in this district, proceeds the military road to Inverness.

INVERNESS, a royal borough, capital of the county, finely seated on the S. bank of the Ness, fifty miles N. E. of Fort William, and 106 N. of Edinburgh. Lon. 4. 5. W. Lat. 57. 30. N.

INVERNESS, New, a town of Georgia, twenty miles from Frederica.

INVERSE, [*inversus*, Lat.] inverted, reciprocal: applied to a manner of working the rule of three, which seems to go backward, i. e. contrary to the order of the common and direct rule: so that, whereas, in the direct rule, more requires more, and less requires less, in the inverse rule, more requires less, and less requires more. E. G. in the direct rule it is said, if three yards of cloth cost 20s. how much will six yards cost? The answer is 40s. where more yards require more money, and less yards require less money. But in the inverse rule it is said, if twenty men perform a piece of work in four days, in how many days will forty men perform as much? The answer is two days; and here the more men require the less time, and the fewer men the more time. See **ARITHMETIC**, where a general rule is given, including questions in the rule of three, direct and inverse.

INVERSE METHOD OF FLUXIONS, is the method of finding fluents, from the fluxions being given; and is similar to the Calculus Integralis. See **CALCULUS**.

INVERSE METHOD OF TANGENTS, is the method of finding the curve belonging to a given tangent; as opposed to the direct method, or the finding the tangent to a given curve. As, to find a curve whose subtangent is a third proportional to $r-y$ and y , or whose subtangent is equal to the semi-ordinate, or whose subnormal is a constant quantity. The solution of this problem depends chiefly on the inverse method of fluxions.

INVERSE PROPORTION, or **INVERSE RATIO**, is that in which more requires less, or less requires more; e. g. in the case of light or heat from a luminous object, the light received is less at a greater distance, and greater at a less distance; so that here more as to distance, gives less, as to light, and less distance gives more light.

This is usually expressed by the term *inversely*, or *reciprocally*; as in the case above, where the light is *inversely*, or *reciprocally*, as the square of the distance; or in the inverse or reciprocal duplicate ratio of the distance.

INVERSION, [*inversio*, Lat.] the act whereby any thing is turned backwards. Problems in geometry and arithmetic are often proved by inversion; that is, by contrary rule or operation.

INVERSION, [*invertendo*, Lat.] or **BY INVERSION**, according to Euclid's fourteenth definition, lib. 5, is inverting the terms of a proportion, by changing the antecedents into consequents, and the consequents into antecedents. As in these, $a : b :: c : d$, then by inversion $b : a :: d : c$.

INVERSION, in grammar, is where the words of a phrase are ranged in a manner not so natural as they might be, *e. g.* "Of all vices the most abominable, and that which least becomes a man, is impurity." Here is an inversion; the natural order being this: Impurity is the most abominable of all vices, and that which least becomes a man. An inversion sometimes has a good effect, and is much used in Latin.

INVERTED, in music, signifies a change in the order of the notes which form a chord, or in the parts which compose harmony: which happens by substituting in the bass, those sounds which ought to have been in the upper part: an operation not only rendered practicable, but greatly facilitated, by the resemblance which one note has to another in different octaves; whence we derive the power of exchanging one octave for another with so much propriety and success, or by substituting in the extremes those which ought to have occupied the middle station; and vice versa.

INVERURY, a royal borough of Scotland in Aberdeenshire, 14 miles N. W. of Aberdeen.

INVEST A TOWN, or FORT, is when a general intending to besiege it, detaches a body of horse to possess all the avenues; blocking up the garrison, and preventing relief from getting into the place, till the army and artillery are got up to form the siege.

INVESTIGATION properly denotes the searching or finding out any thing by the tracts of the feet; whence mathematicians, schoolmen, and grammarians, use it in their respective researches, to denote the tracing or searching out of any thing to its source.

INVESTITURE, in law, the giving livery of seisin, or possession; it was anciently attended with a great variety of ceremonies. At first they were made by a certain form of words, and afterwards by such things as had the greatest resemblance to the thing to be transferred: thus, where lands were intended to pass, a turf, &c. was delivered by the granter to the grantee. In the church, it was customary for princes to make investiture of ecclesiastical benefices, by delivering to the person they had chosen a pastoral staff and a ring.

INULA, ELECAMpane; a genus of the polygamia superflua order, and syngenesia class of plants; natural order, Compositae. Receptacle naked; pappus simple; antherae, at the base, ending in two bristles. It has thirty-four species, chiefly herbaceous plants.

1. **HELENIUM, or COMMON ELECAMpane**, is a native of Britain, and cultivated in gardens for the sake of the root, which is used in medicine. The root is perennial, thick, branching, and of a strong odour. The lower leaves are eight or nine inches long, and four broad in the middle, rough on the upper side, but downy on the under. The stalks rise about four feet high, and divide toward the top into several smaller branches, garnished with oblong oval leaves indented on their edges, ending in acute points. It may be propagated in autumn by seeds or offsets. The root, especially when dry, has an agreeable aromatic smell; its taste, on chewing, is glutinous, and somewhat rancid; in a little time it discovers an aromatic bitterness, which by degrees becomes considerably acrid and pungent. It possesses the general virtues of alexipharmacs; and is principally recommended for promoting expectoration in humoral asthmas and coughs. Liberally taken, it is said to excite urine, and to loosen the belly. In some parts of Germany large quantities of this root are candied, and used as a stomachic for strengthening the tone of the viscera in general, and for attenuating tenacious juices. Spirituous liquors extract its virtues in greater perfection than water.

INUNDATÆ, in botany, the fifteenth order in Linnaeus's Fragments of a Natural Method; it includes those plants which grow in the water. See **BOTANY**.

INVOCATION, in theology, the act of adoring God, and especially of addressing him in prayer for his assistance and protection. See **ADORATION**, and **PRAYER**. The difference between the invocation of God and of the saints, as practised by the Papists, is thus explained in the catechism of the council of Trent: "We beg of God, to give us good things, and to deliver us from evil; but we pray to the saints, to intercede with God, and obtain those things which we stand in need of. Hence we use different forms in praying to God and to the saints: to the former we say, hear us, have mercy on us; to the latter we only say, pray for us." The council of Trent expressly teaches, that the saints who reigned with Jesus Christ offer up their prayers to God for men; and condemn those who maintain the contrary doctrine. The Protestants reject this practice as contrary to scripture, deny the truth of the fact, and think it absurd to suppose, that a limited finite being should be in a manner omnipresent, and at one and the same time hear and attend to prayers offered to him in England, China, and Peru. Hence they infer, that if the saints cannot hear us, it is folly to pray to them. 2. E. D.

INVOCATION, in poetry, an address at the beginning of a poem, wherein the poet calls for the assistance of some divinity, particularly of his Muse, or the deity of his poetry.

INVOICE, [perhaps corrupted from the French word *envoyez*, send,] a catalogue of the freight of a ship, or of the articles and price of goods sent by a factor; or an account in writing of the particulars of merchandise, with their value, custom, charges, &c. transmitted by one merchant to another in a distant country. See **BOOK-KEEPING**.

INVOLUCRUM, in botany, that sort of cup which surrounds a number of flowers together, every one of which has also its particular perianthium. It consists of a multitude of little leaves disposed in a radiated manner. See **BOTANY**.

INVOLUTE FIGURE, or CURVE, in the higher geometry, is that which is traced out by the outer extremity of a string, as it is folded or wrapped upon another figure, or as it is unwound from off it. The involute of a cycloid is also a cycloid equal to the former. Huygens, by means of this, fell upon the plan of making a pendulum vibrate in the curve of a cycloid, and in equal times, whatever be the length of the curve or arc in which it vibrates. See **EVOLUTE**.

INVOLUTION, in algebra and arithmetic, the raising any quantity from its root to any height or power assigned. See **ALGEBRA**, and **ARITHMETIC**.

IO, in fabulous history, the daughter of Inachus, or according to others of Jasion and Pirene, was priestess of Juno at Argos. Jupiter became enamoured of her, but Juno having surprised him in her company, Jupiter changed Io into a beautiful heifer; and the godless, knowing the fraud, obtained from her husband the animal whose beauty she pretended to commend. Juno commanded the hundred-eyed Argus to watch the heifer; but Jupiter sent Mercury to destroy Argus, and restore Io to her liberty. Juno then sent one of the Furies to torment her. She wandered over the greatest part of the earth, and crossed over the sea, till at last she stopped on the banks of the Nile, still exposed to the torments of the Fury. Here Jupiter restored her to her natural form, after which she brought forth Epaphus. Afterwards she married Osiris, king of Egypt, and treated her subjects with such mildness, that after death she was worshipped under the name of Isis. According to Herodotus, Io was carried away by Phœnician merchants, who wished to make reprisals for Europa, who had been stolen by the Greeks.

JOAB, [אַבְיָ, Heb. *i. e.* Fatherhood,] a brave general of the Israelites under King David, the son of Zeruiah, David's sister, and brother of Abishai and Asahel. His defeat of the army under Abner, his capture of the fort of Zion from the Jebusites, and his victories over the Moabites, Philistines, Edomites, Syrians, Ammonites, and the rebels under Absalom and Sheba; as well as his intercession for Absalom, and his judicious advices to David against mourning for his death, and against numbering the people, are recorded in 2 Sam. ii—xxiv. He was a faithful adherent to his royal uncle, in his adversity as well as in his prosperity, and seems to have merited a more grateful return, than he met with on several occasions. In one instance, indeed, he served David rather

rather too faithfully, by procuring the murder of the brave Uriah. But his disobedience to David's orders respecting Absalom, by putting to death that ungrateful monster, was certainly an act of public justice, as well as of mercy to his deluded followers. See ABSALOM. Joab's greatest crimes appear to have been his treacherously murdering Abner and Amasa; for there seems to have been nothing criminal or treasonable in his joining the party of Adonijah, the heir apparent, and for these murders he was justly put to death by Solomon's order, B. C. 1014.

JOACHIM, a celebrated monk, born at Celico, near Cosenza. He went on a pilgrimage to the Holy Land, and on his return joined the Cistercians; became abbot of Flora in Calabria, and founded several other monasteries, which he governed with great discretion. He was regarded by his followers as a prophet, and his predictions were printed in a work entitled, "The Everlasting Gospel." He wrote several other books, and died in 1202.

JOACHIMITES, in church history, the disciples of Joachim. They were particularly fond of certain ternaries: the Father, they said, operated from the beginning till the coming of the Son; the Son, from that time to theirs; (A. D. 1260;) and from that time the Holy Spirit was to operate. They also divided every thing relating to men, to doctrine, and the manner of living, into three classes, according to the three persons in the Trinity.

JOACHIMSTHAL, a town of Brandenburg, 17 miles S. of Prenzlau.

JOAG, the frontier town of the kingdom of Kajaaga, in Africa. Lon. 9. 46. W. Lat. 14. 25. N.

JOAN, POPE, called by Platina John VIII. is said to have held the holy see between Leo IV. who died in 855, and Benedict III. who died in 858. Marianus Scotus says, she sat two years, five months, and four days. Numberless have been the controversies, fables, and conjectures relating to this pope. It is said that a German girl, pretending to be a man, went to Athens, where she made great progress in the sciences; and afterward came to Rome in the same habit. As she had a quick genius, and spoke with a good grace in the public disputations, her great learning was so much admired, that after the death of Leo, she was chosen pope, and performed all offices as such.

JOAN OF ARC, or the MAID OF ORLEANS, the greatest female patriot, that any age or country has produced. She was born in the village of Domremi, near Vaucouleurs. She had been a servant at a small inn; and had submitted to those hard employments which fit the body for the fatigues of war. She was of an irreproachable life, and had hitherto discovered none of those enterprising qualities which appeared soon after. She contentedly fulfilled the duties of her situation, and was remarkable only for her modesty and religion. But the miseries of her country, then involved in war, was one of the greatest objects of her compassion. Her mind, inflamed by these objects, began to feel several impulses, which she considered as the inspirations of heaven. At the age of about twenty-seven she had recourse to one Baudricourt, governor of Vaucouleurs, and informed him of her destination by heaven to free her native country. Baudricourt treated her at first with neglect; but her importunities prevailed; and willing to make a trial of her pretensions, he gave her some attendants, who conducted her to the court, which at that time resided at Chinon. The French court were probably sensible of the weakness of her pretensions; but they were willing to make use of every artifice to support their declining fortunes. It was therefore given out, that Joan was inspired; that she had discovered the king among the number of his courtiers, although without any distinction of his authority; that she had told him alone some secrets; and that she had demanded, and minutely described, a sword in the church of St. Catharine de Fierbois, which she had never seen. In this manner, the minds of the vulgar being prepared for her appearance, she was armed cap à pée, and shewn to the people. She was then brought before the university; and they, willing to second the imposture, declared that she had actually received her commission from above. When her mission was completely blazoned, the next aim was to send her against the enemy. The English were then besieging Orleans, the last resource of Charles VII. and every thing promised a speedy surrender. Joan undertook to raise the siege; and girded herself with the miraculous sword. Thus equipped, she ordered all the soldiers to confess themselves before they set out; she displayed

a consecrated banner, and assured the troops of certain success. Such confidence soon raised the spirits of the French army; and even the English, who pretended to despise her, felt secretly the terrors of her mission. A supply of provisions was to be conveyed into the town; Joan, heading some French troops, covered the embarkation, and entered Orleans at the head of the convoy. While leading her troops along, a dead silence and astonishment reigned among the English; and they regarded with religious awe that temerity, which they thought nothing but supernatural assistance could inspire. But they were soon roused from their amazement by a sally from the town; Joan led on the besieged, bearing the sacred standard in her hand, encouraging them with her words and actions, bringing them to the trenches, and overpowering the besiegers in their own redoubts. In attacking one of the forts, she was wounded in the neck with an arrow; but instantly pulling out the weapon with her own hands, and getting the wound quickly dressed, she hastened back to head the troops, and to plant her victorious banner on the ramparts of the enemy. These successes continuing, the English found it impossible to resist troops animated by such superior energy; and Suffolk, who conducted the attack, thinking that it might prove extremely dangerous to remain any longer in the presence of such a victorious enemy, raised the siege, and retreated with all imaginable precaution. From being attacked, the French in turn became the aggressors. Charles formed a body of 6000 men, and sent them to besiege Jargeau, whither the earl of Suffolk had retired, with a detachment of his army. The city was taken; Suffolk yielded a prisoner; and Joan marched into the place in triumph. A battle was soon after fought near Patay, where the English were worsted, as before; and the generals Scales and Talbot were taken prisoners. The raising of the siege of Orleans was one part of the maid's promise to Charles; the crowning him at Rheims was the other. She now declared that it was time to complete that ceremony; and Charles, by her advice, set out for Rheims at the head of 12,000 men. The towns through which he passed opened their gates to receive him; and Rheims sent him a deputation, with its keys, upon his approach. The ceremony was there performed with the utmost solemnity; and the Maid of Orleans (for so she was now called) seeing the completion of her mission, desired leave to retire. But the king could not think of parting with her; he pressed her to stay so earnestly, that she at length complied. A tide of success followed this solemnity; Laon, Soissons, Chateau Thierry, Provins, and many other fortresses, submitted on the first summons. The English, discomfited and dispirited, fled on every quarter; not knowing whether to ascribe their misfortunes to the power of sorcery or to a celestial influence; but equally terrified at both. They now found themselves deprived of the conquests they had gained, as rapidly as the French had formerly submitted to their power. The duke of Burgundy, at the head of a powerful army, had laid siege to Compiègne; and the Maid of Orleans had thrown herself into the place, contrary to the wishes of the governor, who did not desire the company of one whose authority would be greater than his own. The garrison, however, rejoiced at her appearance, and believed themselves invincible. But their joy was of short duration; for Joan having the day after her arrival headed a sally, and twice driven the enemy from their entrenchments, she was at last obliged to retire, placing herself in the rear, to protect the retreat of her forces. But in the end attempting to follow her troops into the city, the gates were shut, and the bridge drawn up by order of the governor, who is said to have long wished for an opportunity of delivering her up to the enemy. As Joan before, from her successes, was regarded as a saint, she was now, upon her captivity, considered as a sorceress, forsaken by the demon who had granted her a temporary and fallacious assistance. Accordingly it was resolved to send her to Rouen to be tried for witchcraft: and the bishop of Beauvais, a man devoted to the English interest, presented a petition against her for that purpose. The university of Paris were so mean as to join in the request. She was tried, and at first sentenced to perpetual imprisonment, and afterwards to be burnt. But a judicious writer in the Monthly Mag. has lately proved that she did not suffer the horrid death to which she was condemned. "The bishop of Beauvais (says he) is accused by all parties of treachery and trick in the conduct of the trial. It was his known propensity to gain his ends by stratagem, craft, manœuvre, fraud, and dexterity."

terity. He seeks out and brings forward such testimony only as relates to ecclesiastical offences, and then hands over the decision to the secular judges, whose clemency he invokes. Joan says to him publicly, "You promised to restore me to the church, and you deliver me to my enemies." (Villaret. *Histoire de France*, liv. xv. page 72.) "The intention of the bishop, then, must have been, that the secular judges, for want of evidence, should see no offence against the state; as the clerical judges, notwithstanding the evidence, had declined to see any against the church. A fatal sentence was, however, pronounced; and the fulfilment of it entrusted to the ecclesiastical authorities. Immediately after the auto da fe, one of the executioners, ran to two friars, and said, that he had never been so shocked at any execution, and that the English had built up a scaffolding of plaster (an échafaud de plâtre) so lofty, that he could not approach the culprit, which must have caused her sufferings to be long and horrid." (Pasquier *Hist. d'Orléans*, liv. vi.) "She was therefore, by some unusual contrivance, kept out of the reach and observation even of the executioners. Some time after, when public commiseration had succeeded to vindictive bigotry, a woman appeared at Metz, who declared herself to be Joan of Arc. She was every where welcomed with zeal. At Orléans, especially, where Joan was well known, she was received with the honours due to the liberatrix of their town. She was acknowledged by both her brothers, Jean and Pierre d'Arc. On their testimony she was married by a gentleman of the house of Amboise, in 1436. At their solicitation her sentence was annulled in 1456. (*Hist. de la Pucelle*, par l'Abbé Lenglet. *Mélanges Curieux Monstrelet*, &c.) The Parisians, indeed, long remained incredulous; they must else have punished those ecclesiastics, whose humanity, perhaps, conspired with the bishop of Beauvais, to withdraw her from real execution down a central chimney of brick and mortar; or, as the executioner called it, a scaffolding of plaster. The king is stated to have received her with these words: "Pucelle, m'amic, soyez la tres bien revenue, au nom de Dieu." She is then said to have communicated to him, kneeling, the artifice practised. Our author cannot think this woman an impostor, and he appeals to Voltaire, who, in his prose works, allows, that she was not one of those half insane enthusiasts, employed as tools to work on the vulgar, whom the one party cry up as a prophetess, and the other cry down as a witch; but that she was a real heroine, superior to vulgar prejudice, and no less remarkable by force of mind, than for a courage and strength unusual in her sex. This opinion is supported by her behaviour in adversity, which was firm without insolence, and exalted without affectation.

JOANNA, or HINZUAN, one of the Comora Islands, between the N. end of Madagascar, and the continent of Africa. This island has been described by Major Rooke; who says, that Joanna is a proper place of refreshment for the India ships, whose crews, when ill of the scurvy, soon recover by the use of limes, lemons, and oranges, and by the air of the lands. The horned cattle are a kind of buffaloes, having a large hump on their shoulders, which is very delicious eating; but there is not one horse, mule, or ass, in all the island. The original natives, in number about 7000, occupy the hills, and are generally at war with the Arabian interlopers, who established themselves on the sea-coast by conquest, and are about 3000 in number. Though Joanna is not the largest, it may be reckoned the principal of the Comora islands; it claims sovereignty over, and exacts tribute from, all the others. They have a regular form of government, and exercise the Mohammedan religion; both being introduced by the Arabians.

JOANNA, a town on the E. side of the above island, close to the sea, at the foot of a very high hill, about a mile and a half in circuit, and three-fourths of a mile long. Lon. 44. 15. E. Lat. 12. 30. S.

JOAO, ST. DE PESQUIERA, a town of Portugal, in Beira, on the Duero, 12 miles N. E. of Viseu.

JOASH, [יֹאָשָׁ, Heb. *i. e.* the fire of the Lord,] the son of Ahaziah, King of Judah, the only one of the blood royal, who was preserved from his grandmother's bloody massacre. His preservation, coronation, relapse into idolatry, and ungrateful murder of his cousin Zechariah, the son of his benefactors, with his consequent misfortunes, and merited death, A. M. 3165, and B. C. 839, are recorded in 2 Kings xi. xii. and 2 Chron. xxiii. xxiv.

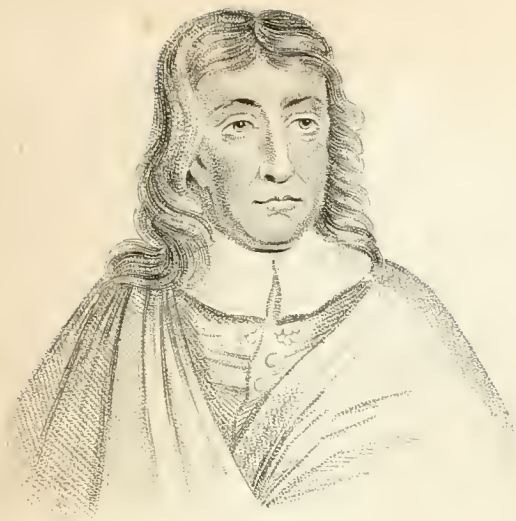
JOB, [יֹב, Heb. *i. e.* patient,] an ancient inhabitant of the land of Uz, E. of Gilead, remarkable for his patience in the midst of the most accumulated and extreme adversity. Many authors have supposed, with the Jewish rabbins, that the character of Job is entirely parabolical, or fictitious; but this is highly improbable, as not only the apostle James (ch. v. 41,) mentions him as a real character, but the language applied to him by the Almighty himself in Ezekiel xiv. 14, 20, puts the matter beyond all possibility of doubt. In that passage he is ranked with Noah and Daniel, (who, we are sure, were no fictitious characters,) as one of the three most righteous persons that had ever existed. The period in which Job lived has also been much disputed; but many passages in the book of Job plainly shew, that he flourished in the patriarchal age. The allusions to the deluge and the destruction of Sodom, and the total silence of Job and his friends with respect to the law, (which is never once quoted,) and to the departure of the Israelites out of Egypt, shew that he must have lived between the former and the latter of these events. But what fixes the chronology of Job, almost to a certainty, is that his aged friend, Eliphaz the Temanite, is expressly recorded to have been the son of Esau, and the father of Teman; (Gen. xxxvi. 10, 11,) who is said to have built a city named after himself, in which his father resided, and was hence called a Temanite. Alstedius, in his *Thesaurus Chronologicus*, proceeding upon that probability, fixes the era of Job's sufferings in the years of the world 2330, and 2331; and gives two genealogies of Job, by one of which he makes him the son of Uz, or Huz, (mentioned, Gen. xxii. 21,) the eldest son of Nahor, Abraham's brother; and by the other, for which he quotes the authority of the LXX, in their appendix to the book of Job, he makes him the same with Jobab, king of Edom, (mentioned, Gen. xxxvi. 33,) the son of Zerah, or Serah, the son of Reuel, and grandson of Esau, by Bashemath, the daughter of Ishmael. According to this genealogy, Eliphaz was Job's grand-uncle, which is not improbable. Alstedius also tells us, that Dinah, Jacob's daughter, was Job's wife. Dr. Watkins, in his *Biogr. and Hist. Diet.* fixes the birth of Job to about B. C. 1700. The descent of Elihu, also, (mentioned in chap. xxxii. ver. 2,) from Buz, the second son of Nahor, (Gen. xxii. 21,) is an additional confirmation, that Job lived about this period.

JOB, THE BOOK OF, a canonical book of the Old Testament, containing a narrative of Job's misfortunes, the uncharitable surmises of his friends, and his final restoration to prosperity. Those, who have supposed Job to be a fictitious character, have fancied the book of Job to be dramatic. But this book will be read with most instruction, by those who consider it as a simple narrative of facts, left on record to remind us, that though "Man is born to trouble," and although many trials and difficulties frequently embitter the cup of mortals, yet the design of the Almighty in permitting these afflictions, is for our ultimate profit and welfare. In the account we have of the "Sons of God presenting themselves," &c. and the agency by which Job was tried and afflicted, the attentive student of Scripture, will find interesting information as to the nature and operation of that Evil Spirit, distinguished by the name Satan. The style of this book is highly poetical, and abounds with the most sublime imagery. It is uncertain who was the writer of this book. Some think Job himself, others Moses, in which opinion many Christian writers agree with the rabbins; but from chap. xxxii. 15 and 16, it appears most probable, that Elihu was the author.

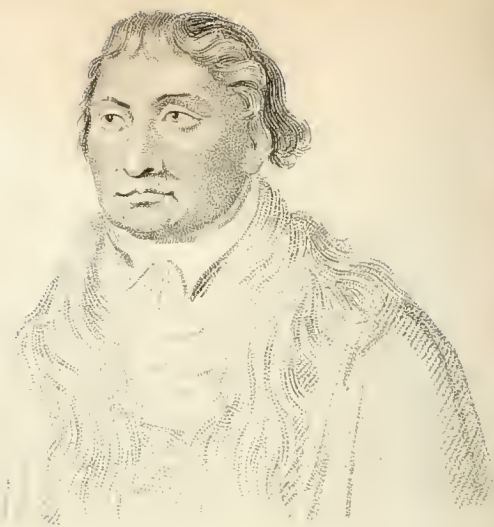
JOCASTA, in fabulous history, the daughter of Menœceus, and wife of Laius king of Thebes, by whom she had Œdipus.

JOGHIS, a sect of heathen religious in the East Indies, who never marry, nor hold any thing in private property; but live on alms, and practise strange severities on themselves.

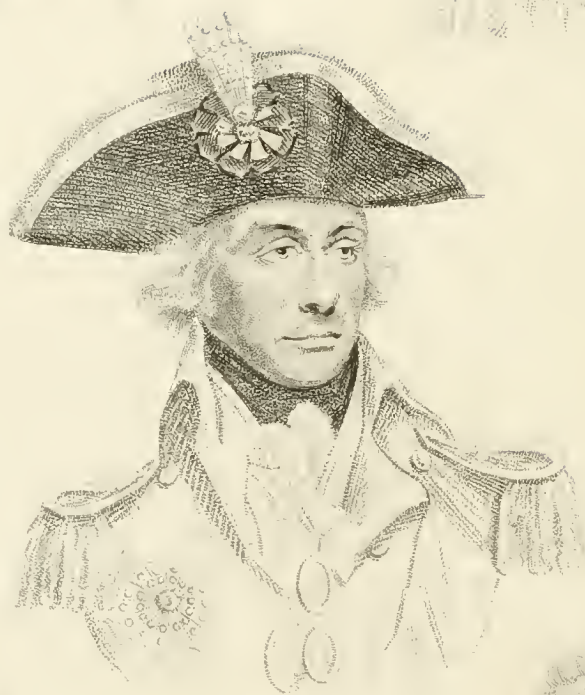
JOGUES, or YOOGS, four ages, æras, or periods, of extraordinary length, in the chronology of the Hindoos. Dr. Robertson in his observations on these periods, from the Notes to his *Historical Disquisition concerning India*, says, "if we suppose the computation of the time in the Indian chronology, to be made by solar or even by lunar years, nothing can be more extravagant in itself, or more repugnant to our mode of calculating the duration of the world, founded on sacred and infallible authority. From one circumstance, however, which merits attention, we may conclude, that the information which we have hitherto received concerning the chronology of the Hindoos is very incorrect. We have, as far as I know, only five original accounts of the different Jogues



John Milton.



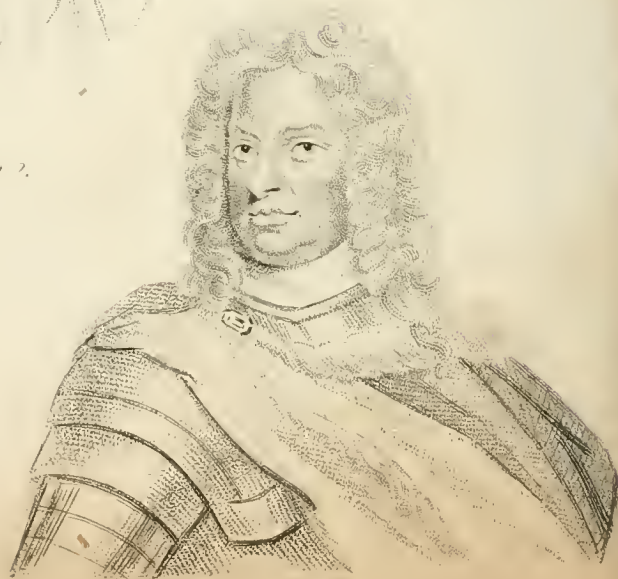
Luther.



Lord Nelson.



Dr. Johnson.



Duke of Marlborough.

or aras of the Hindoos. The first is given by M. Roger, who received it from the Brahmins on the Coromandel coast. According to it, the Sutte Jogue is a period of 1,728,000 years; the Tirtah Jogue is 1,296,000 years; the Dwapaar Jogue is 864,000. The duration of the Collee Jogue he does not specify. (*Porte Ouverte*, p. 179.) The next is that of M. Bernier, who received it from the Brahmins of Benares. According to him the duration of the Sutte Jogue was 2,500,000 years; that of the Tirtah Jogue 1,200,000 years; that of the Dwapaar Jogue 864,000 years. Concerning the period of the Collee Jogue, he likewise is silent; (*Voyages*, tom. ii. p. 160. The third is that of colonel Dow; according to which the Sutte Jogue is a period of 14,000,000 of years, the Tirtah Jogue 1,080,000, the Dwapaar Jogue 72,000, and the Collee Jogue 36,000 years: (*Hist. of Hindost.* vol. i. p. 2.) From this discrepancy, not only of the total numbers, but of many of the articles in the different accounts, it is manifest, that our information concerning Indian chronology is hitherto as uncertain, as the whole system of it is wild and fabulous. To me it appears highly probable, that when we understand more thoroughly the principles upon which the fictitious aras or jogues of the Hindoos have been formed, we may be more able to reconcile their chronology to the true mode of computing time, founded on the authority of the Old Testament; and may likewise find reason to conclude, that the account given by their astronomers, of the situation of the heavenly bodies at the beginning of the Collee Jogue, is not established by actual observation, but the result of a retrospective calculation."

JOHANNESBURG, a town of Prussia, 84 miles S. S. E. of Königsberg.

JOHERS, or **JOWERS**, a numerous and powerful tribe of Africans, in the kingdom of Kaarta, who, though converts to the Mohammedan faith, at least to the ceremonial part of it, retain all their ancient superstitions.

JOHN O'GROAT'S HOUSE, an ancient house, in Caithness-shire, seated on Dungis-bay, or Duncan's Bay Head, and remarkable for being the most northerly point in Great Britain; on which account it has been often visited by travellers.

JOHN'S DAY, **ST.** the name of two Christian festivals; one observed on June 24th, kept in commemoration of the wonderful circumstances attending the birth of John the Baptist; and the other on December 27th, in honour of St. John the evangelist.

JOHNS-HAVEN, a town of Scotland, on the coast of Kincardineshire, about eight miles N. of Montrose and four S. of Berwick.

JOHN'S ISLAND, an island of South Carolina, S. W. of Charleston harbour, separated from James's Island by the Stono.

JOHN'S LAKE, **ST.** a large lake of Canada, which receives rivers in every direction, and sends its waters into the St. Lawrence: its nearest part is 36 leagues N. N. W. of Quebec. Lon. 72. 25. W. Lat. 48. 25. N.

JOHNSON, SAMUEL, an English divine, born in 1649; and, entering into orders, obtained, in 1670, the rectory of Corringham in Essex, worth 80l. a year; which was the only church-preferment he ever had. The times were turbulent; the duke of York declared himself a Papist: his succession to the crown began to be warmly opposed; and Mr. Johnson, being made chaplain to Lord William Russel, engaged Dr. Hicks, the ecclesiastical champion for passive obedience, in a treatise entitled *Julian the Apostate*, &c. published in 1682, for which he was condemned to pay a fine of 500 marks, and to lie in prison till it was paid. By the assistance of Mr. Hampden, who was his fellow-prisoner, he was enabled, on the encampment of the army on Hounslow heath, in 1686, to print and disperse, An humble and hearty address to all the Protestants in the present Army; for this he was sentenced to pay a second fine of 500 marks; to be degraded from the priesthood, to stand twice in the pillory, and to be whipped from Newgate to Tyburn. This was executed with rigour, and he bore it with firmness and even alacrity. On the Revolution, the parliament resolved the proceedings against him to be null and illegal; and recommended him to the king, who offered him the rich deanery of Durham: but this he refused, as inadequate to his services and sufferings. Through Dr. Tillotson he obtained a pension of 300l. a year with some other gratifications; notwithstanding which he wrote against a standing army, and the great favour shewn to the Dutch. He died in 1703, and his works were afterwards collected in one vol. folio.

JOHNSON, SAMUEL, a learned critic, lexicographer, and miscellaneous writer, was born in 1706 at Litchfield, where his father was a bookseller. He was educated partly at the free school of Litchfield, and in 1728 was admitted of Pembroke college, Oxford, which he left in 1731 without a degree. He soon after lost his father, who left him in such poor circumstances that he became usher of the school at Bosworth, where, however, he did not continue long. We next find him residing with a printer at Birmingham, where he translated Lobo's account of Abyssinia. In 1735 he married a widow lady of that town, and the same year opened a school at Edial near Litchfield, but he obtained only three scholars, one of whom was David Garrick. About this time he began his tragedy of *Irene*. In 1737 he set out for the metropolis accompanied by Garrick. On fixing his residence in London he formed a connection with Cave, the publisher of the *Gentleman's Magazine*, for which work he continued to write several years, his principal department being an account of the parliamentary debates. At this period he contracted an intimacy with Richard Savage, whose name he has immortalized by one of the most instructive pieces of biography ever written. In 1738 appeared his imitation of Juvenal's third Satire, under the title of *London*, a poem. In 1747 he printed proposals for an edition of Shakespeare, and the plan of his *English Dictionary*, addressed to Lord Chesterfield. The price agreed upon between him and the booksellers for the last work was 1757l. In 1749 Garrick brought his friend's tragedy on the stage of Drury-lane, but it was unsuccessful. In 1750 he commenced his *Rambler*; a periodical paper of uncommon merit, and which was continued till 1752. In this work only five papers were the productions of other writers. Soon after the close of this paper he lost his wife, a circumstance which greatly affected him, as appears from his *Meditations*, and the sermon which he wrote on her death. In 1755 appeared his *Dictionary*, and the same year the university of Oxford conferred on him the degree of M. A. Lord Chesterfield also endeavoured to assist it by writing two papers in its favour in the *World*, but as he had hitherto neglected the author, Johnson treated him with contempt. The publication of this great work did not relieve him from his embarrassments, for the price of his labour had been consumed in the progress of its compilation, and the year following we find him under an arrest for five guineas, from which he was released by Richardson the printer. In 1758 he began the *Idler*, a periodical paper, which was published in a weekly newspaper. On the death of his mother in 1759 he wrote the romance of *Rasselas* to defray the expences of her funeral, and to pay her debts. In 1762 the king granted him a pension of 300l. per annum, without any stipulation with respect to his literary exertions. Johnson had the honour of a conversation with the king in the royal library, in 1765, when his majesty asked if he intended to publish any more works? To this he answered, that he thought he had written enough; on which the king said, "so should I too, if you had not written so well." About this time he instituted the *Literary Club*, consisting of some of the most celebrated men of the age. In 1773 he went on a tour with Mr. Boswell to the western islands of Scotland, of which journey he shortly after published an account, which occasioned a difference between him and Macpherson relative to the poems of *Ossian*. In 1775 the university of Oxford sent him the degree of LL. D. by diploma, which before had been conferred on him by the university of Dublin. In 1779 he began his *Lives of the English Poets*, which work is a treasure of sound criticism, and a model of literary biography. After a long illness, during part of which he had fearful apprehensions of death, but at last his mind became calm, composed, and resigned, he died full of that faith which he had so vigorously defended and inculcated by his writings, December 13, 1784. His remains were interred in Westminster-abbey, and a statue with an appropriate inscription has been erected to his memory in St. Paul's cathedral. His works have been published in 12 volumes, 8vo. As a writer few have done such essential service to his country, by fixing its language, and regulating its morality. In his person he was large, robust, and unwieldy. In his dress he was singular and slovenly; in conversation positive, and impatient of contradiction. But with his singularities he had an excellent heart, full of tenderness and compassion, and all his actions were the result of principle. He was a stout advocate for truth, and a zealous champion for the Christian religion as professed in the church of England. In politics he was a tory, and at one period of his life a friend

friend to the house of Stuart. He had a noble independence of mind, and would never stoop to any man however exalted, or disguise his sentiments to flatter another. His judgement was uncommonly acute, his imagination quick and ready, his memory tenacious, and his conversation brilliant and instructive. Watkins.

JOINSONIA, or **CALLICARPA**, a genus of the monogynia order and tetrandria class of plants. Natural order *Dumoseæ*. Calyx four-lobed; corolla four-lobed; berry four-seeded. There are seven species, of which *C. Americana*, American *callicarpa*, is a shrub from four to six feet in height.

JOHN'S POINT, *Str.* a cape of Ireland, on the S. coast of the county of Down. Lon. 5. 34. W. Lat. 54. 9. N.

JOHN'S RIVER, *Str.* a river of North America, which rises near a large swamp, in the heart of East Florida. The bar at the mouth, which is thirty-one and a half miles N. of St. Augustine, is liable to shift.

JOHN'S RIVER, *Str.* a river of North America, which forms the boundary between Canada and Labrador, and runs into the St. Lawrence, in Lon. 63. 10. W. Lat. 50. 20. N.

JOHN'S, *Str.* an island of the East Indies, and one of the Philippines E. of Min lauto, from which it is separated by a narrow strait. Lon. 125. 25. E. Lat. 9. 30. N.

JOHN'S, *Str.* an island of North America, in the bay of St. Lawrence, having Nova Scotia on the S. and W. and Cape Breton on the E. Charlottetown is the capital. Lon. 63. 0. W. Lat. 46. 20. N.

JOHN'S, *Str.* a town of Nova Scotia in New Brunswick. Lon. 65. 15. W. Lat. 45. 12. N.

JOHN'S, *Str.* the capital of Antigua.

JOHN'S, *Str.* an island in the West Indies, belonging to Denmark, N. of St. Croix, and S. of Tortola, to which it is very near.

JOHN'S, *Str.* a town and bay of Newfoundland, on the E. coast, with an excellent harbour. Lon. 52. 29. W. Lat. 47. 32. N.

JOHN'S, *Str.* an island and bay on the W. coast of Newfoundland; S. W. of the straits of Belleisle.

JOHNSTON, *DR. ARTHUR*, was born at Caskieben, near Aberdeen, the seat of his ancestors, and probably was educated at Aberdeen, as he was afterwards advanced to the highest dignity in that university. He studied physic, and travelled to improve himself in that science. He was twice at Rome; but he chiefly resided at Padua, in which university the degree of M. D. was conferred on him in 1610. In 1633, Charles I. went into Scotland, and made bishop Laud a member of council; when an acquaintance began between the doctor and that prelate, which produced his *Psalmorum Davidis Paraphrasum Poetica*; a specimen of which, printed at London, was dedicated to his lordship. To perfect the whole, took him up four years; and the two first editions complete were published at Aberdeen, and London, in 1637. In 1641, Dr. Johnston being at Oxford, on a visit to one of his daughters who was married to a divine of the church of England in that place, was seized with a violent diarrhoea, of which he died in a few days, in the 54th year of his age. He was buried in the place where he died; which gave occasion to the following lines of his learned friend Wedderburn in his *Suspiria* on the Doctors death:

Scotia maesta, dole, tanti viduata sepulchro
Vatis; is Angligenis contigit altus honos.

JOHNSTON, a township of Rhode Island, in Providence county.

JOHNSTOWN, a town and an extensive township of New York, with several districts and settlements.

JOHNSTOWN, *Str.* a town of Ireland, in the county of Longford, six miles N. E. of Longford.

JOHORE, *JOR*, or *JIHOR*, a town of Malacca. Lon. 93. 55. E. Lat. 1. 15. N.

JOIGNI, or **JOIGNY**, a town of France, in the department of Yonne, and late province of Champagne, thirty-four miles S. W. of Troyes.

JOINERY, the art of working in wood, or of fitting various pieces of timber together. It is called by the French *menuiserie*, *q. d.* small work, to distinguish it from carpentry, which is employed about large and less curious works.

JOINT, in general, denotes the juncture of two or more things. The joints of the human body are called by anatomists articulations. See *ANATOMY*. The term joint is also applied to the separation between the stones or bricks of a building, usually filled

with mortar, plaster, or cement: also by carpenters, to the several manners of assembling, or fitting pieces of wood together; as a dove-tail joint, &c.

JOINT. UNIVERSAL, an invention adapted to all kinds of motions and flexures. This was probably the origin of the gimbs used in suspending the mariner's compass. By means of the universal joint, the pull of a bell may be carried to any part of a room, and made to act as well in one place as in another.

JOINTURE. A jointure strictly speaking, signifies a joint estate, limited to both husband and wife; but in common acceptance, it extends also to a sole estate, limited to the wife only, and may be thus defined, viz. a competent livelihood of freehold for the wife of lands and tenements, to take effect, in profit or possession, presently after the death of the husband; for the life of the wife at least. 2 Black. 137. By statute of the 27th H. VIII. c. 10, a jointure made to a wife is a bar of her dower, so that she shall not have both jointure and dower, and to make a perfect jointure, and several things are to be observed: 1. That it be made to take effect for the wife's life, either in possession or profit, presently after the decease of her husband. 2. That it be for the term of her own life, or for a greater estate: it may, however, be limited to continue no longer than she remains a widow, &c. 3. That it be expressed to be in satisfaction of her whole dower, and not a part thereof. 4. That, though it may be made either before or after marriage, yet, if before, the wife cannot waive it, and claim her dower at common law: but if made afterwards, she may, at the death of her husband. It is here said, that all other settlements in lieu of jointures, that are not pursuant to this statute, are jointures at common law, and no bars to claim of dower. See *DOWER*. Upon the husband's death, the wife may enter on her jointure, and is not driven to a real action, as she is to recover dower at common law. Wherefore, on a lawful eviction of her jointure, she shall be endowed according to the rate of her husband's lands, of which she was entitled to dower by the common law; and should she be evicted of part of her jointure, she shall have dower for so much thereof. A husband committing treason shall not occasion a forfeiture of the wife's jointure: yet *femme-convertes* committing the same, or felony, are liable to forfeit their jointures; and upon conviction of recusancy, they incur the forfeiture of two parts in three of their jointures, as well as dowers.

JOINVILLE, an ancient town of France, in the department of Upper Marne, and late province of Champagne, 25 miles S. W. of Bar le Due.

JOISTS, or **JOYSTS**, in architecture, are pieces of timber framed into the girders and summers, on which the boards of the floor are laid.

IOLAIA, a festival of Thebes, called also *Heracleia*. It was instituted in honor of Hercules and his friend Iolas, who assisted him in conquering the Hydra.

IOLAS, or **IOLAUS**, in fabulous history, a son of Iphiclus king of Thessaly, who assisted Hercules in conquering the Hydra, and burnt with a hot iron the place where the heads had been cut off, to prevent the growth of others. He was restored to his youth and vigour by Hebe, at the request of his friend Hercules.

IOLCHOS, an ancient town of Magnesia, founded by Cretheus; the birth-place of Jason.

IOLE, the daughter of Eurystus, and wife of Hyllus. See *EURYSTUS*, *HERACLIDÆ*, and *HERCULES*.

ION, in fabulous history, a son of Xuthus and Creusa a daughter of Erechtheus, who married Helice, the daughter of Selinus king of Ægiæ. He succeeded to the throne of his father-in-law. See *IONIA*.

IONA, **JONA**, or **ICOLMKILL**, one of the Hebrides; a celebrated island, "once the luminary of the Caledonian regions, whence savage clans and roving barbarians derived the benefits of knowledge, and the blessings of religion." The name Iona is derived by some from יונה, Heb. *i. e.* a dove, in allusion to its patron Columba, who landed here in 565. See *COLUMBA*. But the Rev. Dugal Campbell says "Iona signifies the Island of Waves." It is said to have been a seat of the Druids before Columbus's arrival, when its name was Inis-Drunish, or the Druid Island.

JONAH, יונה, Heb. *i. e.* a dove, the son of Amittai, one of the 12 minor prophets, and author of the canonical book of the Old Testament, bearing his name; in which are recorded, his

mission to the Ninevites, his foolish attempt to fly from the presence of the Almighty, his punishment, and miraculous deliverance from the belly of the fish, (wherein he was a remarkable type of our Saviour) with his prophecy, discontent, and final reproof afterwards. As it is agreed by Zoologists, that the throat of a whale is too narrow to swallow a man, the opinion that the great fish mentioned in the original text, was a shark is highly probable. Some of the Rabbins suppose Jonah to have been the son of the widow of Sarepta, restored to life by Elijah; others the son of the Shunamite, restored by Elisha: but the chronology renders at least the first of these opinions improbable; as he prophesied under Joash king of Israel, about B. C. 771; and perhaps lived to see his prophecy of relief to the Israelites, (2 Kings xiv. 25.) fulfilled by Jeroboam II. Alstedius says, he prophesied about A. M. 3124: about the time of Sardanapalus, the last king of Assyria; who perished with his capital Nineveh, about 40 years, or 40 prophetic days, after Jonah had foretold its destruction, and which the prophet himself supposed to mean 40 natural days.

JONATHAN, [from יונה, the Lord, and נתן, he gave, Heb. i. e. the Gift of God,] the Son of Saul, king of Israel, one of the greatest and most disinterested heroes recorded in history, sacred or profane. His courage and patriotism in venturing into the host of the Philistines, accompanied by nobody but his armour-bearer, by which he began and accomplished a most important victory over the enemies of his country, (2 Sam. xiv.) have hardly been equalled, much less excelled, by any of the boasted heroes of ancient or modern times: but his astonishing affection for David, the man whom human pride and ambition might have been expected to have led him to detest and persecute, as his rival in the kingdom, is so entirely without a parallel, that it can be accounted for only from those powerful principles, of firm faith in the Almighty and implicit submission to his will, which appear to have been the ruling motives of all this prince's actions. He was at last killed in battle, fighting bravely against the Philistines; B. C. 1055.

JONCQUETIA, in botany, a genus of the decandria tetragynia class and order. Calyx five-leaved; petals five, spreading; filaments growing to a glandule; styles none; capsule sub-globular, one-celled, five-valved, five-seeded. It has but one species, viz. *J. Guianensis*, of Guiana, a lofty tree, with a russet bark, and a white uncompact wood.

JONES, INIGO, a celebrated English architect, the son of a cloth-worker of London, born in 1572. He early displayed a taste for drawing, particularly landscape-painting. This recommended him to the favour of William earl of Pembroke, who sent him abroad with a handsome allowance to perfect himself in that branch. In Venice he saw the works of Palladio, which gave a turn to his pursuits. He soon acquired fame, as an architect, and from his reputation at Venice, Christian IV. invited him to Denmark. James I. found him at Copenhagen, and queen Anne took him in the quality of her architect to Scotland. In 1620, he was appointed one of the commissioners for repairing St. Paul's; but this was not commenced till 1633, when Laud, then bishop of London, laid the first stone, and Inigo the fourth. Mr. Walpole observes, that in the restoration of that cathedral, he made two capital faults. He first renewed the sides with very bad Gothic; and then added a Roman portico, magnificent and beautiful indeed, but which, having no affinity with the ancient parts that remained, made his own Gothic appear ten times heavier. The erecting of the Banqueting-house, according to Nicholas Stone, was begun in 1619, and finished in two years—a small part of the noble pile designed for the palace of our kings; but so complete in itself, that it stands a model of the most pure and beautiful taste. Several plates of the intended palace at Whitehall have been given; but Mr. Walpole thinks them no finished design. The whole fabric, however, was so glorious an idea that one forgets for a moment (says Mr. Walpole) in the regret for its not being executed, the confirmation of our liberties, obtained by a melancholy scene that passed before the windows of that very Banqueting-house. In 1623 he was employed at Somerset House, where a chapel was fitted up for the Infanta, the intended bride of the prince. The chapel is still in being. On the accession of Charles I. Jones was continued in his post. His fee as surveyor was 8s. 4d. a day, with an allowance of 46l. a year for house-rent, besides a clerk, and incidental expences. During the prosperous state of

the king's affairs, the pleasures of the court were carried on with much taste and magnificence. Lord Burlington had a folio of the designs of these solemnities, by Inigo's own hand, consisting of habits, masks, &c. He had much employment both from the court and among the nobility, and realized a handsome fortune, which was diminished by sufferings during the troubles which succeeded. He was obnoxious, both as a favourite of his royal master, and as a Roman Catholic. The king's death greatly affected him; and he died, worn down by grief and misfortune, in July 1651. He is said to have been a skilful geometrician, and to have been well acquainted with various branches of knowledge. He was certainly the greatest English architect previous to Sir Christopher Wren. His designs with the pen were highly valued by Vandyke. A collection of them was engraved and published by Mr. Kent, in two volumes folio, 1727, and some less designs in 1744. Others were published in 1743, 4to. by Mr. Ware. In 1655 appeared his Discourse on Stonehenge, in which he attempts to prove that it has been a Roman temple. Several of his designs have been published. He left in MS. some curious notes on Palladio's architecture, which are inserted in an edition published in 1714.

JONES, WILLIAM, F. R. S. a mathematician, was born in the isle of Anglesea in 1675. He settled in London as a schoolmaster, and having instructed Lord Macclesfield's son in the mathematics, that nobleman made him his secretary, and appointed him deputy-teller of the exchequer. He was very intimate with Sir Isaac Newton, and was chosen a fellow of the Royal Society. He died in 1749. His works are: *A Compendium of the Art of Navigation*, 8vo. 1702. *Synopsis Palmariorum Matheseos*, or a New Introduction to the Mathematics, 8vo. 1706; several Papers in the Philosophical Transactions; an analysis of several of Sir Isaac Newton's Papers, entitled *Analysis de Quantitatum Serie, Fluxione, ac Differentia; cum Enumeratione Linearum Tertii Ordinis*. The private character of Mr. Jones was respectable, his manners were agreeable and inviting; and those qualities not only contributed to enlarge the circle of his friends, whom his established reputation for science had attracted, but also to secure their attachment to him.

JONES, SIR WILLIAM, justly stiled, by the late celebrated Dr. Johnson, "the most enlightened of men," was born Sept. 28th, 1746, and educated at Harrow, under the celebrated Dr. Sumner, who early observed his superior abilities. He was thence removed to University College, Oxford, where the rapidity of his literary acquisitions excited general admiration; while his generous disposition and irreproachable morals procured him universal esteem. In 1769, he made a tour through France, and resided some time at Nice, where he employed himself in investigating the influence of the various forms of government on mankind. His first publication was a translation into French of a Persian MS. entitled "The History of Nadir Shah, known by the name of Thomas Kuli Khan, emperor of Persia." This work he executed in 1770, at his own expence, though at the repeated and pressing request of the king of Denmark; but received no other return than a letter of acknowledgement from the king, and the honour of being enrolled as a member of the Royal Society of Copenhagen. In 1771, he met with an additional disappointment by the death of his friend and preceptor, Dr. Sumner, upon whom he wrote an elegy in the most classical Latin. This year he published *Dissertation sur la Literature Orientale*, 8vo.; *A Grammar of the Persian Language*, in 4to. and *Lettre à M. A** Du P***, dans laquelle est compris l'Examen de sa Traduction des Livres attribués à Zoroastre*, 8vo. containing a spirited vindication of the University of Oxford, from the scurrilous reproaches of the translator of Zoroaster's supposed works. The grammar has been reprinted several times, having been found very useful. In 1772, he published Poems, chiefly translated from the Asiatic languages; with Two Essays subjoined on the Eastern Poetry, and on the Imitative Arts. In 1773, he took the degree of M. A. and published an English translation of his first work, *The History of Nadir Shah*; with an Introduction containing, 1. A Description of Asia, according to the Oriental Geographers. 2. A Short History of Persia, from the earliest Times to the present; and an Appendix containing an Essay on Asiatic Poetry, and the History of the Persian Language, 8vo. In 1774, he published *Poeseos Asiaticæ Commentariorum Libri Sex, cum Appendice*, 8vo. From 1773,

1773, he pursued the study of the law, and being called to the bar, about 1779, was appointed commissioner of bankrupts by Lord Bathurst. In 1779, he published the *Speeches of Isaac in Causes concerning the law of Succession to property at Athens; with a preparatory discourse, notes, and a commentary; dedicated to Lord Bathurst*, 4to. The disgraceful riots in London, in 1780, led him to publish *An Inquiry concerning the legal Mode of suppressing Riots, with a Constitutional Plan of Future Defence*; 8vo. and in 1781, *An Essay on the Law of Bailments*; a masterly treatise. About this time Mr. Jones became a zealous member of the Constitutional Society, as he did not approve of the measures then carrying on by the ministry. In 1782, he published *The Mohammedan Law of Succession to the Property of Intestates, in Arabic; with a verbal Translation, and explanatory Notes*, 4to. On the 4th March 1783, he was appointed Judge of the Supreme Court of Bengal; and was knighted on the 20th. On the 8th of April he married Miss Shipley, eldest daughter of the Bishop of St. Asaph, and soon after embarked for India. During his voyage, he formed the plan of the Asiatic Society, afterwards established at Calcutta; of which he became the active president, and of whose transactions several volumes have since been published, replete with much useful information. His conduct as a judge was most exemplary, and while his literary researches continued indefatigable, his integrity remained unimpeachable. There were few sciences in which he had not made great proficiency; in most of them his knowledge was deep. Botany was his favourite study, and the theories of music, chemistry, and even anatomy, were familiar to him. But the unremitting ardour of his literary exertions, joined to the conscientious discharge of the duties of his office, and the fatal effects of a torrid climate, combined to impair his health, and shorten his useful life. After residing 15 years in India, he was preparing to return to his native country, when he died April 27th, 1794, in the 48th year of his age. This great man was a sincere believer in the doctrines of Christianity, and was often in his closet, in the attitude of addressing his prayer to God. Sir John Shore, Baronet, now Lord Teignmouth, delivered an elegant funeral oration on this ornament of science and virtue, at a meeting of the Asiatic Society, on the 23d May, 1794, from which as room permits not to insert the whole, we shall only quote a few sentences:—"His capacity for the acquisition of languages has never been excelled. In Greek and Roman literature his early proficiency was the subject of admiration. The French, the Spanish and Italian, he spoke and wrote with fluency and precision; and the German and Portuguese were familiar to him. At an early period of life his application to Oriental literature commenced. He studied the Hebrew with ease and success; and many of the most learned Asiatics avow, that his knowledge of Arabic and Persian was as accurate and extensive as their own. He was also conversant in the Turkish idiom, and the Chinese had even attracted his notice so far as to learn the radical characters of that language. It was to be expected after his arrival in India, that he would make himself master of the Sanscrit; and the most enlightened professors of the doctrines of Brahma confess with pride, delight, and surprize, that his knowledge of their sacred dialect was most critically correct and profound. The Pandits, who were in the habit of attending him, could not, after his death, suppress their tears for his loss, nor find terms to express their admiration at the wonderful progress he had made in their sciences. But Sir William was too discerning to consider language in any other light than as the key of science. Knowledge and truth were the objects of all his studies, and his ambition was to be useful to mankind. Such were the motives, that induced him to propose to the government of India, what he justly denominated a work of national utility and importance, the compilation of a copious digest of Hindu and Mohammedan Law, from Sanscrit and Arabic Originals; with an offer of his services to superintend the compilation, and with a promise to translate it. His experience, after a short residence in India, confirmed what his sagacity had anticipated, that without principles to refer to, in a language familiar to the judges of the courts, adjudications among the natives must too often be subject to an uncertain and erroneous exposition, or wilful misrepresentation of their laws. During the course of this compilation, and as auxiliary to it, he was led to study the works of Menu, reputed by the Hindus, the oldest and holiest of legislators, and finding

them to comprise a system of laws, so comprehensive and minutely exact, that it might be considered as the Institutes of Hindu Law, he presented a translation of them to the government of Bengal. During the same period he gave the public an English version of the *Sirajiyah*, or Mohammedan Law of Inheritance, with a Commentary. The latter was published at his own expence, and sold for the benefit of insolvent debtors; as well as a former work on the same subject in London. Sir William had many other important works in contemplation, of which Lord Teignmouth has preserved a list. Sir William, like those great mathematicians, Sir Isaac Newton and Dr. Barrow, not only openly professed his faith in the Christian religion, but esteemed it no small "advantage, that his researches had corroborated the multiplied evidence of revelation, by confirming the Mosaic account of the primitive world." In his eighth anniversary discourse to the Asiatic Society he said:—"Theological inquiries are no part of my present subject; but I cannot refrain from adding, that the collection of tracts, which we call, from their excellence, the Scriptures, contain, independently of a divine origin, more true sublimity, more exquisite beauty, purer morality, more important history, and finer strains both of poetry and eloquence, than could be collected within the same compass from all other books that ever were composed in any age or any idiom. The two parts of which the Scriptures consist, are connected by a chain of compositions, which bear no resemblance, in form or style, to any that can be produced from the stores of Grecian, Indian, Persian, or even Arabian learning; the antiquity of these compositions no man doubts, and the unrestrained application of them, to events long subsequent to their publication, is a solid ground of belief, that they were genuine predictions, and consequently inspired." After such sentiments expressed by a man of such extensive erudition, how contemptible must the silly quibbles of the illiterate Thomas Paine appear! Nor was Sir William's faith in the Christian system unproductive of a suitable moral conduct. In point of strict integrity, humanity, probity, benevolence, affability, and the other social and Christian virtues, he has left few equals, no superior.

JONES, in geography, a county of North Carolina, in Newbern. It is watered by the Trent, and the chief town is Trenton.

JONESBOROUGH, a town of North Carolina, in Edentown district, capital of Camden county.

JONGOMA, a kingdom of Asia, N. of Siam.

IONIA, a country of Asia Minor, bounded on the N. by Æolia, on the W. by the Ægean and Icarian seas, on the S. by Caria, and on the E. by Lydia and part of Caria. It was founded by colonies from Greece, and particularly Attica, by subjects of Ion. Ionia was divided into 12 small states, which formed a celebrated confederacy often mentioned by the ancients. These 12 states were Priene, Miletus, Colophon, Clazomenæ, Ephesus, Lebedos, Teos, Phocæa, Erythræ, Smyrna, and the capitals of Samos and Chios.

IONIC DIALECT, in grammar, a manner of speaking peculiar to the people of Ionia. At first it was the same with the ancient Attic; but passing into Asia, it did not arrive at that delicacy and perfection to which the Athenians attained. The Ionians generally changed the α into η , as $\sigmaοφία$ into $σοφην$: they put the η and ι for ϵ , and α for η , as $\alphaγχιον$ for $\αγχιον$: $αναγκαια$ for $αναγκη$: they also change α and ϵ into η , α into ω , ϵ into ω and ι , ϵ into ω and η , and ϵ into ω , as $\rhoαδι$ into $ρηδι$, $αληθεια$ into $αληθην$, $θαιρα$ into $θαιρα$, $αυτι$ into $ωτι$, $πρωισθαι$ into $πρωισθαι$, $ημει$ into $ημεις$, &c. they also insert the ι and υ , as $ειν$ for $ειν$, and $ωλδ$ for $ωλδ$.

IONIC ORDER. See ARCHITECTURE.

IONIC SECT, was the first of the ancient sects of philosophers; the others were the Italic and Eleatic. The founder of this sect was Thales, who being a native of Miletus in Ionia, occasioned his followers to assume the appellation of Ionic: Thales was succeeded by Anaximander, and he by Anaximenes, both of Miletus. Anaxagoras Clazomenius succeeded them, and removed his school from Asia to Athens, where Socrates was his scholar. It was the distinguishing tenet of this sect, that water was the principle of all natural things.

IONIAN MARE, a part of the Mediterranean sea, at the bottom of the Adriatic. It lies between Sicily and Greece.

JONKIOPING,

JONKIÖPING, a town of Sweden, capital of the province of Smaland; 50 miles N. W. of Calmar.

JONK, or **JONQUE**, in naval affairs, a kind of small ship, very common in the East Indies, about the bigness of our fly-boats.

JOODPOUR, a town of Hindostan, capital of a'cirar in Agimere; 75 miles W. S. W. of Agimere.

JOOSTLAND, Sr. an island of Batavia, in the department of the Meuse, and late province of Zealand, near Walcheren.

JOOTSI SIMA, a small flat island, separated from Cape Nota in Japan, by a channel 15 miles broad.

JOPPA, a sea-port town of Palestine, lying South of Cesarea. It is now called Jaffa, somewhat nearer to its first appellation. See **JAFFA**.

JORDAN, [יַרְדֵּן, *Hebr.* i.e. the river of judgement, or as others translate it, the river of Dan,] a river of Judea, so named from the people where it has its source, which is a lake called Phiala, from its round figure, to the N. of its apparent rising from the mountain Panium or Paneum, as was discovered by Philip, Tetrarch of Trachonitis; for on throwing light bodies into the Phiala, he found them emerge again at Paneum. (Josephus.) From Paneum it runs southwards, till it falls into the Asphalites.

JOSEPHUS, the celebrated historian of the Jews, was descended from the sacerdotal order, and born A.D. 37. At 16 he received a liberal education among the Pharisees, after which he went to Rome, where he cultivated his talents to great advantage. On his return to his own country, he commanded the troops employed to defend Jotapata against Vespasian and Titus, which he maintained bravely seven weeks. Vespasian took him into favour, and he was held in great esteem by Titus, whom he accompanied to the siege of Jerusalem. He every where so flattered Titus, that it is no wonder he obtained his favour. What he advances concerning that prince should be read with caution. His flattery of Vespasian also was so great that he pretended to predict his good fortune as a prophecy from God, and applied to that emperor some of the prophecies which belonged to the Messiah! When Vespasian became emperor he gave Josephus a palace, with a pension, the freedom of the city, and a grant of lands in Judea. Titus added to these favours, and Josephus out of gratitude assumed the name of Flavius. During his residence at Rome he translated into Greek his History of the Wars of the Jews, which was first written in Syriac. Its style approaches nearest to that of Livy. He also wrote the Antiquities of the Jews, and likewise two books in defence of the Jews against Apion, and his own Lite. The best editions of his works are Hudson's at Oxford, 2 vols. fol. 1720, and Havercamp's at Amsterdam, 1727, 2 vols. fol. Josephus died A. D. 93.

JOTAPATA, in ancient geography, a town of the Lower Galilee, distant 40 stadia from Gabara. It was with great difficulty taken by Vespasian, being defended by Josephus, who commanded in it.

JOURNAL, a register, day-book, or a daily account of occurrences.

JOURNAL, in Merchants Accompts. See **BOOK-KEEPING**.

JOURNAL, in navigation, a sort of diary, or daily register of the ship's course, winds, and weather; together with a general account of whatever is material to be remarked in the period of a sea-voyage. In all sea-journals, the day, or what is called the 24 hours, terminates at noon, because the errors of the dead reckoning are at that period generally corrected by a solar observation. The daily compact usually contains the state of the weather; the variation, increase, or diminution, of the wind; and the suitable shifting, reducing, or enlarging, the quantity of sail extended; as also the most material incidents of the voyage, and the condition of the ship and her crew; together with the discovery of other ships or fleets, land, shoals, breakers, soundings, &c. See **NAVIGATION**.

JOURNAL, is also a common name for weekly essays, newspapers, &c. as the Gray's Inn journal, the Westminster journal, &c.

JOURNAL is also used for the titles of several books which come out at stated times, and give abstracts, accounts, &c. of the new books that are published, and the new improvements daily made in arts and sciences; as the Journal de Savans, Journal de Physique, &c.

A Journal, under the title of, "The History of the Works of the Learned," was begun at London in 1699; another entitled "Censura Temporum," in 1708: other two soon after entitled "Memoirs of Literature," by M. La Roche, and "Bibliotheca Curiosa," a miscellany, somewhat like what are now styled Magazines. These were succeeded by the Annual Registers and Monthly Reviews. The most valuable work at present existing under the title of Journal, is Mr. Nicholson's "Journal of Natural Philosophy, Chemistry, and the Arts," begun in 1797.

JOURNEYMAN, one who works by the day only; but the word is now used for any one who works under a master, either by the day, the year, or the piece.

JOY, in ethics, that passion which is produced by love, regarding its objects as present, either immediately or in prospect, in reality or imagination. It is one of the most powerful mental emotions, accompanied with an extraordinary degree of pleasure. The effect of this sensation, if not too violent, invigorates the whole animal frame, and facilitates the cure of diseases. Sudden joy, however, is often as injurious as the operation of either grief or terror; and many instances are recorded, in which the precipitate communication of unexpected news has proved immediately fatal. In order to prevent so dreadful a misfortune, such information ought to be cautiously and not suddenly imparted. We should fortify the mind equally for encountering the most agreeable as well as the most disastrous tidings.

JOYST, or **JEYST**, in Indian chronology, the second month of the Bengal year.

IPECACUANHA, in the materia medica, a West-Indian root, of which there are principally two kinds, distinguished by their colour, and brought from different places; but both possessing the same virtues, though in a different degree. The one is ash-coloured or grey, and brought from Peru; the other is brown, and is brought from the Brazils: and these are indifferently sent into Europe under the general name of ipecacuanha. These two sorts have been by some supposed to be the roots of two different plants: but according to others, this is a mistake; the only difference being that one grows in a different place, and in a richer and moister soil, and is better supplied with juices than the other. The plant they belong to is a species of Psychotria. The ash-coloured ipecacuanha is a small wrinkled root, bent and contorted into a great variety of figures, brought over in short pieces full of wrinkles, and deep circular fissures, quite down to a small white woody fibre that runs in the middle of each piece: the cortical part is compact, brittle, looks smooth and resinous upon breaking; it has very little smell; the taste is bitterish and subacid, covering the tongue as it were with a kind of mucilage. The brown sort is small, and somewhat more wrinkled than the foregoing, of a brown or blackish colour without, and white within. The first sort, the ash-coloured or grey ipecacuanha, is that usually preferred for medicinal use. The brown has been sometimes observed, even in a small dose, to produce violent effects. This root is one of the mildest and safest emetics with which we are acquainted; and has this peculiar advantage, that if it should not operate by vomit, it passes off by the other emunctories. It was first introduced, with the character of an almost infallible remedy, in dysenteries, and other inveterate fluxes, as menorrhagia and leucorrhœa, and also in disorders proceeding from obstructions of long standing: nor has it lost much of its reputation by time. In dysenteries, it almost always produces happy effects, and often performs a cure in a very short space of time. In other fluxes of the belly, in beginning dysenteries, and such as are of a malignant kind, or where the patient breathes a tainted air, it has been found equally successful: in these cases it is necessary to continue the use of this medicine for several days, and to join with it opiates, diaphoretics, and the like. This root, given in substance, is as effectual, if not more so, than any of the preparations of it; the pure resin acts a strong irritating emetic, but it is of little service in dysenteries; while an extract prepared with water is almost of equal service in these cases with the root itself, though it has little effect as an emetic. Ipecacuanha, in the state of powder, is now advantageously employed in almost every disease in which full vomiting is indicated; and when combined with opium under the form of the pulvis sudorificus, it furnishes the most useful and active sweating medicine which we possess. It is also given with advantage in very small doses, so as neither to operate by vomiting, purging,

nor sweating. The full dose of the powder is a scruple or half a drachm, and double that in form of watery infusion. The full dose is recommended in the paroxysm of spasmodic asthma, and a dose of three or four grains every morning in habitual asthmatic disposition. A dose of $\frac{1}{4}$ or $\frac{1}{2}$ grain rubbed with sugar, and given every four hours or oftener, is recommended in uterine hemorrhagy, cough, pleurisy, hamoptoe, &c. and has often been found highly serviceable.

IPHICRATES, general of the Athenians, had that command conferred upon him at 20 years of age, and became famous for the exactness of his military discipline. He made war on the Thracians; restored Sentes, who was an ally of the Athenians; attacked the Lacedemonians; and, on many other occasions, gave signal proofs of his conduct and courage. Many ingenious repartees have been mentioned of this general: a man of good family, with no other merit than his nobility, reproaching him one day for the meanness of his birth, he replied, I shall be the first of my race, and thou the last of thine." He died B. C. 380.

IPHIGENIA, daughter of Agamemnon and Clytemnestra. When the Greeks going to the Trojan war were detained by contrary winds at Aulis, they were informed by one of the soothsayers, that to appease the gods they must sacrifice Iphigenia, Agamemnon's daughter, to Diana. Her father at first refused, but afterwards consented. She implored the forgiveness and protection of her father: but tears and intreaties were unavailing. Calchas took the knife in his hand; and as he was going to strike the fatal blow, Diana relented, caught away Iphigenia, who suddenly disappeared, and a goat of uncommon size and beauty was found in her place for the sacrifice. Calchas, the Grecian priest, in this affair seems to have acted with the same humane policy, that the Bishop of Beauvois did in the case of Joan of Arc. See JOAN OF ARC.

IPOMŒA, **QUAMOCLIT**, or **SCARLET CONVULVULUS**; a genus of the monogynia order, and pentandria class of plants; natural order, Campanacea. Corolla funnel-shaped; stigma round-headed: capsule three-celled. It has 27 species.

IPSWICH, the capital of the county of Suffolk, in England. The name comes from the Saxon Gypeswick, *i. e.* a town situated upon the Gypen, now called Orwell.

IRASCIBLE, in the old philosophy, was applied to an appetite or a part of the soul, where anger and the other passions, which animate us against things difficult or odious, were supposed to reside. Of the 11 kinds of passions attributed to the soul, philosophers ascribe five to the irascible appetite, *viz.* wrath, boldness, fear, hope, and despair: the other six are charged on the concupiscible appetite, *viz.* pleasure, pain, desire, aversion, love, and hatred. Plato divided the soul into three parts; the reasonable, irascible, and concupiscible, parts.

IRELAND, one of the Britannie islands, situated between Lon. 5° and 10° W. and between Lat. 51° and 56° N. extending in length about 300 miles, and about 150 in breadth. The ancient history of this island is involved in so much obscurity, that it has been a subject of contention among antiquarians for near two centuries. According to the Irish historians, the island was first inhabited about 322 years after the flood, when Partholanus the son of Scara landed in Munster on the 14th of May with 1000 soldiers, and some women from Greece; but that about 300 years after the arrival of this colony, all of them perished by a plague. After this, Ireland remained a perfect wilderness for 30 years; when another colony arrived from the E. under one Nemedius. During his reign, the most material occurrence was a war, in which he engaged with some African pirates, who in the end enslaved his people. The victors proved such tyrants, that the Irish left the island altogether. They embarked on board a fleet of 1130 ships, under the command of three grandsons of Nemedius, *viz.* Simon Breac, To Chath, and Briatan Maol. The first returned to Greece, the second sailed to the northern parts of Europe, and the third landed in the north of Scotland, and from him the island of Britain is said to have taken its name, and the Welsh their origin. About 216 years after the death of Nemedius, the descendant of Simon Breac returned from Greece into Ireland. The country is said to have continued in a state of barbarity. The kingdom of Ireland continued, till the introduction of Christianity by St. Patrick, about the middle of the 5th century. This account is,

however, reckoned fabulous by most writers; and it is generally thought that Ireland was first peopled from Britain. A dispute has arisen concerning the place from whence the first emigrants from Britain set sail for Ireland. The honour of being the mother country of the Irish has been disputed between the North and South Britons. Mr. Macpherson has argued strenuously for the former, and Mr. Whitaker for the latter. For an account of their dispute, however, we must refer to the works of these gentlemen. Mr. Whitaker claims the victory, and challenges to himself the honour of being the first who clearly and truly demonstrated the origin of the Irish. About B. C. 350, according to Mr. Whitaker the Belgæ crossed the channel, invaded Britain, and seized the whole extended line of the southern coast, from Kent to Devonshire. Numbers of the former inhabitants, who gradually retired before the enemy, were obliged at last to take shipping on the western coast of England, and passed over into the uninhabited island of Ireland. These were afterwards joined by another body of Britons driven out by the Belgæ under Divitiacos, about B. C. 100. For two centuries and a half afterwards, these colonies were continually reinforced with fresh swarms from Britain; as the populousness of this island, and the vicinity of that, invited them to settle in the one, or the bloody and successive wars in Britain during this period naturally induced them to relinquish the other: and the whole island appears to have been completely peopled about A. D. 150; and as the inhabitants had all fled equally from the dominion of the Belgæ, or for some other cause left their native country, they were distinguished among the Britons by one general and very apposite name, *viz.* that of Scitæ or Scots, *i. e.* wanderers, or refugees. The name of Ireland, according to Mr. Whitaker, is obviously derived from the word *Jar* or *Eir*, which in the Celtic language signifies west. This word was sometimes pronounced *Iver*, and *Hiver*; whence the names of *Iris*, *Ierna*, *Juverna*, *Iverna*, *Hibernia*, and *Ireland*; by all of which it hath at some time or other been known. Before 1800 this kingdom was subordinate to Great Britain, but at that period it was deemed expedient for the welfare of Ireland that it should be united to this country; and the two parliaments passed acts for that purpose, by which the two kingdoms at the commencement of 1801, was to be stiled the United Kingdom of Great Britain and Ireland, and that 28 peers, 4 bishops, and 100 commoners, of Ireland were to be elected to represent that country in the Imperial Parliament, to be assembled in England. The lord lieutenant of Ireland, as well as the council, are appointed, from time to time, by the king. The inhabitants in general, of this kingdom, are very far from being, what they have too often unjustly been represented by those who never saw them, a nation of wild Irish. Miserable and oppressed, as by far too many of them are, an Englishman will find as much civility in general, as amongst the same class in his own country, and more hospitality. Poverty and oppression naturally make mankind sour and unsociable, and eradicate, or at least suppress, all the amiable principles and passions of humanity. But it is unfair and ungenerous to judge of the natural disposition of people reduced by indigence and oppression almost to desperation. Let commerce, agriculture, and arts, but call forth the dormant activity of their genius, and rouse the native spirit of enterprize, which lies torpid within them; let liberal laws unfetter their minds, and plenty cheer their tables; they will soon shew themselves deserving to rank with the most respectable societies in Europe. Personal beauty seems to be more diffused in England among the lower ranks of life, than in Ireland; which may be attributed to the different modes of living. In England, the meanest cottager is better fed, lodged, and dressed, than the most opulent Irish farmers, who, unaccustomed to the comforts of life, know no luxury but in deep potations of aquavita. For this circumstance, we may account for a fact reported by some officers of the army, who themselves were Irishmen. They say, that the young fellows of Ireland, who offer to enlist, are more generally below the given height than in England. The same causes, which promote or prevent the growth of other animals, have doubtless similar effects upon the human species. In England, where there is no stint of provisions, the growth is not checked; but, on the contrary, it is extended to the utmost bound of nature's limits: whereas, in Ireland, where food is neither in the same quantity, nor of the same quality, the body cannot expand. The gentlemen of Ireland are full as tall as those of England; the difference, then, between

IRELAND





tween them and the commonalty, can only proceed from the difference of living. In 1731, while the duke of Dorset was lord lieutenant, the inhabitants were numbered, and it was found that the four provinces contained as follows:

Connaught.....	21604	Connaught.....	221710
Leinster.....	203087	Leinster.....	447916
Munster.....	115130	Munster.....	482044
Ulster.....	360632	Ulster.....	158020

Protestants 700453

Papists 1,309,760

The return of houses in Ireland, in 1754, was 395,439, in 1766, it was 424,046, and in 1786 it was 474,284. Supposing, therefore, the numbers to have increased at the same rate, the number of houses now cannot be less than 562,891; which, allowing eight persons to a family, which is the average ascertained by Dr. Hamilton, will make the number of inhabitants 4,023,128: but as the return of houses by hearth-collectors is rather under than above the truth, and as there are many families in every parish who are by law excused from that tax, and therefore not returned, the number on a moderate estimate may be about 4,200,000. A considerable deduction, however, must be made for the number of houses destroyed during the late rebellion. Mr. Molyneux says, "Ireland has certainly been better inhabited formerly; for on the wild mountains between Armagh and Dundalk, are observable the marks of the plough, as they are also on the mountains of Altmore. The same has been observed in the counties of Londonderry and Donegal. Mountains that are now covered with bogs have been formerly plowed; for when you dig five or six feet deep, you discover a proper soil for vegetation, and find it plowed into ridges and furrows: a plough was found in a very deep bog near Donegal; and a hedge, with some wattles, under a bog 5 or 6 feet in depth. Ireland is divided into 4 large provinces, and those again into 32 counties, as follows:

I. ULSTER.

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| 1. Antrim | 4. Down | 7. Londonderry |
| 2. Armagh | 5. Donegal | 8. Monaghan |
| 3. Cavan | 6. Fermanagh | 9. Tyrone |

II. LEINSTER.

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| 1. Carlow | 5. King's County | 9. Queen's Co. |
| 2. Dublin | 6. Longford | 10. Westmeath |
| 3. Kildare | 7. Lowth | 11. Wexford |
| 4. Kilkenny | 8. E. Meath | 12. Wicklow |

III. MUNSTER.

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|----------|-------------|--------------|
| 1. Clare | 3. Kerry | 5. Tipperary |
| 2. Cork | 4. Limerick | 6. Waterford |

IV. CONNAUGHT.

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| 1. Galway | 3. Mayo | 5. Sligo |
| 2. Leitrim | 4. Roscommon | |

The principal rivers of Ireland are the Shannon, Foyle, Bann, Liffey, Boyne, Slaney, Suir, Barrow, Erne, Moy, Noir, Suck, and Gyll. The chief lakes are Lough Neagh, Lean, Erne, and Corib. The principal mountains are Knock-Patrick, Slieve-Bloom, and the Curlew Hills. The chief sea-port towns are Belfast, Dublin, Drogheda, and Dundalk, on the E. coast; Cork, Waterford, Kinsale, Dungarvon, and Youghal, on the S. of Galway; Sligo, Limerick, &c. on the W. and Londonderry on the N. The soil of Ireland varies from the stiffest clay to the lightest sand; but of the latter there is not much; nor is any chalk found in it. It is in general more stony than the soil of England, but is abundantly fruitful both in corn and grass, especially the latter, in consequence of which, a vast number of black cattle and sheep are bred, particularly in Connaught. Few countries produce finer grain, than that which grows in the improved parts of this kingdom. The northern and eastern counties are best cultivated and inclosed, and most populous. The climate is more variable, and both heat and cold more moderate, than in England. The air is more damp; but this, Dr. Beaufort observes, is not to be attributed to the bogs, but chiefly to its insular situation. And the bogs, wherewith Ireland is in some places overgrown, are not

injurious to health, as is commonly imagined; the watery exhalations from these are neither so abundant nor so noxious as those from marshes, which become prejudicial from the various animal and vegetable substances, which are left to putrefy as soon as the waters are exhaled by the sun. Bogs are not, as might be supposed from their blackness, masses of putrefaction; but, on the contrary, they are of such a texture, as to resist putrefaction above any other substance we know of. A shoe, all of one piece of leather, very neatly stitched, was taken out of a bog some years ago, entirely fresh; from the fashion of which, it is supposed to have lain there some centuries. Butter, called roushin, hath been found in hollowed trunks of trees, where it had been hid so long, that it was become hard and almost friable, yet not devoid of unctuousity; that the length of time it had been buried was very great, we learn from the depth of the bog, which was ten feet, that had grown over it. But the common phenomenon of timber-trees dug out of these bogs, not only found, but also so embalmed as afterwards to defy the injuries of time, demonstrate the antiseptic quality of them. The Rev. Clement Cruttwell, in his Universal Gazetteer, states the superficial contents of Ireland at 19,000 square miles. The commodities which Ireland exports, are hides, tallow, beef, butter, cheese, honey, wax, hemp, metals, fish, wool, and glass; and her linen trade is of great consequence. No country in the world seems better situated for a maritime power than Ireland, where the ports are convenient to every nation in Europe, and the havens safe and commodious. The great plenty of timber, the superior excellence of the oak, and the acknowledged skill of her artizans in wood-works, are circumstances clearly in her favour. That the Irish formerly exported large quantities of timber, is manifest from the churches of Gloucester, Westminster monastery and palace, &c. being covered with Irish oak.

IRELAND, NEW, an island in the East Indian Ocean. Lon. 152. 17. E. Lat. 4. 59. S.

IRELAND, NEW, a long narrow island, in the S. Pacific Ocean; extending 270 miles from N. W. to S. E. Lon. between 148° and 153° E. Lat. between 3° and 10. S.

IRENEUS, St. Bishop of Lyons, was born in Greece, about A. D. 120. He was the disciple of Pappias and St. Polycarp, by whom, it is said, he was sent into Gaul in 157. He stopped at Lyons, where he performed the office of a priest; and in 178 was sent to Rome, where he disputed with Valentinus, and his two disciples Florinus and Blastus. At his return to Lyons, he succeeded Photinus, bishop of that city; and suffered martyrdom in 202, under Severus. He wrote many works in Greek, of which there remains only a barbarous Latin version of his five books against heretics, some Greek fragments in different authors, and Pope Victor's letter mentioned by Eusebius. The best editions of his works are those of Erasmus, in 1526; of Grabe, in 1702; and of F. Massuet, in 1710. St. Irenaeus's style is close, clear, and strong, but plain and simple. Dodwell wrote six curious dissertations on the works of St. Irenaeus.

IRISINE, in botany, a genus of the pentandria order, and diœcia class of plants; natural order, Miscellaneæ. Male calyx two-leaved; corolla five-petaled; nectaria five. Female stigmata, two sessile; capsule with flocky seeds. It has only one species.

IRIDESCENT, [from *Iris*, Lat.] in mineralogy, optics, &c. exhibiting the colours of the rainbow.

IRIDIUM, a new metal discovered by Mr. Tennant, when examining the black powder left after dissolving platina, which, from its appearance had been supposed to consist chiefly of plumbago, when he found in it two distinct metals never before noticed, which he had named iridium and osmium. Iridium is of a white colour, and perfectly infusible. It does not combine with sulphur and arsenic. Lead unites with it, but may be separated by cupellation. Copper, silver, and gold, are found to combine with it. Mr. Tennant gave it the name of iridium, from the striking variety of colours it affords while dissolving in muriatic acid. Dr. Wallaston has observed, that among the grains of crude platina there are some scarcely distinguishable from the rest but by their insolubility in nitro-muriatic acid. They are harder, however, when tried by the file; not in the least malleable; and of the specific gravity of 19.5. These appeared to him to be an ore, consisting entirely of the two new metals.

IRIS, [*iris*, Lat. the rainbow,] in anatomy, the anterior-coloured

loured part of the uvea of the eye, so called because of its variety of colours. The iris is a circular variously coloured part, which surrounds the pupil; it is in some persons blue, in others black, brown, grey, &c. each of which has its peculiar beauty, and is suited to the complexion of the person who has it. See **ANATOMY**, and **OPTICS**.

IRIS, in botany, a genus of the triandria monogynia class and order. Natural order, Epsatæ. Corolla six-petaled, unequal; petals alternate, jointed, and spreading; stignas petal-form, cowl-ed, two-lipped. There are fifty species, some of which are found in every quarter of the world.

IRIS is also applied to those changeable colours which sometimes appear in the glasses of telescopes, microscopes, &c. so called from their similitude to a rainbow. The same appellation is also given to that coloured spectrum, which a triangular prismatic glass will project on a wall, when placed at a due angle in the sun-beams.

IRIS, in mythology, the daughter of Thaumas and Electra, one of the Oceanides, the goddess of the rainbow, and messenger of Juno, whom she attended. She was supposed to supply the clouds with water, colours, &c.

IRIS, in philosophy. See **RAINBOW**. The word is Greek, *iris*, supposed by some to be derived from *αἶς*, I tell, being a meteor that is supposed to foretel, or rather declare, rain.

IRKUTZK, a town of Russia, the capital of Irkutskoi, near lake Baikal; the see of a bishop, and a place of great trade. Lon. 122. 44. E. of Ferro, Lat. 52. 4. N.

IRKUTZK, or **IRKUTSKOI**, the largest and least populous government of Russia, comprehending all that part of Siberia, which lies beyond 125° Lon. E. of Ferro; bounded on the E. by the N. Pacific Ocean; S. by Chinese Tartary, W. by Kohran and Tobolsk, and N. by the Frozen Sea. It is divided into four provinces, viz. Irkutsk, Nertchinsk, Skortzk, and Yakutzk.

IRON, [*birn*, Welsh; *isern*, *iren*, Saxon; *iorn*, Erse,] a metal common to all parts of the world. Iron is one of the perfect metals, and the most useful, as well as the most plentiful, of them all. It is of a bluish-white colour, of considerable hardness and elasticity; very malleable, exceedingly tenacious and ductile, and specific gravity about 7.7. When exposed to the air, its surface is soon tarnished, and it is gradually changed into a brown or yellow powder, well known under the name of rust. This change takes place more rapidly if the atmosphere is moist. It is occasioned by the gradual combination of the iron with the oxygen of the atmosphere, for which it has a very strong affinity. For preserving iron from rust various compositions have been contrived; but none appears to be more serviceable than common oil, though its use is on many occasions both troublesome and disagreeable. To obviate these inconveniences it has been recommended to heat the iron to such a degree that it cannot be touched without burning the hand; then to varnish it with new white wax, and expose it to the fire, till the wax is completely imbibed by the metal, which should next be rubbed over with a piece of serge. According to others, this metal may be perfectly secured from the effects of rust, by plunging it, while red-hot, into lintseed-oil, which is suffered to drop off till it becomes dry, and then wiping the iron with a clean cloth. A piece of iron-wire, immersed in a jar of oxygen gas, being ignited at one end, will be entirely consumed by the successive combustion of its parts. It requires a very intense heat to fuse it; on which account it can only be brought into the shape of tools and utensils by hammering. This high degree of infusibility would deprive it of the most valuable property of metals, namely, the uniting of smaller masses into one, if it did not possess another singular and advantageous property, which is found in no other metal except platina, namely, that of welding. In a white heat, iron appears as if covered with a kind of varnish; and in this state, if two pieces be applied together, they will adhere, and may be perfectly united by forging. Iron is thought to be the only substance in nature, which has the property of becoming magnetical; however, there have not yet been made a sufficient number of experiments to determine this point. A piece of iron is rendered considerably warm by hammering, so as even to become red-hot. But after the iron has been completely hammered once, it cannot be rendered again red-hot by the same operation. Of all the metals in the earth, hard steel is the only one, that, being struck slantwise with the sharp edge of a flint, or of another hard stone, produces sparks of fire

When iron is exposed to the action of pure water, it acquires weight by gradual oxydation, and hydrogen gas escapes: this is a very slow operation. But if the steam of water be made to pass through a red hot gun-barrel, or through an ignited copper or glass-tube, containing iron-wire, the iron becomes converted into an oxide, while hydrogen gas passes out at the other end of the barrel. The action of air, assisted by heat, converts iron into a black oxide, containing twenty-five of oxygen. By the action of stronger heat this becomes a reddish brown oxide, containing forty-eight of oxygen. The yellow rust, formed when iron is long exposed to damp air, is not a simple oxide, as it contains a portion of carbonic acid. M. Chenevix reckons four stages of oxydation of iron: the first, or minimum, white; the second, green; the third, black; the fourth, or maximum, red. Thenard admits only three, the white, green, and red. Concentrated sulphuric acid scarcely acts on iron, unless it be boiling. If the sulphuric acid be diluted with two or three parts of water, it dissolves iron readily, and hydrogen gas escapes in large quantities. Sulphate of iron exists in two states, one containing oxide of iron, with .27 of oxygen, which is of a pale green, not altered by gallic acid, and giving a white precipitate with prussiate of potass. The other, in which the iron is combined with .48 of oxygen, is red, not crystallizable, and gives a black precipitate with gallic acid, and a blue with prussiate of potass. In the common sulphate these two are mixed in various proportions. Distillation separates the acid from sulphate of iron, and leaves the brown oxide of iron, called *colcothar*. Vegetable astringent matters, such as nut-galls, the husks of nuts, logwood, tea, &c. which contain the gallic acid, precipitate a fine black fecula from sulphate of iron, which, by means of gum arabic, is suspended in the fluid, and thus ink is made. See **INK**. Prussian blue is likewise a precipitate afforded by sulphate of iron. Iron is eminently adapted to the purpose of dyeing cotton. From the various experiments made by Chaptal, it appears that the oxide of iron has so great an affinity for cotton-thread, that if the latter be immersed in a saturated solution of this metal in any acid, it assumes instantaneously a chamoy-yellow colour, which becomes more or less deep, according to the strength of the liquors, and the length of time it has been exposed to the air. The colour thus communicated is fixed; resists both air and water, and also alkaline leys; nor is its durability in the least affected by washing it with soap; which, on the contrary, imparts to it additional brightness. The oxide of iron, if precipitated on any stuff, easily unites with the fawn colour obtained from vegetable astringents; and, by varying the strength of the soda soap, or other mordants employed in dyeing, an infinity of shades may be produced. Thus, by means of a boiling heat, the oxide of iron may be more intimately combined with the astringent principle. These colours may likewise be rendered brown, as they are susceptible of a variety of shades, from a bright grey to a deep black tint; by simply passing the cotton impregnated with astringent vegetable matter, through a solution of iron. Concentrated nitric acid acts powerfully on iron-filings, and much nitrous gas is disengaged. The solution is of a reddish brown, and deposits the oxide of iron after a certain time; more especially if the vessel be left exposed to the air. A diluted nitric acid affords a more permanent solution of iron, of a greenish colour, or sometimes of a yellow colour. Diluted muriatic acid rapidly dissolves iron, a large quantity of hydrogen is disengaged, and the mixture becomes hot. In this, as well as in the solution by sulphuric acid, the same quantity of alkali is said to be required to saturate the acid as before the solution; whence it is inferred, that the acid is not decomposed, but that the oxidation is effected by the oxygen of the water; whence also it appears to follow, that the hydrogen must be afforded from the decomposed water, and not from the metal. Carbonate of iron is easily obtained by diluted carbonic acid, which combines with a considerable quantity of iron, in proportion to its mass. Vinegar scarcely dissolves it, unless by the assistance of the air. Phosphoric acid unites with iron, but very slowly. The union is best effected by adding an alkaline phosphate to a solution of one of the salts of iron. A saturated phosphate of iron has been found native in France, semi-transparent, of a red brown colour, and foliated texture. Borate of iron may be obtained by precipitating a solution of the sulphate with neutral borate of soda. Arsenic acid likewise unites with iron. This arseniate is found native in Cornwall, in pretty large cubic crystals, tolerably transparent, of a dark green colour with a brownish tinge;

tinge; sometimes yellowish, or of a brown yellow, like resin. Chromate of iron is said to have been found abundantly in the department of Var in France, and to form a beautiful green for enamelling or colouring pastes. According to Vauquelin and Tassaert it contains chromic acid 43, oxide of iron, 34.7, alumina 20.3, silice 2, in 100 parts. By fusion with iron, sulphur produces a compound of the same nature as the pyrites, and exhibiting the same radiated structure when broken. If a bar of iron be heated to whiteness, and then touched with a roll of sulphur, the two substances combine, and drop down together in a fluid state. It is necessary that this experiment should be made in a place where there is a current of air to carry off the fumes; and the melted matter, which may be received in a vessel of water, is of the same nature as that produced by fusion in the common way.

1. Iron is employed in three different states, each having its peculiar properties, by which they are each particularly applicable to various purposes. The first is cast iron; the second wrought or malleable iron, and the third steel. Cast iron is also called unripe or raw iron. Steel is called also pig-iron, and yetlin in England. The richest ores of iron are the compact and ponderous, of a brownish, reddish brown, or red colour. Some of these ores, in colour and appearance, resemble iron itself; as the grey ores of Derbyshire, and the bluish of the Forest of Dean in Gloucestershire. Most of the Swedish ores are likewise of this kind. Others are blackish, brown, red, yellowish, or rusty coloured: these are the most common in England and Germany. There is one very singular species of a striated texture, and of a pale yellowish or greyish colour, oftentimes white, and in some degree pellucid; which, although, in its crude state, it promises nothing metallic; nevertheless, on being moderately calcined, discovers, by the deep colour it assumes, that it abounds in iron. Cramer informs us, that it gives out by fusion from thirty to sixty per cent. But some richer ores yield no less than seventy and eighty on a hundred. Different kinds of iron ore are found adhering in some mines to the tops of caverns, in form of icicles or stræ, sometimes irregularly clustered together, sometimes hanging down like the bristles of a brush; from whence the name of brush iron ore. Other particular forms of the iron-stone have occasioned a variety of fanciful names, that are met with in some of the metallurgic writers. The iron of Great Britain is made from different kinds of ores. The iron ore called Lancashire ore, from the county where it is found in greatest abundance, is very heavy, of a fibrous or lamellated texture; of a dark purple, approaching to a shining black; and when reduced to powder, it becomes of a deep red: it lies in veins like other ores. The bog ore, which resembles a deep yellow ochry clay, and seems to be the deposition of some ferruginaceous rivulets, whose currents had formerly been over the surface of those flat marshy plains. It lies in beds of irregular thickness, commonly from twelve to twenty inches, and very various in their breadths from side to side, never being of great dimensions. The iron-stones, however, have no regular appearance, and do not in the least resemble a metal in their external surface. They lie often in beds of great extent, and are sometimes stratified with seams of pit-coal, forming alternate layers. The ores of iron are commonly calcined previous to the fusion, even the harder ones, though they should contain nothing sulphureous or arsenical, in order to calcine the hard adhering matrices, and render the masses soft enough to be easily broken into fragments of a convenient size for melting. After the mineral is duly prepared, it must be melted in large furnaces. Near the bottom is an aperture, for the insertion of the pipe of a large bellows, worked by water, or by other machines, that may produce a strong current of air. Some very powerful ones, as those in the iron-works at Colebrook Dale and Carron, consist of two or more iron-cylinders, upwards of two feet wide, whose pistons are alternately moved by a small fire-engine, or by a water-wheel: but Mr. Wilkinson very ingeniously adapted to his own a large vaulted receiver surrounded by water, which produces a very regular and uniform blast. Two or more holes are also left ready to be occasionally opened at the bottom of the furnace, to permit at a proper time the scoria and the metal to flow out, as the process may require. Charcoal, or coke with lighted brushwood, is first thrown in: and when the inside of the furnace has acquired a strong ignition, the ore is thrown in by small quantities at a time, with more of the fuel; and commonly a portion of lime-stone is

thrown in as a flux. The ore gradually subsides into the hottest part of the furnace, where it becomes fused; and the metallic parts being revived by the coal, pass through the scoria, and fall to the lower part or bottom of the furnace, where a passage is open for taking off the scum or dross. The metal now in strong fusion is let out by a tap-hole into furrows made in a bed of sand: the large mass, which sets in the main furrow, is called by the workmen a sow, and the less ones pigs of iron. Chimney-backs, stoves, garden-rollers, &c. are formed of this rough metal, taken out of the receiver with ladles, and cast into moulds made of fine sand. The excessive and long continued ignition kept up in these furnaces gradually wastes the materials of which they are composed, rendering their sides thinner, until at last they become unable to sustain the weight of the melted metal; so that it sometimes bursts out suddenly, in a violent and most destructive stream. At certain intervals, therefore, the fire ought to be allowed to go out, whatever may be the expense of rekindling it, and the furnace examined and repaired. The best cast iron or raw iron, as much freed from heterogeneous matters as the usual process of melting can effect it, is not at all malleable, and so hard as to withstand the file. In general the impure cast iron, as run from the ore, is melted down a second time in another furnace, intermixed with charcoal. A strong blast of air being impelled on the surface of the metal, its fusion is remarkably promoted; the iron thickens into a mass called a loop, which is conveyed under a large hammer raised by the motion of a water-wheel. The iron is there beaten into a thick square form, then heated again until almost ready to melt, and forged; by a few repetitions of this process, it becomes completely malleable, and is at length formed into bars for sale. Iron in this state of malleability is much softer than before, and of a fibrous texture. But if it be still crude and brittle after the above process, it shews that there have remained heterogeneous matters, being hidden in its interstices, which must be expelled; for this purpose the iron must be stratified with charcoal-dust within a proper furnace, heaped up in great quantity in strata; then the fire must be blown pretty strongly, so as to bring it to a fusion, which is to be helped by the addition of fusible scoria or sand. The fire must not be much greater than is necessary to make all these melt as equally as possible. To obtain this end, the melted mass must be agitated here and there with poking rods of wrought iron, in order to make every part feel alike the action of the fire and air; and the increasing scorias taken out once or twice. In the mean time, many sparkles will be thrown out from the iron, which diminish the more as the iron comes nearer to the desired degree of purity, but they never cease entirely. The burning coals being then removed, and the scoria conveyed out of the fire through a channel made for that purpose, the iron, by lessening the violence of the fire, grows solid, and must be taken out red-hot, and tried by striking it with a hammer. If it prove crude still, let the melting be repeated; and when it is at last sufficiently purified, it is to be hammered, and extended various ways, by making it repeatedly red-hot; this done, it will no longer be brittle, even when cold. Cast iron has of late been brought into the malleable state, by passing it through rollers instead of forging it. This seems to be a real improvement in the process, as well in point of dispatch, as in its not requiring that skill and dexterity which forgersmen only acquire by long practice. If the purposes of commerce should require more iron to be made, it will be easy to fabricate and erect rolling machines, though it might be impracticable to procure expert forgersmen in a short time. Steel is iron in an intermediate state between cast iron and malleable iron, which is soft and tough. The iron run from some German ores is found to be a good steel when forged only to a certain point. But the best steel is usually made by cementation from the best forged iron, with matters chiefly of the inflammable kind. Two parts of pounded charcoal and one of wood-ashes is esteemed a good cement. The charcoal-dust may be made of bones, horns, leather, and hairs, of animals, or of any of these ingredients after they are burned in a close vessel till they are black: these being pulverized, must be well mixed with wood-ashes. The iron should be of pure metal, not over thick, and quite free from heterogeneous matters. A deep crucible, two or three inches higher than the bars, is to receive part of the cement, well pressed at the bottom, the height of one inch and a half; and the bars are to be placed perpendicularly, about one

inch distant from the sides of the vessel and from each other. All the interstices are to be filled with the same cement, and the whole covered to the top with it; then a tile is applied to cover the vessel, stopping the joints with thin lute. The crucible is then to be put in the furnace, and a strong fire is to be made, that it may be kept moderately red-hot for eight or ten hours together; at the end of which time they will be found converted into steel. If the cementation be continued too long, the steel will become excessively brittle, incapable of being welded, and apt to crack and fly in forging. On the contrary, steel cemented with absorbent earths is reduced to the state of forged iron. Steel is further purified for making the nicest kinds of instruments, such as lancets, pen knives, razors, and various pieces, for the best kind of watches, time-keepers, or chronometers, and astronomical regulators. This purification of steel consists in melting it again with a strong but regular fire in a crucible, the better to free it from the heterogeneous parts, and little flaws that may be contained in it. It is then called cast steel when fused into bars; which name, however, does not imply that the pieces, for instance the cast steel razors, have been really cast in their present shape; for they must be forged from the bar after it is cast. The fusion must have been perfect, so that the metallic parts be rendered uniform. The metal diminishes a little by this process, for a bar of common steel thirty-six inches long, will afterwards produce another only thirty-five, if properly fused and purified. The cast steel will not bear more than a red heat; otherwise it runs away, like sand under the hammer, if the heat be pushed to the welding degree. Because steel is iron combined with a small portion of carbon, it has been called carburized iron. The proportion of carbon has not been ascertained with much precision. From the analysis of Vauquelin, it amounts, at an average, to $\frac{1}{15}$ part. Mr. Clouet seems to affirm that it amounts to $\frac{1}{25}$ part. That steel is composed of iron combined with pure carbon, and not with charcoal, has been demonstrated by Morveau, who formed steel by combining together directly iron and diamond. At the suggestion of Clouet, he inclosed a diamond in a small crucible of pure iron, and exposed it, completely covered up in a common crucible, to a sufficient heat. The diamond disappeared, and the iron was converted into steel. Kinnman, long ago, pointed out a method by which steel may be distinguished from iron. When a little diluted nitric acid is dropped upon a plate of steel, allowed to remain a few minutes, and then washed off, it leaves behind it a black spot; whereas the spot formed by nitric acid on iron is whitish green. Cast iron, is iron combined with a still greater proportion of carbon than is necessary for forming steel. The quantity has not yet been ascertained with precision: Mr. Clouet makes it amount to one-eighth of the iron. The blackness of the colour, and the fusibility of cast iron, are proportional to the quantity of carbon which it contains. Cast iron is almost always contaminated with foreign ingredients: these are chiefly oxide of iron, phosphuret of iron, and silica. The conversion of cast iron into wrought iron is effected by burning away the charcoal, and depriving the iron wholly of oxygen: this is accomplished by heating it violently while exposed to the air. Mr. Clouet has found, that when cast iron is mixed with one-fourth of its weight of black oxide of iron, and heated violently, it is equally converted into pure iron. The oxygen of the oxide, and the carbon of the cast iron, combine, and leave the iron in a state of purity. The conversion of iron into steel is effected by combining it with carbon. This combination is performed in the large way by three different processes, and the products are distinguished by the names of natural steel, steel of cementation, and cast steel. Natural steel is obtained from the ore by converting it first into cast iron, and then exposing the cast iron to a violent heat in a furnace while its surface is covered with a mass of melted scoria five or six inches deep. Part of the carbon combines with the oxygen which cast iron always contains, and flies off in the state of carbonic acid gas. The remainder combines with the pure iron, and constitutes it steel. This steel is inferior to the other species; its quality is not the same throughout; it is softer, and not so apt to break; and as the processes by which it is obtained are less expensive, it is sold at a lower price than the other species. It is obvious that iron and carbon are capable of combining together in a variety of different proportions. When the carbon exceeds, the compound is carburet of iron, or plumbago. When the iron exceeds, the compound is steel or cast iron in va-

rious states, according to the proportion. All these compounds may be considered as subcarburets of iron. The hardness of iron increases with the proportion of charcoal with which it combines, till the carbon amounts to about one-sixtieth of the whole mass. The hardness is then a maximum; the metal acquires the colour of silver, loses its granulated appearance, and assumes a crystallized form. In medicine, iron is chiefly employed as a tonic and corroborant: when properly prepared, it is given with advantage in diseases proceeding from laxity and inactivity of the digestive organs, such as indigestion, flatulency, colic, &c. It is also of considerable service in hypochondriacal affections, intermittent, tertian, quartan, and other fevers; but it seldom agrees with either bilious or plethoric constitutions, and is, like all active drugs, much abused by quacks and other pretenders, who should not be suffered to trifle with the health and lives of the multitude.

IRON-MOULDS, are spots on linen, occasioned by its exposure to damp situations, and also by ink accidentally dropped on the cloth. They may be removed by moistening the stained part, sprinkling it with a small quantity of the essential salt of lemons; after which the linen is to be rubbed over a pewter-plate, and the blot washed out with warm water. But a less expensive method consists in wetting the spot, applying to it a few drops of spirit of salt, or lemon-juice; then rubbing it for a minute or longer between the fingers, while it is carefully held over a hot smoothing iron, or a bason filled with boiling water, the steam of which greatly facilitates the removal of the stains.

IRON-BANKS, a tract of land on the E. side of the Mississippi, below the mouth of the Ohio abounding with iron.

IRON-LOUGH, a lake of Ireland.

IRON-MOUNTAIN, a mountain of Angola, in the province of Cabizzo, abounding with iron.

IRON-MOUNTAIN, a mountain of France, in the department of Dyle, and late province of Austrian Brabant, near Louvain.

IRON-MOUNTAINS, GREAT, mountains of Tennessee, which extend N. E. from the river Tennessee to the French Broad, and constitute the boundary between Tennessee and North Carolina. They abound with iron, and have many cascades and caverns.

IRONY, [*εἰρωνεία*], in rhetoric, is when a person speaks contrary to his thoughts, in order to add force to his discourse; whence Quintilian calls it *diversiloquium*. Thus, when a notorious villain is scornfully complimented with the titles of a very honest and excellent person; the character of the person commended, the air of contempt that appears in the speaker, and the exorbitancy of the commendations, sufficiently discover the irony. Ironical exhortation is a very agreeable kind of trope; which, after having set the inconveniences of a thing in the clearest light, concludes with a feigned encouragement to pursue it. Such is that of Horace, when, having beautifully described the noise and tumults of Rome, he adds ironically,

“Go now, and study tuneful verse at Rome!”

IROQUOIS, the name of six nations in North America, in alliance with the British colonies. Their country is bounded by Canada on the N. by New York and Pennsylvania on the E. and S. and by lake Ontario on the W.

IRRADIATION, the act of emitting beams of light, or any subtle effluvia, like the rays of the sun, every way. See **EFFLUVIUM**.

IRREGULAR NOUNS, in Latin grammar, are divided, according to Mr. Ruddiman, into three kinds, viz. variable, defective, and abundant: and

IRREGULAR VERBS into anomalous, defective, and abundant.

IRRIGATION. See **HUSBANDRY**.

IRRITABILITY, in physiology, a term first invented by Glisson, and adopted by Dr. Haller to denote an essential property of all animal bodies; which, are said to exist independently of, and in contradistinction to, sensibility. Dr. Haller calls that part of the human body irritable, which becomes shorter upon being touched; very irritable, if it contract upon a slight touch; and the contrary, if by a violent touch it contract but little. He calls that a sensible part of the human body, which upon being touched transmits the impression of it to the soul; and in brutes, he calls those parts sensible, the irritation of which occasions evident signs of pain and disquiet in the animal. On the contrary, he calls that insensible,

insensible, which being burnt, tore, pricked, or cut, till it is quite destroyed, occasions no sign of pain nor convulsion, nor any sort of change in the situation of the body. From the result of many cruel experiments he concludes, that the epidermis is insensible; that the skin is sensible in a greater degree than any other part of the body; that the fat and cellular membrane are insensible; and the muscular flesh sensible, the sensibility of which he ascribes rather to the nerves than to the flesh itself. The tendons, he says, having no nerves distributed to them, are insensible. The ligaments and capsulae of the articulations are also concluded to be insensible; whence Dr. Haller infers, that the sharp pains of the gout are not seated in the capsulae of the joint, but in the skin, and in the nerves which creep upon its external surface. The bones are all insensible, says Dr. Haller, except the teeth; and likewise the marrow. Under his experiments the periosteum and pericranium, the dura and pia mater, appeared insensible; and he infers, that the sensibility of the nerves is owing to the medulla, and not to the membranes. The arteries and veins are held susceptible of little or no sensation, except the carotid, the lingual, temporal, pharyngeal, labial, thyroidal, and the aorta near the heart; the sensibility of which is ascribed to the nerves that accompany them. Sensibility is allowed to the internal membranes of the stomach, intestines, bladder, ureters, vagina, and womb, on account of their being of the same nature with the skin: the heart is also admitted to be sensible: but the lungs, liver, spleen, and kidneys, are possessed of a very imperfect, if any, sensation. The glands, having few nerves, are endowed with only an obtuse sensation. Some sensibility is allowed to the tunica choroidis and the iris, though in a less degree than the retina: but none to the cornea. Dr. Haller concludes, in general, that the nerves alone are sensible of themselves; and that in proportion to the number of nerves apparently distributed to particular parts, such parts possess a greater or less degree of sensibility. Irritability, he says, is so different from sensibility, that the most irritable parts are not all sensible, and vice versa. He alleges facts to prove this position, and also to demonstrate, that irritability does not depend upon the nerves, which are not irritable, but upon the original formation of the parts which are susceptible of it. Irritability, he says, is not proportioned to sensibility; in proof of which, he observes, that the intestines, though rather less sensible than the stomach, are more irritable; and that the heart is very irritable, though it has but a small degree of sensation. Irritability, according to Dr. Haller, is the distinguishing characteristic between the muscular and cellular fibres; whence he determines the ligaments, periosteum, meninges of the brain, and all the membranes composed of the cellular substance, to be void of irritability. The tendons are unirritable; and though he does not absolutely deny irritability to the arteries, yet his experiments on the aorta produced no contraction. The veins and excretory ducts are in a small degree irritable, and the gall-bladder, the ductus chole dochus, the ureters and urethra, are only affected by a very acrid corrosive; but the lacteal vessels are considerably irritable. The glands and mucous sinuses, the uterus in quadrupeds, the humatrix, and the genitals, are all irritable; as are also the muscles, particularly the diaphragm. The oesophagus, stomach, and intestines, are irritable: but of all the animal organs the heart is endowed with the greatest irritability. In general, there is nothing irritable in the animal body but the muscular fibres; and the vital parts are the most irritable. This power of motion, arising from irritations, is supposed to be different from all other properties of bodies, and probably resides in the glutinous mucus of the muscular fibres, altogether independent of the influence of the soul. The irritability of the muscles is said to be destroyed by drying of the fibres, congealing of the fat, and more especially by the use of opium in living animals. The reader will find much information on this subject in Dr. Crichton, on Mental Derangement. Irritability, is also found to be an essential property of plants, as well as of animal bodies. Chemists have lately endeavoured to shew, that all animal and vegetable irritability originates from the oxygen, which is inhaled by the lungs, or respired by the leaves, or absorbed by the roots. And as respiration is every minute requisite to the support of animal life, Dr. Darwin conjectures that something immediately necessary to their existence is acquired by the lungs of animals from the atmosphere, rather than the food they digest; and that this nameless something, perhaps oxygen, is mixed with the blood,

and again separated from it by the spinal marrow, after having undergone certain changes in the course of its circulation, or secretion. In a similar manner, he considers it as probable that the spirit of vegetation may be derived from that source, namely, the uncombined oxygen of the air, which is respired by the upper surfaces of the leaves, and not from that which is absorbed by roots, in a more combined state; farther, that this oxygen is again separated from the juices by the sensorium, or brain, of each individual bud, after having undergone some change in its passage through the secretory vessels. A long-continued, unusual, or unnatural stimulation of vegetable fibres, by an increase of heat, exhausts the spirit of vegetation; hence a slighter degree of cold will destroy such fibres; because, after having been excited for a considerable time by a more powerful stimulus, they will cease to act on the application of one that is weaker, so that in consequence of hot days tender plants are more liable to perish from the coldness of the night. For this reason, gardeners in the more northern climates, shelter both the flowers of apricots and the tender vegetables, during the spring-frosts, from the meridian-sun, as well as from the destructive cold of the night, which is generally the most intense about one hour before sun-rise. In the hot days of the month of June, 1798, Dr. Darwin twice observed several rows of garden-beans to become quite sickly; and some of them even died, in consequence of being irrigated for one or two hours with water from an adjoining canal. This circumstance he attributes to the sudden application of cold, after the plants had been greatly enfeebled, and deprived of their irritability by the excessive heat of the season, rather than to the too copious watering of the dry soil. Some vegetables, however, such as strawberries, onions, &c. which were equally exhausted, are less liable to be thus injured, and even receive benefit from occasional irrigation in dry and sultry weather. On the contrary, the spirit of vegetation acquires additional vigour, if plants have been exposed for a considerable time to a less than usual degree of heat: but, if they be suddenly removed from a cold to a warm place, they will experience a similar fate with those hapless persons, to whose frozen limbs sudden heat was imprudently applied; thus, too great increase of action occasions inflammation, which is generally succeeded by mortification and death. This fact has been ascertained and confirmed by the experiments of M. Van Uslar, who kept two species of the spurge, or wartwort, namely, the *Euphorbia Peplus*, and *Esula*, secluded from the light and heat, with a view to render them more irritable; on exposing these plants afterwards to a meridian-sun, they became gangrenous, and in a short time decayed. The increased, or diminished, degree of irritability in plants, is by Dr. Darwin attributed to their previous habits, with respect to the stimulus of greater or less heat. Thus, the periods at which vegetables thrive in the spring, appear to be greatly influenced by their acquired habits, as well as by their present sensibility to heat: hence potatoes will germinate in a much cooler temperature during the spring than in autumn; hence also, the vernal months are the most favourable to the process of making good malt; because the barley will then sprout with a less degree of heat than at any other season. The irritability of plants has been discovered to be greater in the morning than at noon, and less in the evening than at mid-day; though it is considerably augmented during cool and rainy weather. In a similar manner, the limbs of animals acquire a greater sensibility of heat, after having been exposed to the cold: thus, the hands, after immersing them for a short time in snow, glow with warmth on entering the house; and the late celebrated Spallanzani observed several animals and insects, that conceal themselves under ground in a torpid state during the winter, and enjoy the genial warmth of the spring, again to disappear at a season when the heat of the atmosphere was much higher than on their first emerging from their subterraneous abode. From these considerations, Dr. Darwin infers, that such plants as are sheltered in a warm room, during the winter ought to be occasionally exposed to a cooler atmosphere, in order to increase their irritability; otherwise their growth in the succeeding spring will be much retarded. For the same reason, the continual vicissitudes of the air and weather are essentially necessary to mankind; as the frequent changes of heat and cold have an obvious tendency to preserve or restore their irritability, and consequently the activity, of the system. Hence not only the health and energy of men are more conspicuous in our variable climate, but their longevity is comparatively

comparatively greater than on those tropical continents, which experience both a more considerable degree of heat, and a more steady atmosphere.

IRROGATIO, a law-term amongst the Romans, signifying the instrument, in which were put down the punishments which the law provided, against such offences as any person was accused of by a magistrate before the people. These punishments were first proclaimed *viva voce* by the accuser, and this was called *inquisitio*: the same, being immediately after expressed in writing, took the name of *Rogatio*, in resp. ct of the people, who were to be consulted or asked about it; and was called *Irrogatio* in respect of the criminal, as it imported the mulct or punishment assigned him by the accuser.

IRROMANGO, or **ERRAMANGO**, one of the New Hebrides, is about 24 or 25 leagues in circuit.

IRTIS, or **IRTISCH**, a large river of Asia, in Siberia, which rises among the hills of the country of the Kahnucks, and, running N. E. falls into the Ob near Tobolsk.

IRVINE, or **IRWINE**, a sea-port and royal burgh, of Scotland in Ayrshire, 15 miles E. of the isle of Arran, and 60 W. by S. of Edinburgh.

ISATIS, in botany, **WOAD**, a genus of the siliquosa order, and tetradynamia class of plants; natural order, Siliquosa. Siliqua lanceolated, unilocular, monospermous, bivalved, and deciduous; valves navicular or canoe-shaped. It has five species, of which

I. TINCTORIA, or **COMMON WOAD**, which is cultivated in several parts of Britain for dyeing, is biennial; the lower leaves are of an oblong oval figure, and pretty thick consistence, ending in obtuse roundish points; they are entire on their edges, and of a lucid green. The stalks rise four feet high, dividing into several branches, garnished with arrow-shaped leaves sitting close to the stalks; the branches are terminated by small yellow flowers, in very close clusters, composed of four small petals, in form of a cross, which are succeeded by pods shaped like a bird's tongue, which, when ripe, turn black, and open with two valves, having one cell, in which is situated a single seed. This plant is of excellent use in dyeing, as it forms the basis of black and other dark colours.

ISAURA, or **ISAURUS**, in ancient geography, a strong city at mount Taurus, in Isauria.

ISAURIA, a county bordering on Pamphylia and Cilicia, and according to some, extending to the Mediterranean by a narrow slip.

ISCA DUMNIORUM, an ancient town of Britain, now Exeter.

ISCA SILURUM, the station of the Legio II. Augusta, in Britain, now called Caerleon, a town of Monmouthshire.

ISCHEMUM, in botany, a genus of the monocæcia order, and polygamia class of plants; natural order, Gramina. Hermaphrodite calyx; glume two-flowered; corolla two-valved; stamens three; styles three; seed one: male, calyx and corolla as in the other; stamens three. There are eight species.

ISCHIADIC [*ισχιαον, ισχιαδικος*], in anatomy, an epithet of the crural vein; in pathology, the ischiadic passion is cut in the hip, or the sciatica.

ISCHIUM, in anatomy, one of the bones of the pelvis. See **ANATOMY**.

ISCHORA, a river of Ingria, which runs into the Nieva.

ISCHURIA, [*ισχυρια*, from *ισχυω*, I stop, and *ουρον*, urine,] in physic, a disease consisting in an entire suppression of urine. See **MEDICINE**. It is occasioned by any thing which may obstruct the passages of the reins, ureters, or the neck of the bladder, as sand, stone, mucus, &c. It may also arise from an obstruction of the nerves which pass to the reins or bladder, as it does in a palsy of the parts below the diaphragm. The too great distension of the bladder may also produce the same effect: for the fibres being much lengthened, and consequently condensed, the spirits necessary for their contraction cannot get admittance; whence it is that persons who have retained their urine for a long time, find great difficulty in discharging it.

ISELASTICS, a kind of games, or combats, celebrated in Greece and Asia, in the time of the Roman emperors.

ISENBURG, a large town of Germany, now included in the department of the Sarre. Lon. 7. 14. E. Lat. 50. 28. N.

ISENGHEIN, a town of France, in the department of Escout,

and late province of the Austrian Netherlands. Lon. 3. 18. E. Lat. 50. 44. N.

ISEO, a lake of the late Cisalpine or Italian republic in the department of the Mella, and late province of Bresciano, anciently called *Sebinus*.

ISERE, a river of France, which rises in Mount Iseran, runs through the department of Mont Blanc, and passing by Grenoble, St. Quintin, Romans, &c. falls into the Rhine, three miles above Valence.

ISERE, a department of France, out of the late province of Dauphiny. Grenoble is the capital.

ISERLOHN, or **LOHN**, a town in Westphalia, 32 miles N. E. of Cologne.

ISERTIA, in botany, a genus of the hexandria monogynia class and order. Calyx coloured, four or six-toothed; corolla six-cleft, funnel-form; pome sub-globular, six-celled, many-seeded. It has but one species, viz. *I. coccinea*, a tree of Guinea, with a trunk ten or twelve feet in height, and about eight inches in diameter.

ISHMAEL, [from *יש*, and *שמע*, i. e. God hath heard,] the son of Abraham by Hagar, the progenitor of the Arabs, Hagarenes, Ishmaelites, &c.

ISHMAELITES, the descendants of Ishmael, who dwelt from Havila to the wilderness of Sur, towards Egypt, and thus over-spread Arabia Petrea. All ancient authors, as well as Josephus, agree that Ishmael was the father of the Arabs. The Ishmaelites, as well as the Jews, afford a living and striking evidence of the truth of divine revelation. The prophecies of the innumerable multitudes, the wild and roving manner of living, and the free, independent, unconquered state of the Ishmaelites, (Gen. xvi. 10—12: xvii. 20; xxi. 18.) have been, and still are, literally fulfilled in their posterity, the Arabs.

ISIA, [*ισια*], feasts and sacrifices anciently solemnized in honour of the goddess Isis. They were full of the most abominable impurities, and therefore those who were initiated into them were obliged to take an oath of secrecy.

ISIAI, priests of the goddess Isis. Dioscorides tells us, that they bore a branch of sea wormwood in their hands instead of olive.

ISERINE, in mineralogy, a species of the menachine genus, colour an iron-black, inclining a little to the brownish-black; consists of small, obtuse, angular grains, in rolled pieces, with a rough glimmering surface; lustre glistering internally, semi-metallic. Specific gravity 4.5. It melts before the blow-pipe into a blackish-brown coloured glass, which is slightly attracted by the magnet. Its constituent parts are

Oxide of menachine.....	59,1
iron.....	30,1
uran.....	10,2
	99,4
Loss	6
	100,0

It is a native of Germany.

ISIAI TABLE, one of the most considerable monuments of antiquity, discovered at Rome in 1525, and supposed by the various figures in bas relief upon it, to represent the feasts of Isis, and other Egyptian deities.

ISIDORUS, St. named **DAMIATENSIS**, or **PELUSIOTA**, from his living in a solitude near Pelusium, the most famous of all St. Chrysostom's disciples, flourished in the time of the general council held in 421. There are extant 2012 of his epistles in five books. They are short, but well written, in Greek. The best edition is that of Paris, in Greek and Latin, printed in 1638, in folio.

ISIGNI, or **ISIGNY**, a town of France, in the department of Calvados, and late province of Lower Normandy, 28 miles W. by N. of Caen.

ISINGLASS. See **ICHTHYOCOLLA**.

ISIS, **CORAL**, in natural history, a genus of the Vermes Zoophyta class and order. Animal growing in the form of a plant; stem stony, jointed, the joints longitudinally striate, united by spongy or horny junctures, and covered by a soft porous cellular flesh

ash or bark; mouth beset with oviparous polypes. There are species.

Isis, in mythology, a celebrated deity of the Egyptians, daughter of Saturn and Rhea, according to Diodorus of Sicily. Some suppose her to be the same with Io. Plutarch says Isis married her brother Osiris, and mentions some other absurd traditions respecting her. These two ancient deities, as some observe, comprehended all nature, and all the gods of the heathens. Isis was the Venus of Cyprus, the Minerva of Athens, the Cybele of the Phrygians, the Ceres of Eleusis, the Proserpine of Sicily, the Diana of Crete, the Bellona of the Romans, &c. Osiris and Isis reigned jointly in Egypt, but Typhon, the brother of Osiris, rebelled and murdered him. The ox and the cow were the symbols of Osiris and Isis; because while on earth, they had diligently applied themselves to agriculture. Isis was supposed to be the moon, and Osiris the sun; she was represented as holding a globe in her hand, with a vessel full of ears of corn. The Egyptians believed, that the inundations of the Nile proceeded from the tears which Isis shed for the murder of Osiris. The word Isis, according to some, signifies ancient. The inscriptions on the statues of the goddess were often in these words: "I am all that has been, that shall be, and none among mortals has hitherto taken off my veil." Her worship was universal in Egypt.

Isis, a river that rises in Gloucestershire, and flows through a part of Wiltshire, and falls into the Thames.

ISLA, a river of Forfarshire, and another of Banffshire.

ISLAM, the true faith according to the Mohammedans.

ISLAND, [*insula*, Lat. *isola*, Italian; *caland*, Erse. It is pronounced *iland*,] a tract of land surrounded by water. It stands contradistinguished from Continent, or Terra Firma. Islands from their situation enjoy many great advantages, the principal of which are these: 1st. Many benefits are derived to the inhabitants of an island from its unity. The very largest country on a continent is still but a part, which implies dependence, and is necessarily attended with a train of imperfections; from all of which, the people who live in an island (at least in a large one) are, or may be, entirely free. All countries on the continent are exposed to continual dangers, against which their inhabitants must be perpetually upon their guard. This renders a large military force requisite. It involves them in continual negotiations, leagues, and alliances; all of which, however, cannot exempt them from frequent wars, or the miseries that attend them, and which have commonly bad effects on their internal policy. 2d. The climate is generally mild and salubrious from the vapours of the surrounding sea, which according to the latitude abates the violence of heat, and moderates the rigour of cold, both of which are sensibly and constantly less than on continents under the same elevation of the pole. We have a remarkable instance of this in the islands called anciently Stoehades, in the modern Latin *Insulæ Arearum*, by us the *Hierres*. They are three in number, lying in 43° Lat. N. before Toulon. In them, the fruits of France and Italy arrive at the highest perfection, and all the medical herbs of Italy, Greece, and Egypt, grow wild. Yet the climate is wonderfully temperate and pleasant in all seasons. 3. There is commonly a greater variety, and always a greater fertility, in the soil, occasioned chiefly by the warmth of the circumambient air, frequent showers, and, in consequence of both, being continually impregnated with vegetable salts. 4. A considerable advantage arises from accessibility on every side, by which islands are open to receive supplies from other countries, and have the convenience of exporting their commodities and manufactures to all markets, and, in comparison of the continent, at all seasons. The opposite sides of an island may in regard to commerce be considered as two countries; each has its ports, its proper commodities, its proper correspondences; in consequence of which, it promotes the cultivation, and procures vent for the manufactures, of a large district behind it; while the intermediate midland space finds a profit in that inland trade, which these two districts supply. The winds contrary on one side are favourable on the other; and the sea, the common road to both coasts, is continually plowed by vessels outward and homeward bound, which keeps up that active and enterprising spirit which characterizes islanders. 5. An island has the most extensive and the most effectual frontier, on all sides, subsisting for ever, without repairs, and without expence; and, which is still more, derives from this very frontier a great part of the subsistence of its inhabitants,

and a valuable article in its commerce, from its fisheries. It is commonly said the sea is a mine, but its treasures are more lasting and more certain, procured by labour solely, and fit for use or for sale as soon as procured, quickly consumed, and thereby the source of continual employment to a stout, hardy, laborious race of men, who likewise find employment, for numbers, and are in various respects otherwise beneficial members of the community. The defence by this natural barrier, is not only permanent, but in every respect more to be relied on, than any that could be raised by the skill and industry of men at the greatest expence. All these benefits are insured to the inhabitants of every island, if they place their hopes in the assiduous cultivation of their own country, bend all their endeavours to raising and extending their commerce, and put their trust, (under Providence,) in the natural safeguard of a hardy race of men accustomed to robust exercises, and in what necessarily arises from their way of life, a naval force. The first inhabitants of islands come in vessels, are for a time dependent on the country from whence they came, arrive at independence by enlarging their correspondence; and thus commerce is natural and essential to islanders; which is the reason that they thrive so long as they cultivate it, and decline in proportion as it decays. Several naturalists are of opinion, that the islands were formed at the deluge: others think, that there have been new islands formed by the casting up of vast heaps of clay, mud, sand, &c. others think they have been separated from the continent by violent storms, inundations, and earthquakes. These last have observed, that the East Indies, which abound in islands more than any other part of the world, are likewise more annoyed with earthquakes, tempests, lightnings, volcanoes, &c. than any other part. Others again, conclude, that islands are as ancient as the world, and that there were some at the beginning: and, among other arguments, support their opinion from Gen. x. 5, and other passages of Scripture. Varenus thinks that there have been islands produced each of these ways. St. Helena, Ascension, and other steep rocky islands, he supposes to have become so by the sea overflowing their neighbouring champaigns; but by the heaping up huge quantities of sand, and other terrestrial matter, he thinks the island of Zealand, Japan, &c. were formed. Sumatra and Ceylon, and most of the East India islands, he thinks, were rent off from the main land; and concludes, that the islands of the Archipelago were formed in the same way, imagining it probable that Deucalion's flood might contribute towards it. The ancients had a notion that Delos, and a few other islands, rose from the bottom of the sea; which, how fabulous soever it may appear, agrees with later observations. Seneca takes notice, that the islands Therasia rose thus out of the Aegean sea in his time, of which the mariners were eye-witnesses. It is indeed very probable, that many islands have existed not only from the deluge, but from the creation of the world; and we have undoubted proofs of the formation of islands in all the different ways abovementioned. Another way, however, in which islands are frequently formed in the South Sea, is by the coralline insects. On this subject the following curious dissertation by Alexander Dalrymple, Esq. hath appeared in the Philos. Trans. for 1767. "These islands are generally long and narrow: they are formed by a narrow bar of land, inclosing the sea within it; generally, perhaps always, with some ingress at least on the tide; commonly with an opening capable of receiving a canoe, and frequently sufficient to admit even larger vessels. The origin of these islands will explain their nature. What led me first to this deduction was an observation of Abdul Roobin, a Sooloo pilot, that all the islands lying off the N. E. coast of Boreno had shoals the eastward of them. These islands being covered to the W. by Boreno, the winds from that quarter do not attack them with violence. But the N. E. winds, tumbling in the billows from a wide ocean, heap up the coral with which those seas are filled. This, obvious after storms, is perhaps at all other times imperceptibly effected. The coral-banks, raised in the same manner, become dry. These banks are found of all depths, at all distances from the shore, entirely unconnected with the land, and detached from each other: although it often happens that they are divided by a narrow gut without bottom. Coral-banks also grow, by a quick progression, towards the surface; but the winds, heaping up the coral from deeper water, chiefly accelerate the formation of these into islands. They become gradually shallower; and, when once the sea meets with resistance, the coral is quickly thrown

up by the force of the waves breaking against the bank; and hence, in the open sea, there is scarcely an instance of a coral-bank having so little water that a large ship cannot pass over, but it is also so shallow that a boat would ground on it. I have seen these coral-banks in all the stages; some in deep water, others with few rocks appearing above the surface; some just formed into islands, without the least appearance of vegetation; and others from such as have a few weeds on the highest part, to those which are covered with large timber, with a bottomless sea at a pistol-shot distance. The loose coral, rolled inward by the billows in large pieces, will ground; and the reflux being unable to carry them away, they become a bar to coagulate the sand, always found intermixed with coral; which sand, being easiest raised, will be lodged at top. When the sand-bank is raised by violent storms beyond the reach of common waves, it becomes a resting-place to vagrant birds, whom the search of prey draws thither. The dung, feathers, &c. increase the soil, and prepare it for the reception of accidental roots, branches, and seed, cast up by the waves, or brought thither by birds. Thus islands are formed: the leaves and rotten branches intermixing with the sand, form in time a black mould, of which in general these islands consist; more sandy and less woody; and, when full of large trees, with a greater proportion of mould. Cocoa-nuts, continuing long in the sea without losing their vegetative powers, are commonly to be found in such islands: particularly as they are adapted to all soils, whether sandy, rich, or rocky. The violence of the waves within the tropics, must generally be directed to two points, according to the monsoons. Hence the islands formed from coral-banks must be long and narrow, and lie nearly in a meridional direction.

ISLE ADAM, a town of France, 3 miles from Beaumont, and 20 from Paris.

ISLE AUMONT, a town of France in the department of Aube, 6 miles S. of Troyes.

ISLE JOURDAIN, a town of France, in the department of Gers, and late province of Armagnac, 8 miles N. of Lombez.

ISLE JOURDAIN, a town of France, in the department of Vienne, 24 miles S. E. of Pontiers.

ISLE OF BLEVES, a fertile island, in the Gulf of Mexico, and bay of Campeachy, 17 miles long, 8 broad, and abounding in cattle and fruits.

ISLE OF FRANCE, one of the late governments of France. It was bounded on the N. by Picardy, W. by Normandy, S. by the Orleanois, and E. by Champagne.

ISLE OF FRANCE. See MAURITIUS.

ISLEBIANS, in ecclesiastical history, a name given to those who adopted the antiscipitral sentiments of a Lutheran divine of Saxony, called John Agricola, a disciple and companion of Luther, a native of Isleb, whence the name; who interpreting literally some of the precepts of St. Paul with regard to the Jewish law, declaimed against the law and the necessity of good works.

ISLINGTON, a village of Middlesex, on the N. side of London, to which it is almost contiguous. It appears to be of Saxon origin; and in the conqueror's time was writted Isledon, or Isendon. There is a spring of chalybeate water, in a very pleasant garden, which for some years was constantly attended by the princess Amelia, and many persons of quality, who drank the waters. To this place, which is called New Tunbridge Wells, many people resort, during summer, the price of drinking the waters being 10s. 6d. for the season. Near this, is a house of entertainment called Sadler's Wells, where, during the summer-season, people are amused with romances, pantomimes, &c.

ISLIP, a town of Oxfordshire, 56 miles W. from London, noted for the birth and baptism of Edward the Confessor.

ISMAEL. See ISHMAEL.

ISMAEL, or ISMAIL, a strong town of Turkey in Europe, in Bessarabia, 140 miles S. by W. of Bender.

ISNARDIA, in botany, a genus of the monogynia order, and tetrandria class of plants; calyx four-cleft; corolla none; capsule four-celled, covered by the calyx. There is but one species, viz. *I. palustris*, a creeping and floating plant; the flowers are axillary, opposite, sessile, and green. It is a native of Europe, Jamaica, and Virginia, in rivers.

ISNIC, or ISNIK, a town of Asiatic Turkey in Natolia. Lon. 30. 9. E. Lat. 47. 15. N.

ISNY, an imperial town of Suabia, in Algow; seated on the Isny. Lon. 9. 10. E. Lat. 47. 33. N.

ISOCHRONAL, is applied to such vibrations of a pendulum as are performed in the same space of time; as all the vibrations or swings of the same pendulum are, whether the arches it describes are shorter or longer. See MECHANICS.

ISOCHRONAL LINE, that in which a heavy body is supposed to descend without any acceleration.

ISOCRATES, one of the greatest orators of Greece, was born at Athens, about B.C. 400. He was the son of Theodorus, who had enriched himself by making musical instruments, and gave his son a liberal education. He was the disciple of Prodicus, Gorgias, and other great orators. He endeavoured at first to declaim in public, but without success; he, therefore, contented himself with instructing his scholars, and making private orations. He always shewed great love for his country; and being informed of the loss of the battle of Cheronea, he abstained four days from eating, and died, aged 98. There are still extant 21 of his orations, which are admired, and have been translated from the Greek into Latin by Wolfius. Isocrates excelled in the justness of his thoughts, and the elegance of his expressions. There are also nine letters attributed to him.

ISOETES, in botany, a genus of the natural order of filices, and cryptogamia class of plants. Antherae of the male flower within the base of the fronds or leaves: capsule of the female flower bilocular, and within the base of the leaf. It has two species.

ISOLA, a sea-port town of Naples, in Calabria Ultra, 15 miles S. E. of St. Severina. Lon. 7. 33. E. Lat. 39. 1. N.

ISOLA DELLA SCALA, a town of the late Italian republic, in the department of the Mincio, and district of Verona, late province of the Veronese, 13 miles S. of Verona.

ISOPERIMETRICAL, [*ισος*, equal, *περι*, about, and *μετρον*, measure,] in geometry, a term applied to such as have equal perimeters, or circumferences. 1. Of isoperimetrical figures, that is the greatest that contains the greatest number of sides, or the most angles, and consequently a circle is the greatest of all figures that have the same ambit as it has. 2. Of two isoperimetrical triangles, having the same base, whereof two sides of one are equal, and of the other unequal, that is, the greater whose two sides are equal. 3. Of isoperimetrical figures, whose sides are equal in number, that is, the greatest which is equilateral and equiangular. From hence follows that common problem of making the hedging or walling that will wall in one acre, or even any determinate number of acres, or a fence or wall in any greater number of acres whatever. In order to the solution of this problem, let the greater number be supposed a square equal to b . Let

x be one side of an oblong, whose area is a ; then will $\frac{a}{x}$ be the

other side; and $2\frac{a}{x} + 2x$ will be the ambit of the oblong, which

must be equal to four times the square root of b ; that is, $2\frac{a}{x}$

$+ 2x = 4\sqrt{b}$. Whence the value of x may be easily had, and you may make infinite numbers of squares and oblongs that have the same ambit, and yet shall have different given areas, thus,

Let $\sqrt{b} = d$,

$2a + 2x^2$

Then, $\frac{x}{x^2 - 2dx} = 4d$

$a + x^2 = 2dx$

$x^2 - 2dx = -a$

$x^2 - 2dx + d^2 = d^2 - a$

$x = \frac{1}{2}d \pm \sqrt{d^2 - a}$

Thus, if one side of the square be 10; and one side of an oblong be 19, and the other 1: then will the ambits of that square and oblong be equal, viz. each 40, and yet the area of the square will be 100, and of the oblong but 19.

ISOPYRUM, in botany, a genus of the polygynia order, and polyandria class of plants; natural order, Multisiliquæ. Calyx none, petals five; nectaria trifid and tubular; capsules recurved, polyspermous. It has three species, of no note.

ISOSCELES TRIANGLE, in geometry, one that has two equal sides. See GEOMETRY.

ISPAHAN, or, (as the Persians pronounce it,) SPAUHAWN, the capital of Persia, situated in the province of Irac Agemi, or Persia

Persia Proper, upon the ruins, as is generally supposed, of the ancient Hecatompylos, or, as others think, of the Aspa of Ptolemy. Lat. 32. 25. N. Lon. 52. 50. E. It stands on a very extensive plain, surrounded by mountains; and has eight districts belonging to it, that contain about 400 towns and villages. The fertility of the soil, the mildness of the climate, and the fine temperature of the air, all conspire to render Isphahan one of the most delightful cities in the world.

ISPIDA, in ornithology. See *ALCEDO*.

ISRAEL, [from *יִשְׂרָאֵל*, and *אֵל*, Heb. *i. e.* prevailing in the Lord,] the name which the angel gave Jacob, after having wrestled with him all night at Mahanaim or Penuel. Gen. xxxii. 1, 2, and 28, 29, 30. and Hosea xii. 3.

ISRAEL is also used for the people of Israel, or the whole descendants of Jacob, as well as for the kingdom of Israel, or of the Ten Tribes distinct from the kingdom of Judah.

ISRAELITES, the descendants of Israel; who were at first called Hebrews, from Heber, one of their ancestors, afterwards Israelites, from Israel the patriarch; and lastly Jews, after their return from the captivity of Babylon, because the tribe of Judah was then much stronger and more numerous than the other tribes.

ISSACHAR, [from *יִשָּׂכָר*, Heb. *i. e.* he hired, or wages,] the fifth son of Jacob by Leah, and the progenitor of the tribe so named from him. Also, one of the divisions of Palestine by tribes; lying S. of Zebulon, so as by a narrow slip to reach the Jordan, between Zabulon and Manasseh, Josh. xix.

ISSOUDUN, a considerable town of France, in the department of Indre, and late province of Berry.

ISSUE, in law, has many significations, sometimes being used for the children begotten between a man and his wife; sometimes for profit growing from amercements or fines; and sometimes for profits of lands or tenements; sometimes for that point of matter depending in a suit, when, in the course of pleading, the parties in the case affirm a thing on one side, and deny it on the other, they are then said to be at issue; all their debates being at last contracted into a single point, which may be determined either in favour of the plaintiff or defendant.

ISSUES, in surgery, are small artificial apertures or ulcers in the muscular parts of the body, for the purpose of draining superfluous moisture, or of giving vent to some noxious humours. Issues are usually made in the arms, legs, or back, either by caustics, or by incision. They are chiefly applied in disorders of the head, eyes, ears, teeth, &c. which are thus relieved, and frequently cured. Inveterate complaints generally require two or more issues, to produce any considerable effect, namely one in each arm, or on the arm and leg of one side of the body.

ISSUS, a town of Cilicia in Natolia, now called Ajazzo; with a harbour on the Levant Sea, a little N. of Scanderoon.

ISTHMA, or the ISTHMIAN GAMES, one of the four solemn games which were celebrated every fifth year in Greece. They had the name from the Isthmus of Corinth, where they were celebrated. In their first institution, according to Pausanias, they consisted only of funeral-rites and ceremonies in honour of Melicertes; but Theseus afterwards, as Plutarch informs us, in emulation of Hercules, who had appointed games at Olympia in honour of Jupiter, dedicated those to Neptune, his reputed father, who was regarded as the particular protector of the Isthmus and commerce of Corinth. The same trials of skill were exhibited here as at the other three sacred games; and particularly those of music and poetry. These games, in which the victors were only rewarded with garlands of pine-leaves, were celebrated with great magnificence and splendor, as long as paganism continued to be the established religion of Greece; nor were they omitted even when Corinth was sacked and burnt by Mummius the Roman general; at which time the care of them was transferred to the Sicyonians, but was restored again to the Corinthians when their city was rebuilt.

ISTHMUS, [*isthmus*, Lat.] a narrow neck of land which joins two continents, or separates two seas. The most celebrated isthmuses are, that of Panama or Darien, which joins North and South America; that of Suez, which connects Asia and Africa; that of Corinth, or Peloponnesus, in the Morea; that of Crim Tartary, otherwise called Taurica Chersonesus; that of the peninsula Romania, and Erisso, or the isthmus of the Thracian Chersonesus, 12 furlongs broad, being that which Xerxes undertook to cut through.

ISTRIA, a peninsula of Italy, in Maritime Austria, and late territory of Venice, lying in the N. part of the Adriatic. It is bounded by Carniola on the N; and on the S. E. and W. by the sea. The air is unwholesome, especially near the coast; but the soil produces plenty of wine, oil, and grass: there are also quarries of fine marble. Cabo d'Istria is the capital.

ITALIAN BAILIEWICS, four districts of Italy, formerly belonging to the Swiss, afterwards incorporated with the Cisalpine Republic in 1797, and now included in the kingdom of Italy.

ITALIAN LANGUAGE, the language spoken in Italy. This tongue is derived principally from the Latin; and of all the languages formed from the Latin, there is none which carries with it more visible marks of its original than the Italian. It is accounted one of the most perfect among the modern tongues. It is complained, indeed, that it has too many diminutives and superlatives, or rather augmentatives; but without any great reason; for if those words convey nothing further to the mind than the just ideas of things, they are no more faulty than our pleonasm and hyperboles. The language corresponds to the genius of the people, who are slow and thoughtful: accordingly, their language runs heavily, though smoothly; and many of their words are lengthened out to a great degree. They have a great taste for music; and to gratify their passion this way, have altered many of their primitive words; leaving out consonants, taking in vowels, softening and lengthening out their terminations, for the sake of the cadence. Hence the language is rendered extremely musical, and succeeds better than any other in operas and some parts of poetry; but it fails in strength and nervousness; and a great part of its words, borrowed from the Latin, become so far disguised, that they are not easily known. The Italian is generally pretty well understood throughout Europe; and is frequently spoken in Germany, Poland, and Hungary.

ITALIAN REPUBLIC, a name given by Bonaparte and the deputies from the Cisalpine Consulta, who met with him at Lyons, in 1801, to that part of Italy, which, in October, 1797, was erected into a democratic state, under the title of the Cisalpine Republic. The following division of the Cisalpine or Italian Republic into 12 departments, and 46 districts was published by the Cisalpine Consulta, on the 13th May 1801.

No.	Depart.	Capitals.	Population.	Distr.
1.	Agogna.	Novara.	346,213	5
2.	Lario.	Como.	371,894	4
3.	Olona.	Milan.	526,234	4
4.	Serio.	Bergamo.	294,142	4
5.	Mella.	Brescia.	333,625	4
6.	Upper Po.	Cremona.	361,079	4
7.	Mincio.	Mantua.	290,329	4
8.	Crostolo.	Reggio.	179,795	2
9.	Panaro.	Modena.	200,170	2
10.	Lower Po.	Ferrara.	227,500	3
11.	Reno.	Bologna.	421,841	4
12.	Rubicon.	Cesena.	304,846	6
			3,857,668	46

Nº	Distr.	Popul.	Nº	Distr.	Popul.
I.	1. Novara.	73,042	V.	3. Treviglio.	75,217
	2. Vigevano.	95,562		4. Breno.	40,303
	3. Domo d'Ossola.	40,849		1. Brescia.	145,035
	4. Varallo.	48,285		2. Chiari.	58,852
II.	5. Arona.	89,475	VI.	3. Verola of Alghist.	69,901
	1. Como.	118,465		4. Salò.	59,837
	2. Varese.	89,371		1. Cremona.	110,642
	3. Sondrio.	83,641	VII.	2. Crema.	86,039
III.	4. Lecco.	75,417		3. Lodi.	85,307
	1. Milan.	217,807		4. Casal Major.	79,091
	2. Pavia.	119,105		1. Mantua.	83,025
	3. Monza.	78,202	IV.	2. Rovero.	80,178
IV.	4. Gallarate.	111,120		3. Verona.	81,575
	1. Bergamo.	137,261		4. Castiglione.	45,551
	2. Clusone.	41,361			

N°	Distr.	Popul.	N°	Distr.	Popul.
VIII. 1.	Reggio.	137,187	XI. 1.	Belogna.	180,148
2.	Massa and Carrara.	42,608	2.	Imola.	116,728
IX. 1.	Modena.	150,944	3.	Cento.	71,142
2.	Castelnuovo.	49,226	4.	Vergato.	53,823
X. 1.	Ferrara.	109,947	XII. 1.	Cesena.	68,046
2.	Coracchio.	45,603	2.	Forli.	39,253
3.	Rovigo.	71,950	3.	Faenza.	52,286
			4.	Ravenna.	47,252
			5.	Rimini.	62,736
			6.	Pesaro.	35,273

The whole of this country, in March, 1805, was included in the kingdom of Italy, over which the present French emperor, Napoleon, was crowned king, at Milan, May 26 of the same year, and his step-son Eugene afterwards nominated viceroy.

ITALIC CHARACTERS, one of the characters, in printing, as the letters of the following word *Italic*.

ITALICA, in ancient geography, a town of Baetica in Spain, built by Scipio Africanus, now called Sevilla Vieja.

ITALY, one of the finest countries of Europe, lying between 42° and 19° Lon. E. and between 37° and 46° Lat. N. On the N. N. W. and N. E. it is bounded by France, Switzerland, the country of the Grisons, and Germany; on the E. by the Adriatic sea; and on the S. and W. by the Mediterranean; its figure bearing some resemblance to a boot. Its length from Aosta at the foot of the Alps in Savoy, to the utmost verge of Calabria, is about 600 miles; but its breadth is very unequal, being in some places very near 400 miles, in others not above twenty-five, or thirty. This country, like most others, was anciently divided into a great number of petty states, and kingdoms. Afterwards, when the Gauls settled in the western, and many Greek colonies in the eastern parts, it was divided, with respect to its inhabitants, into three great parts, viz. Gallia Cisalpina, Italy Proper, and Magna Græcia. The most western and northern parts of Italy were in great part possessed by the Gauls; and hence took the name of Gallia, with the epithets of Cisalpina and Citerior, because they lay on the side of the Alps next to Rome; and Togata, with relation to the Roman gown or dress which the inhabitants used: but this last epithet is of a much later date than the former. This appellation was antiquated in the reign of Augustus, when the division of Italy into eleven provinces, introduced by him, took place. Hence the name of Cisalpine Gaul frequently occurs in authors who flourished before, and scarcely ever in those who wrote after, his reign. This country extended from the Alps and the river Varus, parting it from Transalpine Gaul, to the river Aesius; or, as Pliny has it, to Ancona, in the ancient Picenum. On the N. it was divided from Rhætia by the Alpes Rhæticae; and from Illyricum by the river Formio; but on this side, the borders of Italy were, in Pliny's time, extended to the river Arsia in Istria. On the S. it reached to the Ligustic sea, and the Appennines parting it from Etruria; so that under the common name of Cisalpine Gaul were comprehended the countries lying at the foot of the Alps, called by Pliny and Strabo the Subalpine Countries, Liguria, Gallia Cispadana, and Transpadana. Italy, properly so called, extended, on the coast of the Adriatic, from the city of Ancona to the river Trento, now the Fortore; and on the Mediterranean, from the Mærea to the Silarus, now the Sele. Magna Græcia comprised Apulia, Lucania, and the country of the Brutii. It was called Greece, because most of the cities on the coast were Greek colonies. The inhabitants gave it the name of Great, not as if it was larger than Greece, but merely out of ostentation, as Pliny informs us. Italy was anciently known by the names of Saturnia, Oenotria, Hesperia, and Ausonia. It was called Saturnia from Saturn; who being driven out of Crete by his son Jupiter, is supposed to have taken refuge here. The names of Oenotria and Ausonia are borrowed from its ancient inhabitants the Oenotrians and Ausones; and that of Hesperia or Western was given it by the Greeks, from its situation with respect to Greece. The name of Italia, or Italy, which in process of time prevailed over all the rest, is by some derived from Italus, a king of the Siculi: by others, from the Greek word *ἰταλός*, an ox; this country abounding, by reason of its rich pastures, with oxen of an extraordinary size and beauty. All these names were originally peculiar to particular provinces of Italy, but afterwards applied to the whole

country. The Italians are well proportioned, and in dress they follow the fashions of the countries on which they border, or to which they are subject. With respect to their genius and taste in architecture, painting, carving, and music, they are thought to excel greatly, and to leave the other nations of Europe far behind them; but their music seems too soft and effeminate to deserve all the praise bestowed on it; and their houses are far inferior to those of England in respect of convenience. No country has produced better politicians, historians, poets, painters, and sculptors, since the revival of the arts and sciences, exclusive of those of ancient times. The Italians are very affable, courteous, ingenious, sober, and ready-witted; but extremely jealous, vindictive, lascivious, ceremonious, and superstitious. In respect to jealousy, indeed, we are told, that a very extraordinary change has lately taken place; and that the Italians are now no less indulgent and complaisant to their wives, than the most polite husbands in France were under the old government. In their tempers, the Italians seem to be a good medium between the French and Spaniards; neither so gay and volatile as the one, nor so grave and solemn as the other. Boiled snails served up with oil and pepper, or fried in oil, and the hinder parts of frogs, are reckoned dainty dishes. Kites, jackdaws, hawks, and magpies, are also eaten not only by the common people, but by the superior ranks. Wine is drank both in summer and winter cooled by ice or snow. The women affect yellow hair, as the Roman ladies and courtezans formerly did. The chief mountains of Italy are the Alps and Appennines. See these articles. They abound not only with mines of iron, lead, alum, sulphur, marble of all sorts, alabaster, jasper, porphyry, &c. but also produce gold and silver; with a great variety of aromatic herbs, trees, shrubs, and evergreens, as thyme, lavender, laurel, and bays, wild olive-trees, tamarinds, juniper, oaks, and pines. The chief rivers of Italy are the Tiber, Po, Adige, Arno, and Var; and it has several fine lakes, viz. Lake Maggiore, Lugano, Como, Garda, Pernigia, Bracciano, and Celano. The soil of Italy, in general, is very fertile, being watered by a great number of rivers. It produces a great variety of wines, and the best oil in Europe; excellent silk in abundance; corn of all sorts, but not in such plenty as in some other countries; oranges, lemons, citrons, pomegranates, almonds, raisins, sugar, mulberry-trees without number, figs, peaches, nectarines, apricots, pears, apples, filberts, chestnuts, &c. Most of these fruits were at first imported by the Romans from Asia Minor, Greece, Africa, and Syria, and were not the natural products of the soil. The tender plants are covered in winter on the N. side of the Appennines, but on the S. side they have no need of it. This country also yields good pasture; and abounds with cattle, sheep, goats, buffaloes, wild boars, mules, and horses. The forests are well stored with game. The air of Italy is very different according to the different situations of the several countries contained in it. In those on the N. of the Appennines it is more temperate, but on the S. it is generally very warm. The air of the Campania of Rome, and of the Ferrarese, is unhealthy, owing to the lands not being duly cultivated, nor the marshes drained. That of the other parts is generally pure, dry, and healthy. In summer, the heat is very great in the kingdom of Naples; and would be almost intolerable if it were not somewhat alleviated by the sea-breezes. A very extensive trade is carried on in many places in Italy, particularly at Leghorn, Genoa, Bologna, Venice, and Naples; the country having a great variety of commodities and manufactures for exportation, especially wine, oil, perfumes, fruits, and silks.

ITCH, a cutaneous affection, in which the skin is covered with small watery pustules, that appear first on the wrist, or between the fingers, then upon the arms, legs, &c. where they are accompanied with an intolerable irritating sensation. The itch is contagious, but seldom prevails where due attention is paid to cleanliness, fresh air, and wholesome food. Unless it be improperly treated, it is in itself not a dangerous disease: but if it be too long neglected, the whole humours become corrupted; and if it be suddenly suppressed, without proper evacuations, it is apt to occasion fevers, inflammations, pulmonary consumptions, &c. Hence the extreme absurdity of having recourse to ointments which profess to cure it in a certain number of days, or even hours. This disease is supposed to be caused by an insect, a species of the genus *Acarus*, viz. *A. scabiei*, which, when viewed by a good microscope, is white with reddish legs; the four hind ones having

long



ITALY

Longitude East 10 from London.

Lat. Malta



ing bristle. It is found in the small pellucid vesicles with which the hands and joints of persons infected with the itch are covered. It appears to be not only the cause of the disorder, but the reason why it is so highly infectious. There is another species, called the dry, or malignant itch, which generally arises from the scurvy, and is very difficult to eradicate. In this case, the liberal use of antiscorbutics, and a vegetable diet, are of equal importance. A strong decoction of tobacco has often been found an efficacious external application. Mercurial ointments have likewise been employed with advantage, but their use requires great circumspection, as it is absolutely necessary to keep the bowels regular.

ITEA, in botany, a genus of the monogynia order, and pentandria class of plants. Capsule two-celled, two-valved, many-seeded; stigma emarginate. There are two species, viz. *I. Virginica*, Virginian itea; and *I. ceyllla*, entire-leaved itea. These are both shrubs, natives of America.

ITHACA, in ancient geography, an island in the Ionian sea, on the coast of Epirus; the country and kingdom of Ulysses, near Dulichium, with a town and port situated at the foot of mount Neius. Pliny says it is about twenty-five miles in compass; Artemidorus makes it only ten; and it is now found to be only eight miles round. It is now uninhabited, and called Jathaco.

ITHOMALA, a festival held at Ithome, in honour of Jupiter, hence called Ithomates, in which musicians contended.

ITINERARY, **ITINERARIUM**, a journal, or an account of the distances of places. The most remarkable is that which goes under the names of Antoninus and Æthicus; or, as Barthius found in his copy, Antoninus Æthicus; a Christian writer, posterior to the time of Constantine. Another, called Hierosolymitanum, from Bourdeaux to Jerusalem, and from Hieraclea through Aulona and Rome to Milan, under Constantine. Itinerarium also denotes a day's march.

ITKARINSKOL, a town of Russia, in the province of Kollivan.

ITTER, a river of Germany, which runs into the Eder.

ITTRIA, one of the earths discovered by Gadolin, a Swedish chemist, in a fossil, found at Ytterby, in Sweden, which has since received the name of gadolinite, and in which it is combined with silice and lime. The same earth has been discovered in some other fossils particularly combined with lantalum. In several of its properties ittria resembles glucine, particularly in forming salts of a sweet taste, and in being soluble in carbonate of ammonia; but it differs entirely in others. Vauquelin, to obtain this earth from the gadolinite, dissolved it, with the assistance of heat, in diluted nitric acid, pouring off the solution from the undissolved silice. He then evaporated to dryness, and by re-dissolving the residuum in water, obtained the compound of nitric acid and ittria. If any traces of iron be observed, the liquor is either again evaporated to dryness, or a little ammonia is added; and after the separation of the oxide of iron by yellow flakes, the solution is decomposed by ammonia, which precipitates the new earth. This earth is obtained in the form of a white powder; its specific gravity is about 4.8, being heavier than any other earth. It is not soluble in water, but it retains that fluid with considerable force. Ittria combines with the acids; its salts have generally a sweetish taste, and several of them are coloured, a property in which it differs from all the other earths.

ITZEHOA, an ancient and handsome town of Germany, in the late duchy of Holstein. Lon. 9. 25. E. Lat. 54. 8. N.

IVA, in botany, a genus of the pentandria order, and monœcia class of plants; natural order, Compositæ. Male calyx common, three-leaved; corolla of the disk, one-petaled, five-cleft; receptacle with hairs or linear chaffs: female, in the ray, five, or fewer; corolla none; styles two, long; seeds naked, blunt. It has two species, *I. annua*, annual iva; and *I. frutescens*, shrubby iva, or bastard Jesuit's bark-tree.

IVAHIAH, the name of one of the canoes or boats used by the islanders of the South Sea for short excursions to sea: it is wall-sided and flat-bottomed.

JUAN FERNANDEZ, an island in the great South Sea, formerly a place of resort for the buccaneers who annoyed the western coast of the Spanish continent. They were led to resort hither from the multitude of goats which it nourished; to deprive their enemies of which advantage, the Spaniards transported a considerable number of dogs, which increasing greatly, have almost extir-

pated the goats, who now only find security amongst the steep mountains in the northern parts, which are inaccessible to their pursuers. There are instances of two men living, at different times, alone on this island, for many years; the one a Muquito Indian; the other Alexander Selkirk, a Scotsman, who was, after five years, taken on board an English ship, which touched here in about 1710, and brought back to Europe. From the history of this recluse, Daniel de Foe wrote his *Adventures of Robinson Crusoe*, and robbed Selkirk of both the honour and profits of his MS. Lon. 78. 30. W. Lat. 33. 40. S.

JUAN, St. the capital of California, in North America. Lon. 114. 9. W. Lat. 26. 25. N.

JUAN, St. DE LA FRONTERA, a town of South America, in Chili, in the province of Chiquito, near the lake Guanacho.

JUAN, St. DE PORTO, or PUERTO RICO, an island of America, one of the Caribbees, being 100 miles long, and 50 broad.

JUAN, St. DE PORTO RICO, the capital town of the island of Porto Rico, on the N. coast of the island. Lon. 65. 35. W. Lat. 18. 30. N.

IVANGOROD, a town of Russia, in the government of Petersburg, fifty-two miles S. W. of Petersburg.

JUBAL, [יובל, Heb. *i. e.* fading, or a trumpet,] the son of Lamech, and sixth from Cain: the inventor of musical instruments.

JUBILEE, among the Jews, denotes every fiftieth year; being that following the revolution of seven weeks of years; at which time all the slaves were made free, and all lands reverted to their ancient owners. The jubilees were not observed after the Babylonish captivity. The political design of the law of the jubilee was to prevent the too great oppressions of the poor, as well as their being liable to perpetual slavery. A kind of equality was thus preserved through all the families of Israel, and the distinction of tribes was also preserved, that they might be able, when there was occasion, on the jubilee-year, to prove their right to the inheritance of their ancestors. It served also, like the Olympiads of the Greeks, and the Lustra of the Romans, for the readier computation of time. The Jubilee has also been supposed to be typical of the gospel state and dispensation described by Isaiah, lxi. 1, 2, in reference to this period, as the "acceptable year of the Lord."

JUBILEE, in a modern sense, denotes a grand church-festivity, celebrated at Rome, wherein the pope grants a plenary indulgence to all sinners; at least to as many as visit the churches of St. Peter, and St. Paul, at Rome. The jubilee was first established by Boniface VII. in 1300, in favour of those who should go ad limina apostolorum; and it was only to return every 100 years. But the first celebration brought in such store of wealth to Rome, that the Germans called this the golden year; which occasioned Clement VI. in 1343, to reduce the period of the jubilee to fifty years. Urban VI. in 1389, appointed it to be held every thirty-five years, that being the age of our Saviour; and Paul II. and Sixtus IV. in 1475, brought it down to every twenty-five, that every person might have the benefit of it once in his life. Boniface IX. granted the privilege of holding jubilees to several princes and monasteries: for instance, to the monks of Canterbury, who had a jubilee every fifty years; when people flocked from all parts to visit the tomb of St. Thomas a Becket. Jubilees are now become more frequent, and the pope grants them as often as the church has occasion for them. There is usually one at the inauguration of a new pope. To be entitled to the privileges of the jubilee, the bull enjoins fastings, alms, and prayers. It gives the priests a full power to absolve in all cases even those otherwise reserved to the pope: to make commutations of vows, &c. in which it differs from a plenary indulgence. During the time of jubilee, all other indulgences are suspended.

JUBILER is also used for any musical solemnity or festival, appointed or repeated at a distant period. Thus Edward III. caused his birth-day to be observed in manner of a jubilee, when he became fifty years of age, in 1362, but never before or after. This he did by releasing prisoners, pardoning all offences except treason, making good laws, and granting many privileges to the people.

JUBO, a kingdom of Africa, on the coast of Ajan.

JUDAH, [יְהוּדָה, Heb. *i. e.* Praise, or Confession,] the fourth son of Jacob, and father of the chief tribe of the Jews, distinguished by his name, and honoured by giving birth to the Messiah, died B. C. 1635. This patriarch, though he seems, from the

brief account we have of him, not to have been a very rigid moralist, shewed himself, nevertheless, a man of fine feelings, and possessed of a strong filial affection for his aged father. In his pathetic intercession with Joseph, for the liberation of Benjamin, as well as in his previous suretiship to Jacob, he may be considered as a type of our Saviour. See Gen. xliii. xlv.

JUDAH is also used for the people of Judah, including not only the whole people of that tribe, but those of the tribe of Benjamin, the majority of the Levites, and many individuals from all the other tribes, who adhered to the house of David, to avoid the idolatrous worship established by Jeroboam I. Many other individuals from the dispersed tribes are also supposed to have joined them after the Babylonish captivity, when they were called Jews. See JEWS.

JUDAH, THE KINGDOM OF, was of small extent compared with that of the kingdom of Israel; consisting only of two tribes, Benjamin and Judah: being bounded on the E. by the Jordan; on the W. by the Mediterranean, in common with the Danites, except some places recovered by the Philistines, and others taken by the kings of Israel; on the S. its limits seem to have been contracted by Hadad. 1 Kings xi. 14.

JUDAH HAKKADOSH, OR THE SAINT, a rabbi celebrated for his learning and riches, lived in the time of the emperor Antoninus, and was the friend and preceptor of that prince. Leo of Modena, a rabbi of Venice, tells us, that rabbi Judah, who was very rich, collected about twenty-six years after the destruction of the temple, in a book which he called the Misnia, the constitutions and traditions of the Jewish magistrates who preceded him. But as this book was short and obscure, two Babylonish rabbis, Rabbina and Ase, collected all the interpretations, disputes, and additions, that had been made until their time, upon the Misnia, and formed the book called the Babylonish Talmud or Gemara; which is preferable to the Jerusalem Talmud, composed some years before by rabbi Jochanan of Jerusalem. The Misnia is the text of the Talmud; of which we have a good edition in Hebrew and Latin by Surenhusius, with notes, in three vols. folio. It were to be wished the same had been done to the Gemara.

JUDAISM, the religious doctrines and rites of the Jews. Judaism was but a temporary dispensation, and was to give way, at least the ceremonial part of it, at the coming of the Messiah. For a complete system of Judaism, see the books of Moses. Judaism was anciently divided into several sects; the principal whereof were the Pharisees, Sadducees, and Essenians. At present there are two sects among the Jews, viz. the Karaites, who admit of no rule of religion but the law written by Moses; and the Rabbinists, who add to the law the traditions of the Talmud.

JUDE, ST. OR JUDAS, called also LEBBEUS, and THADDEUS, the son of Joseph, and brother of St. James the younger. Matth. xiii. 55. He preached in Mesopotamia, Arabia, Syria, and Idumea; and died in Berytus for the confession of Christ. He wrote that epistle which goes under his name, and after the death of most of the apostles. He was cruelly put to death for reproving the superstition of the Magi.

JUDE, THE GENERAL EPISTLE OF, a canonical book of the New Testament, written against the heretics, who, by their disorderly lives, and impious doctrines, corrupted the faith and good morals of the Christians. St. Jude draws them in lively colours, as men given up to their passions, full of vanity, conducting themselves by worldly wisdom, and not by the Spirit of God.

JUDEA, in ancient geography, taken largely, either denotes all Palestine, or the greater part of it; and thus it is generally taken in the Roman history. See PALESTINE.

JUDENBURG, a town of Germany, in Austria, eighty-four miles S. W. of Vienna.

JUDGE, [*judex*, Lat.] one who is invested with authority to determine any cause or question, real or personal. The judges are the chief magistrates in the law, to try civil and criminal causes. Of these there are twelve in England, viz. the Lords Chief Justices of the Courts of King's Bench and Common Pleas; the Lord Chief Baron of the Exchequer; the three puisne or inferior judges of the two former courts, and the three puisne barons of the latter. By statute 1 Geo. III. c. 23, the judges are to continue in their offices during their good behaviour, notwithstanding any demise of the crown (which was formerly held immediately to vacate their seats) and their full salaries are absolutely secured to them during

the continuance of their commissions, by which means the judges are rendered completely independent of the king, his ministers, or his successors. A judge at his creation takes an oath, that he will serve the king, and indifferently administer justice to all men, without respect of persons, take no bribe, give no counsel where he is a party, nor deny right to any, though the king or any other, by letters, or by expressed words, command the contrary, &c. and in default of duty, to be answerable to the king in body, land, and goods. Where a judge has an interest, neither he nor his deputy can determine a cause, or sit in court; and if he does, a prohibition lies. Hardw. 503. Judges are punishable for wilful offences, against the duty of their situations; instances of which happily live only in remembrance. There are ancient precedents of judges who were fined when they transgressed the laws, though commanded by warrants from the king. Judge is not answerable to the king, or the party, for mistakes or errors of his judgement, in a matter of which he has jurisdiction.

JUDGES, in Jewish antiquity, supreme magistrates who governed the Israelites from the time of Joshua till the reign of Saul. They continued during the whole time of the republic of Israel, being a space of about 339 years.

JUDGES, BOOK OF, a canonical book of the Old Testament, so called from its relating the state of the Israelites under the administration of many illustrious persons who were called judges, from being both the civil and military governors of the people, and who were raised up by God upon special occasions, after the death of Joshua, till the time of their choosing a king.

JUDGES, SELECT, [*judices selecti*, Lat.] in antiquity, were persons summoned by the prætor to give their verdict in criminal matters in the Roman courts, as juries do in ours. No person could be regularly admitted into this number till he was twenty-five years of age.

JUDGEMENT, among logicians, a faculty, or rather act, of the human soul, whereby it compares its ideas, and perceives their agreement or disagreement. See LOGIC, and METAPHYSICS.

JUDGEMENT, in law, is the sentence pronounced by the court upon the matter contained in the record. Judgements are of four sorts. First, where the facts are confessed by the parties, and the law determined by the court; as in the case of judgement upon demurrer. Secondly, where the law is admitted by the parties, and the facts disputed; as in the case of judgement on verdict. Thirdly, where both the fact and the law arising thereon are admitted by the defendant; which is the case of judgements by confession or default: or, lastly, where the plaintiff is convinced that either fact, or law, or both, are insufficient to support his action, and therefore abandons or withdraws his prosecution; which is the case in judgements upon a nonsuit or retraxit. The judgement, though pronounced or awarded by the judges, is not their determination or sentence, but the determination and sentence of the law; it is the remedy prescribed by law for the redress of injuries; and the suit or action is the vehicle or means of administering it. What that remedy may be, it is indeed the result of deliberation and study to point out; and therefore the style of the judgement is not that it is decreed or resolved by the court; for then the judgement might appear to be their own; but, "it is considered," *consideratum est per curiam*, that the plaintiff do recover his damages, his debt, his possession, and the like; which implies that the judgement is none of their own, but the act of law pronounced and declared by the court, after due deliberation and inquiry. See Blackstone's Comment. iii. 396.

JUDGEMENT, in criminal cases, is the next stage of prosecution, after trial and conviction are past, in such crimes and misdemeanors as are either too high or too low to be included within the benefit of clergy. For when, upon a capital charge, the jury have brought in their verdict guilty, in the presence of the prisoner; he is either immediately, or at a convenient time soon after, asked by the court, if he has any thing to offer why judgement should not be awarded against him. And in case the defendant be found guilty of a misdemeanor (the trial of which may, and does usually, happen in his absence, after he has once appeared), a *capias* is awarded and issued, to bring him to receive his judgement; and if he absconds, he may be prosecuted even to outlawry. But whenever he appears in person, upon either a capital or inferior conviction, he may at this period, as well as at his arraignment,

ment, offer any exceptions to the indictment, in arrest or stay of judgment: as for want of sufficient certainty in setting forth either the person, the time, the place, or the offence. And if the objections be valid, the whole proceedings shall be set aside; but he par y may be indicted again. A pardon also may be pleaded in arrest of judgment: and it is the same when pleaded here as when upon arraignment, viz. the saving the attainder, and, of course, the corruption of blood: which nothing can restore but parliament, when a pardon is not pleaded till after sentence. And certainly, upon all accounts, when a man hath obtained a pardon, he is in the right to plead it as soon as possible. See PARDON. Praying for benefit of clergy may also be ranked among the motions in arrest of judgment. See CLERGY. If all these resources fail, the court must pronounce that judgment which the law hath annexed to the crime. Of these some are capital, which extend to the life of the offender, and consist generally in being hanged by the neck till dead; though in very atrocious crimes other circumstances of terror, pain, or disgrace, are superadded: as, in treasons of all kinds, being drawn or dragged to the place of execution; in high treason, affecting the king's person or government, embowelling alive, beheading, and quartering; and in murder, a public dissection. And in case of any treason committed by a female, the judgment is, to be burned alive. But the humanity of the English nation has authorised, by tacit consent, an almost general mitigation of such parts of these judgments as savour of torture or cruelty: a sledge or hurdle being usually allowed to such traitors as are condemned to be drawn; and there being very few instances (and those accidental, or by negligence) of any persons being embowelled or burned, till previously deprived of sensation by strangling. Some punishments consist in exile or banishment, by abjuration of the realm, or transportation to New South Wales; others in loss of liberty, by perpetual or temporary imprisonment. Some extend to confiscation, by forfeiture of lands, or moveables, or both, or of the profits of lands for life: others induce a disability of holding offices or employments, of being heirs, executors, and the like. Some, though rarely, occasion a mutilation or dismembering, by cutting off the hand or ears; others fix a lasting stigma on the offender, by slitting the nostrils, or branding in the hand or face. Some are merely pecuniary, by stated or discretionary fines: and, lastly, there are others that consist principally in their ignominy, though most of them are mixed with some degree of corporeal pain; and these are inflicted chiefly for such crimes as either arise from indigence, or render even opulence disgraceful; such as whipping, hard labour in the house of correction, the pillory, the stocks, and the ducking-stool. Disgusting as this catalogue may seem, it will afford pleasure to a British reader, and do honour to the British laws, to compare it with that shocking apparatus of death and torment to be met with in the criminal code of almost every other nation in Europe. And it is moreover one of the glories of our law, that the nature, though not always the quantity or degree, of punishment is ascertained for every offence; and that it is not left in the breast of any judge, nor even of a jury, to alter that judgment which the law has beforehand ordained for every subject alike, without respect of persons.

JUDGEMENT OF GOD. See JUDICIUM.

JUDICATURE, [*judico*, Latin,] power of distributing justice.

JUDICATURE is also used for the quality or profession of those who administer justice, as well as the extent of the jurisdiction of the judge, and the court wherein he sits to render justice.

JUDICIA CENTUMVIRALIA, in Roman antiquity, were trials before the centumviri, to whom the prator committed the decision of certain matters of inferior nature, like our justices of peace at the quarter-sessions.

JUDICIUM CALUMNIE, was an action brought against the plaintiff for false accusation. The punishment, upon conviction, was iustitio frontis, or branding in the forehead.

JUDICIUM DEI, JUDGEMENT OF GOD, was a term anciently applied to all extraordinary trials of secret crimes; as tho' by arms, and single combat, and the ordeals; or those by fire, or red-hot plough-shares; by plunging the arm in boiling water, or the whole body in cold water; in hopes God would work a miracle, rather than suffer truth and innocence to perish. These customs were long kept up even among Christians; and they are still used in some nations. See BATEL, ORDEAL, &c.

JUDICIUM FALSI, was an action which lay among the judges for corruption or unjust proceedings.

JUDICIUM PARIVM, denotes a trial by a man's equals, i. e. of peers by peers, and of commoners by commoners. In magna charta it is more than once insisted on as the principal bulwark of our liberties.

JUDICIUM PRÆVARICATIONIS, was an action brought against the prosecutor, after the criminal was acquitted, for suppressing the evidence of, or extenuating his guilt, rather than urging it home, and bringing it to light.

JUDOIGNE, a town of France, in the department of the Dyle, 13 miles S.E. of Louvain.

IVES, St. a sea-port town of Cornwall, chiefly frequented by fishermen for pilchards.

IVES, St. a town in Huntingdonshire, sixty-four miles from London.

JUGERUM, in Roman antiquity, a square of a hundred and twenty Roman feet; its proportion to the English acre being as 10:000 to 16:097.

JUGLANS, in botany, a genus of the monœcia order, and polyandria class of plants; natural order, Amentaceæ. Male calyx monophyllous, squamiform; corolla divided into six parts; filaments eighteen: female calyx quadrifid, superior; corolla quadripartite; styles two; fruit, a plum with a furrowed kernel. There are eight species.

J. REGIA, the COMMON WALNUT, rises fifty feet high or more, with a large upright trunk, branching into a very large spreading head. The fruit is used at two different stages of growth; when green to pickle, and when ripe to eat raw. The wood of the walnut-tree is very valuable; cabinet-makers esteem it highly for several sorts of furniture and light works; for being beautifully veined, it takes a fine polish, and the more knotty it is, the more it is valued for particular purposes. Walnut-trees are also well adapted for planting round the borders of orchards, where, by their large spreading heads, they guard the less fruit-trees from boisterous winds. The kernels are similar in quality to almonds; but are not, like them, used in medicine.

JUGORA, a considerable province of Muscovy, in the government of Archangel.

JUGULAR, among anatomists, is applied to certain veins and glands in the neck. See ANATOMY.

JUGULARES, in the Linnæan system, an order or division of fish; the general character of which is, that they have ventral fins before the pectoral fins. See ICHTHYOLOGY, and ZOOLOGY.

JUGUM, the YOKE, a disgrace inflicted by the Romans upon their vanquished enemies, by making them pass singly between two spears, with a third laid across.

IVICA, or YVICA, an island in the Mediterranean. See YVICA.

JUICE, denotes the sap of vegetables, or the fluids of animals. See BLOOD, PLANTS, SAP, &c. The juices of several plants and fruits are expressed with a view to obtain their essential salts, and for various medicinal purposes: they are used either without further preparation, or converted into symps and extracts. Such juices are generally obtained by simply bruising the plant in a marble-mortar, and then submitting the pulp to a press: some vegetables, however, require the addition of water in the mortar, to express their juice with greater facility. The sap of most antiscorbutic plants, abounding with saline volatile principles, may be disposed to filtration, merely by pouring it in close bottles, and immersing them in boiling water: thus, the saline and volatile particles, in which their medicinal virtues chiefly consist, may be easily preserved. See FILTRATION. Fermentation is another method of clarifying juices that are susceptible of it; for all liquors which have undergone that process, spontaneously become pellucid. See FERMENTATION. Most vegetable juices coagulate, when exposed to the air, whether they are extracted from the plant by wounds, or flow from it without any external injury: in the latter case, however, it is generally the effect of a disease in the plant, either from a species of canker, or some other internal cause. Different parts of the same plant often yield juices of opposite qualities. Thus, the sap in the root of the cow-parsnip is of a yellow colour; while that obtained from its stalk is white. The wild or strong-scented lettuce affords the greatest

greatest abundance of milky juice of any known British plant. On wounding the stalk with a knife, there exudes a white ropy liquor; but, if incision be made at the top of the stalks, a purpletinged sap appears, as if cream had been sprinkled over it with a few drops of red-wine. In a short time it acquires a deeper purple, and thickens so, that finally a separation takes place, when the watery part floats on the surface.

JULEP, a convenient form of medicines which require no decoction, and are mixed up with syrup or sugar, in order to dilute them properly, or to cover their pungency. See **PHARMACY**.

JULIAN, a famous Roman Emperor, styled the Apostate, because he professed the Christian religion before he ascended the throne, but afterwards openly embraced Paganism, and endeavoured to abolish Christianity. He made no use of violence, however, at his first onset, for this purpose; but behaved with a polite mildness to the Christians; recalled all who had been banished on account of religion under Constantius; and endeavoured to pervert them by his caresses, and by temporal advantages covered over by artful pretences: but he prohibited Christians to plead before courts of justice, or to enjoy any public employments. He even prohibited their teaching polite literature; well knowing the great advantages they drew from profane authors in their attacks upon Paganism and irreligion. Though he on all occasions shewed a sovereign contempt for the Christians, whom he called Galileans, yet he was sensible of the advantage they obtained by their virtue and purity of their manners; and therefore incessantly proposed their example to the Pagan priests. At last, however, when he found that all other methods failed, he gave public employments to the most cruel enemies of the Christians, when the cities in most of the provinces were filled with tumults and seditions, and many of them were put to death. Historians mention, that Julian attempted to prove the falsehood of our Lord's prediction with respect to the temple of Jerusalem, by rebuilding it; but that all his endeavours served only the more perfectly to verify it. Julian being mortally wounded in a battle with the Persians, it is said, that he caught in his hand some of the blood which flowed from his wound, and, throwing it towards heaven, cried, "Thou Galilean hast conquered." But Theodoret relates, that Julian discovered a different disposition; and employed his last moments in conversing with Maximus the philosopher, on the dignity of the soul. He died the following night, aged thirty-two.

JULIAN EPOCH, the æra of the institution of the Julian reformation of the calendar, which began B. C. 46.

JULIAN PERIOD, in chronology, a period so called, as being adapted to the Julian year. See **CHRONOLOGY**. It is made to commence before the creation. Its principal advantage lies here, that the same years of the cycles of the sun, moon, and indiction, of which three cycles it was made to consist by Joseph Scaliger in 1580, belonging to any year of this period, will never fall together again till after the expiration of 7980 years; for 28, the number of years in the solar cycle, $\times 19$, do. in the lunar cycle, $\times 15$, do. in the indiction-cycle, = 7980. There is taken for the first year of this period that which hath the first of the cycle of the sun, the first of the cycle of the moon, and the first of the indiction cycle, and so reckoning on. The first year of the Christian æra is always, in our systems of chronology, the 4714th of the Julian period. To find what year of the Julian period answers to any given year of Christ: to the given year of Christ add 4713, because so many years of the Julian period were expired A.D. 1; and the sum gives the year of the period sought. On the contrary, having the year of the Julian period given, to find what year of Christ answers thereto; from the year of the Julian period given subtract 4713, and the remainder will be the year sought.

JULIAN YEAR, the old account of the year, established by Julius Cæsar, consisting of 365 $\frac{1}{4}$ days.

JULIERS, a late duchy of Germany in Westphalia, now annexed to France, in the department of the Roer.

JULIERS, capital of the above, 23 miles W. of Cologne.

JULIUS VICUS, in ancient geography, a town of the Nemetes in Gallia Belgica, now called Germersheim.

JULUS, in entomology, a genus of insects of the order aptera. Lip crenate, emarginate; feet very numerous; antennæ moniliform; palpi two, ariculate; body of a semicylindrical form. There are fourteen species. See Plate LXXVI.

JULY, the month during which the sun enters the sign Leo. Mark Antony first gave this month the name of July, after Julius Cæsar, who was born in it.

JUMIEGE, a town of France, in the department of the Lower Seine, and late province of Normandy, 77 miles N. W. of Paris.

JUMMOO, a town of Hindoostan, in Lahore, 70 miles N. E. of Lahore.

JUMNAH, a large river of Hindoostan Proper, which rises to the N. W. of Delhi, and joins the Ganges about 10 miles below Benares.

JUNAGUR, a town and fort of Hindoostan, in Guzerat, 170 miles S. W. of Amedabad. Lon. 69. 54. E. Lat. 21. 50. N.

JUNCTURE. See **JOINT**.

JUNCTURE, in oratory, is a part of composition, particularly recommended by Quintilian, and denotes such an attention to the nature of the vowels, consonants, and syllables, in the connection of words, with regard to their sound, as will render the pronunciation most easy and pleasant, and best promote the harmony of the sentence.

JUNCUS, the Rush; in botany, a genus of the monogynia order, and hexandria class of plants; natural order, Tripelatoideæ. Calyx six-leaved; corolla none; capsule one-celled. There are 29 species which are universally known, being very troublesome weeds, and difficult to be eradicated.

JUNE, [*Junius*, Lat.] derived by some from *Juno*. Ovid, in the sixth book of his *Fæsti*, makes the goddess say,

Junius a nostro nomine nomen habet.

Others rather derive it a junioribus, this being for young people as the month of May was for old ones:

Junius est juvenum; qui fuit ante senum.

In this month is the summer-solstice, and the sun enters Cancer on the 21st day of it.

JUNGERMANNIA, in botany, a genus of the natural order alga, in the cryptogamia class of plants. Male flower pedunculated, and naked; anthera quadrivalved: female flower sessile, naked, with roundish seeds. There are thirty species, natives of Britain, growing in woods, and shady places, by the sides of ditches, &c. Many of them are beautiful objects for the microscope.

JUNGIA, in botany, a genus of the polygamia segregata order, and syngenesia class of plants. Common receptacle chaffy; perianthium three-flowered; florets tubular, two-lipped; exterior lip ligulate; interior two-parted. It has but one species, a native of South America.

JUNIA LEX SACRATA, a law made by L. Junius Brutus, the first tribune of the people, A. U. C. 260, that the persons of the tribunes should be inviolable; that an appeal might be made from the Consuls to the tribunes; and that no Senator should exercise the office of a tribune.

JUNIPER-TREE, or **JUNIPERUS**, a genus of the monadelphia order, and monoecia class of plants; natural order, Conifera. Male, calyx of the ament a scale; corolla none; stamina three: female, calyx three-parted; petals three; styles three; berry three-seeded, irregular, with the three tubercles of the calyx. There are twelve species; some of these are lofty handsome trees; but the J. communis, common juniper, is a low shrub, seldom more than three feet in height, sending out many spreading tough branches, inclining on every side, covered with a brown or reddish bark, with a tinge of purple. The male flowers are sometimes on the same plant with the females, but at a distance from them; they are commonly on distinct plants.

JUNIUS, FRANCIS, professor of divinity at Leyden, was born at Bourges in 1545, of a noble family, and studied at Lyons, under Bartholomew Aneau, principal of the college. He was remarkable for being proof against all temptations to lewdness; but a libertine so far overpowered him by his sophistry, that he made him an atheist; however, he soon returned to his first faith; and, though averse to unlawful love, he was married four times. He was employed in public affairs by Henry IV. and at last was invited to Leyden to be professor of divinity, which employment he discharged with honour, till he died of the plague, in 1602. Du Pin says, he was a learned and judicious critic. He wrote, in conjunction with Emmanuel Tremellius, a Latin version of the Hebrew text of the Bible. He also published Commentaries on

great part of the Holy Scriptures; and many other works, all Latin.

JUNIUS, FRANCIS, or FRANCIS DU JON, the son of the professor, was born at Heidelberg in 1589. He came to England in 1620, and lived thirty years in the earl of Arundel's family. He is greatly esteemed for his profound erudition, and purity of manners. In 1676, he went to Windsor, to visit Vossius, at whose house he died in 1677. The university of Oxford, to which he bequeathed his MSS. erected a handsome monument to his memory. He wrote, 1. *De Pictura Veterum*, which is admired; the best edition is that of Rotterdam in 1694. He published the same work at London in English. 2. An Explication of the old Gothic MS. called the Silver MS. because the four Gospels are here written in silver Gothic Letters. This was published with notes by Thomas Mareschal. 3. A large Commentary on the Harmony of the four Gospels by Tatian, still in MS. 4. A Glossary in five languages, in which he explains the origin of the Northern languages; published at Oxford in 1745, in folio, by Mr. Edward Lee.

JUNIUS, the assumed name of an unknown but highly esteemed writer on political topics in England. His celebrated letters, which appeared in 1769, form an 8vo. volume, and have been universally read and admired. They are not less distinguished or striking remarks, keen invective, and polished satire, than for their extraordinary beauties of composition. He was opposed by Sir W. Draper, and Dr. Samuel Johnson, who, however, quotes Junius repeatedly in his Dictionary, and considered him as a strictly classical writer. The letters have been ascribed to Mr. Burke, who solemnly disclaimed the imputation; William Gerard Hamilton, commonly called Single-speech Hamilton, was also suspected, but he likewise denied the charge. Other persons to whom they have been imputed are, John Wilkes, Mr. Dunning (afterwards lord Ashburton,) Mr. Serjeant Adair, the Rev. J. Rosenhagen, John Roberts, Esq. Mr. Charles Lloyd, Mr. Samuel Dyer, General Lee, and Hugh Boyd, Esq. The matter, however, is still hidden in obscurity.

JUNK, in sea-language, pieces of old cable, cut into small portions, for making points, matts, gaskets, sennit, &c.

JUNKSEILON, a fertile island in the East Indian Ocean, near the S. coast of Siam, 63 miles long, and from 9 to 21 broad. Lon. 98. 5. to 98. 30. E. Lat. 7. 37. to 8. 40. N.

JUNKSEILON, the capital of the above island.

JUNO, in pagan mythology, the daughter of Saturn and Rhea, the sister and wife of Jupiter, and the goddess of kingdoms and riches. She was styled the queen of heaven, and presided over marriage and child-birth. She married Jupiter; but was not a very complaisant wife: for, according to Homer, that god was sometimes obliged to use all his authority to keep her in due subjection; and on her entering into a conspiracy against him, he punished her by suspending her in the air with two anvils fastened to her feet, and golden manacles on her hands, while all the other deities looked on without being able to help her. Being jealous, she often interrupted her husband in his amours; and punished with unrelenting fury Europa, Semele, Io, Latona, and the rest of his mistresses. Jupiter himself having conceived Minerva, without any commerce with a female, Juno, in revenge, conceived Vulcan by the wind, Mars by touching a flower pointed out to her by Flora, and Hebe by eating lettuces. Juno, as the queen of heaven, preserved great state; her usual attendants were Terror and Boldness, Castor, Pollux, and fourteen nymphs; but her most faithful attendant was the beautiful Iris. Homer describes her in a chariot adorned with precious stones, the wheels of which were of ebony, and which was drawn by horses with reins of gold. But she is more commonly painted drawn by peacocks. Some suppose that Juno signifies the air; others, that she was the Egyptian Isis.

JUNO, in astronomy, a planet discovered by Mr. Harding between Pallas and Jupiter. See **ASTRONOMY**.

JUNONALIA, a festival observed by the Romans in honour of Juno. It was instituted on account of certain prodigies that happened in Italy, and was celebrated by matrons.

JUNTO, in matters of government, denotes a select council for taking cognizance of affairs of great consequence, which require secrecy. In Spain and Portugal, it signifies much the same with convention, assembly, or board, among us; thus

they have the *junto* of the three estates, of commerce, of tobacco, &c.

IVORY, [*ebur*,] the tooth or tusk of an elephant, growing on each side of his trunk, and somewhat resembling the shape of a horn. Ivory is much esteemed for its remarkable whiteness, its polish, and beautiful grain. By steeping small pieces of ivory in vinegar, or any other acid, they become ductile, and may be preserved in that state for a considerable time, by keeping them in common water. This hard substance may also be softened and whitened, by immersing it in a hot decoction made of red sage-leaves, in double-distilled white wine vinegar, with the addition of a little quick-lime. For removing spots, the ivory should be laid in unslacked lime, and a small portion of water poured on it, lest the heat be too intense, and the ivory scale, become brittle. Others discharge the stains by merely steeping it for some time in strong lime-water. Ivory may be dyed green, either in a solution of copper or verdigrease in aquafortis; or by grinding together two parts of verdigrease and one of sal ammoniac, and dissolving them in strong white wine vinegar. Farther, by employing four ounces of aqua regia, and one ounce of sal ammoniac, a fine purple colour will be the result. Ivory, bone, horn, and other solid parts of animals, may be stained yellow, by previously boiling them in a solution of one pound of alum in two quarts of water; then immersing them for half an hour in a liquor prepared by boiling half a pound of turmeric in a gallon of water, till it be reduced to three quarts, and afterwards plunging the coloured substance into alum-water. All bony matters may also be stained blue: they are first to be tinged with green, then dipped in a strong and hot solution of pearl-ashes. Ivory may be prepared as a ground for miniature-painting, by cleansing the leaves or plates, and rubbing them over with the juice of garlic. This method is preferably recommended for removing its greasy quality, which prevents the colours from fixing on the ground, and is said to be more useful than either soap or ox-gall. With respect to the medicinal properties of ivory, its shavings, like those of hartshorn, may, by boiling, be converted into a jelly, and possess similar restorative virtues.

IVORY-BLACK, is prepared from ivory, or bones burnt in a close vessel. This, when finely ground, forms a more beautiful and deeper colour than lamp-black; but, in the common methods of manufacturing, it is apt to be adulterated with charcoal-dust, so as to be almost, or altogether, unfit for use.

JUPITER, the supreme god of the ancient pagans. The theologians, according to Cicero, reckoned up three Jupiters; the first and second of whom were born in Arcadia; of these two, the one sprung from Æther, the other from Cœlus. The third Jupiter was the son of Saturn, and born in Crete, where they pretended to shew his sepulchre. Cicero in other places speaks of several Jupiters who reigned in different countries. The Jupiter, by whom the poets and divines understand the supreme god, was the son of Saturn king of Crete. He would have been devoured by his father as soon as born, had not his mother Rhea substituted a stone instead of the child, which Saturn immediately swallowed. Saturn took this method to destroy all his male-children, because it had been foretold by Cœlus and Terra, that one of his sons should deprive him of his kingdom. Jupiter, being thus saved from his father's jaws, was brought up by the Curetes in a den on mount Ida. Virgil tells us, that he was fed by the bees; out of gratitude for which he changed their colour from that of iron to gold. Some say, that his nurses were Amalthæa and Melissa, who gave him goats-milk and honey; and others, that Amalthæa was the name of the goat which nourished him, and which, as a reward for her great services, was changed into a constellation. According to others, he was fed by wild pigeons, who brought him ambrosia from Oceanus; and by an eagle, who carried nectar in his beak from a steep rock; for which he rewarded the former, by making them the foretellers of winter and summer; and the latter by giving him immortality, and making him his thunderbearer. When grown up, he drove his father out of heaven, and divided the empire of the world with his brothers. For himself, he had heaven and earth. Neptune had the sea and waters; and Pluto hell. The Titans attempted to dethrone Jupiter, as he had done his father. These Titans were giants, the son of Titan and Terra. They declared war against Jupiter, and heaped mountains upon mountains, in order to scale heaven: but their efforts

efforts were unsuccessful. Jupiter overthrew them with his thunder, and shut them up under the waters and mountains, from which they were not able to get out. Jupiter had several wives: the first of whom, named Metis, he is said to have devoured when big with child, by which he himself became pregnant; and Minerva issued out of his head, completely armed and fully grown. His second was Themis; the name of his third is not known; his fourth was the celebrated Juno, whom he deceived under the form of a cuckoo, which to shun the violence of a storm fled for shelter to her lap. He was the father of the Muses and Graces; and had a prodigious number of children by his mistresses. He metamorphosed himself into a satyr to enjoy Antiope; into a bull, to carry off Europa; into a swan, to abuse Leda; a shower of gold, to corrupt Danae; and into several other forms to gratify his passions. He had Bacchus by Semele, Diana and Apollo by Latona, Mercury by Maia, and Hercules by Alcmena, &c. The wisest part of the heathens believed that there was but one supreme God; but it is certain, that the great body of the people believed in a plurality of gods, endued with different powers and attributes, and all of them influenced by human passions and vices. It is in vain to attempt to exculpate them from this folly. The whole history of ancient Greece, Rome, Egypt, &c. with their routine of superstitious ceremonies, prove, that they believed all the ridiculous fables of the mythology. They even used different representations of the same deity, and if they did not consider them as so many different persons, at least regarded each of them in different views: e.g. The Jupiter that showered down blessings, was called the Kind Jupiter; and when punishing, the Terrible Jupiter. There was also one Jupiter for Europe, and another for Africa; and in Europe, there was one great Jupiter who was the particular friend of the Athenians, and another who was the special protector of the Romans: nay, there was scarcely a town in Italy, that had not a Jupiter of its own; and the Jupiter of Terracina, or Jupiter Anxur, represented in medals as young and beardless, with rays round his head, more resembled Apollo than the great Jupiter at the Capitol. In this way Jupiter at length had temples and different characters almost every where: in Carthage he was called Ammon; in Egypt, Serapis; at Athens, the great Jupiter was the Olympian Jupiter: and at Rome the greatest Jupiter was the Capitoline Jupiter, who was the guardian and benefactor of the Romans, and whom they called Jupiter optimus maximus, *i. e.* the best and greatest Jupiter. This Jupiter was represented in his chief temple on the Capitoline hill, as sitting on a curule chair, with the fulmen, *i. e.* thunder, or rather lightning, in one hand, and a sceptre in the other. This fulmen in the figures of the old artists was always adapted to the character under which they were to represent Jupiter. If his appearance was to be mild and calm, they gave him the conic fulmen, or bundle of flames wreathed close together, held down in his hand: when punishing, he held up the same figure, with two transverse darts of lightning, sometimes with wings added to each side of it, to denote its swiftness; this was called by the poets the three-forked bolt of Jove: and when he was going to do some exemplary execution, they put in his hand a handful of flames, all let loose in their utmost fury; and sometimes filled both his hands with flames. Some consider a part of the fable of Jupiter to include the history of Noah and his three sons; and that Saturn is Noah, who saw all mankind perish in the waters of the deluge; and who, in some sort, swallowed them up, by not receiving them into the ark: Jupiter is Ham; Neptune, Japheth; and Shem, Pluto. The Titans, it is thought, represent the old giants, or first tyrants, who built the tower of Babel, and whose pride and presumption God had confounded, by changing their language, and pouring out the spirit of discord and division among them. The name of Jupiter, or Jovis Pater, is thought to be derived from Jehovah, pronounced with the Latin termination Jovis instead of Jova; and in medals we meet with Jovis in the nominative, as well as oblique cases: for example Jovis custos, Jovis propugnator, Jovis stator. To the name Jovis was added pater; and afterwards instead of Jovis pater, Jupiter was used by abbreviation. The name Jupiter was not known to the Hebrews till the reign of Alexander the Great.

JUPITER, 2^d, in astronomy, one of the superior planets, of the Solar System, remarkable for its brightness; and which by its proper motion seems to revolve round the earth in about twelve

years. Astronomers make use of this symbol (♃) to represent that one of the satellites of this planet is eclipsed by his body or shadow; and of this symbol (♄) when the satellite is invisible to the face of Jupiter. See ASTRONOMY.

JUPITER, MOONS, OR SATELLITES OF. See ASTRONOMY and SATELLITE.

JURA, one of the western islands of Scotland, lying opposite to Knapdale in Argyleshire, it is supposed to be about 30 miles long and 7 broad.

JURA, a chain of mountains in the Helvetic republic, beginning in the canton of Zurich, extending from thence along the Rhine into the canton of Basle, stretching into that of Soleure and the territory of Neuchâtel, and branching out towards the Pays de Vaud; separating that county from the late Franche Comté and Burgundy, and continued beyond the late Genevan territory as far as the Rhone.

JURA, a department of France, formed of part of the late province of Franche Comté. Lons le Saunier is the capital.

JURATS, or **JURATI**, are magistrates similar to Aldermen. Jersey has a bailiff and twelve jurats, or sworn assistants, to govern the island.

IVREA, an ancient and strong town of Italy, in Piedmont, and capital of Canaveze.

JURIEU, PETER, a French Protestant divine, was the son of Daniel Jurieu, pastor of the reformed church at Mer in the diocese of Blois, and born there in 1637. His mother was sister to the famous Peter du Moulin. He received his education partly in Holland, and partly in England, and while here received episcopal ordination. On his return home he became assistant to his father, and professor of divinity and Hebrew at Sedan, where he gained great reputation by his lectures and preaching. He wrote against Bossuet's Exposition of the Doctrine of the Catholic Church, and defended the moral character of his sect against the accusations of Arnauld. On the revocation of the edict of Nante he retired to Holland, and was chosen pastor of the Walloon church at Rotterdam. He there applied so assiduously to the study of the Revelation, as to fancy he had discovered most of the mysteries therein; and particularly with regard to Antichrist. He addressed William III. king of England, as the instrument appointed to destroy the kingdom of the beast. He embroiled himself into controversy with Bayle and Beauval, who had objected to the extravagance of his opinions. He also offended his best friends by the irascibility of his temper in charging M. Saurin and other eminent persons with heterodoxy. He died at Rotterdam in 1713. The principal of his works are, the History of Calvinism and Popery, with a Parallel between them; Pastoral Letters On the Unity of the Church; Treatise of Nature and Grace. Critical History of the Doctrines and Worship of the Church, and those of the Pagans; this is a curious book, and has been translated into English in 2 vols. 8vo.; On the Revelation, and the Accomplishment of the Prophecies.—Watkins.

JURIN, Dr. JAMES, a distinguished person, who cultivated medicine and mathematics with equal success. He was secretary to the Royal Society in London, as well as president of the College of Physicians there. He died in 1750, at a very advanced age. He wrote papers on philosophical and medical subjects in the Philosophical Transactions, and a tract of his on Vision is appended to Smith's Optics. He had a dispute with Michellotti on the motion of currents; with Keill and Senac on the motion of the heart; with Robins upon distinct vision; and with the partisans of Leibnitz on the active forces.

JURISCONSULT, [*juris consultus*, Lat.] commonly contracted into *ICtus*, among the Romans, denoted a person learned in the law; a master of the Roman jurisprudence; who was consulted on the interpretation of the laws and customs, and on the difficult points in law-suits. The fifteen books of the Digests were compiled wholly from the reports of the ancient jurisconsults. The jurisconsults seem to have been a kind of chamber-counsellors, who arrived at the honour of being consulted through age and experience, but never pleaded at the bar.

JURISDICTION, a power which a man has to do justice in cases of complaint made before him. There are two kinds of jurisdiction, the one ecclesiastical, the other secular.

1. **JURISDICTION, ECCLESIASTICAL**, belongs to bishops and their deputies. Bishops, &c. have two kinds of jurisdiction; the

one internal, which is exercised over the conscience in things purely spiritual; and this they are supposed to hold immediately of God. The other is contentious, which is a privilege some princes have given them in terminating disputes between ecclesiastics and laymen.

3. JURISDICTION, SECULAR, belongs to the king and his justices or delegates. The courts and judges at Westminster have jurisdiction all over England, and are not restrained to any county or place; but all other courts are confined to their particular jurisdictions, which if they exceed, whatever they do is erroneous. There are three sorts of inferior jurisdictions; the first is *tenere placita*, to hold pleas, and the plaintiff may sue either there or in the king's courts. The second is the *conuance* of pleas, where a right is invested in the lord of the franchise to hold pleas; and he is the only person that can take advantage of it, by claiming his franchise. The third sort is an exempt jurisdiction, as where the king grants to some city, that the inhabitants shall be sued within their city, and not elsewhere; though there is no jurisdiction that can withstand a *certiorari* to the superior courts.

JURISDICTION, HEREDITARY, a hereditary right or power, enjoyed for ages, by many of the nobility and gentry of Scotland, more especially by those in the Highlands, of exercising the rights of judges in criminal cases, over all the people who resided on their estates.

JURISPRUDENCE, the science of what is just or unjust; or the knowledge of laws, rights, customs, statutes, &c. necessary for the administration of justice. See **LAW**.

JURIS UTRUM, in law, is a writ in behalf of a clergyman whose predecessor has alienated the lands belonging to his church.

JUROR, [*juror*, Lat.] in law, signifies any person sworn on a jury. See **JURY**.

JURY, a town of France, in the department of Eure, and late province of Normandy, 10 miles N. by W. of Dreux.

JURY, [*jurata*, Lat.] a certain number of persons sworn to enquire of, and try some fact, and declare the truth upon the evidence brought before them. In criminal cases juries are divided into grand and petty. The grand jury must be all freeholders, but it does not appear that any specific estate has been determined to be necessary; before them the charge is laid, and unless twelve or more of them are of opinion that it is well founded, the accusation is dismissed; which they call not finding a true bill. If they find a true bill, it must afterwards be confirmed by the unanimous suffrage of a petty jury of 12 men upon whom no suspicion of partiality can possibly rest. In civil cases juries are divided into common and special. The latter are generally employed in cases where any difficulties with respect to commercial transactions arise, and are best decided by a special jury of merchants. To obtain a special jury, a motion is made in court, and rule granted, for the sheriff to attend the master, prothonotary, or other proper officer, with his freeholders' book, in the presence of the attornies on both sides, and to take indifferently forty-eight freeholders, when each party strikes off twelve, and the remaining twenty-four are returned upon the pannel. A common jury is one returned by the sheriff according to the directions of 3 Geo. II. c. 25, which appoints that the sheriff shall not return a separate pannel for every cause, but the same for every cause to be tried at the same assizes, containing not less than forty-eight, nor more than seventy-two; and that their names being written on tickets, shall be put into a box, and when the cause is called, twelve whose names shall be first drawn shall be sworn, unless absent, challenged, or excused. When a sufficient number of persons are impanelled, they are then separately sworn well and truly to try the issue between the parties, and a true verdict give according to the evidence. Jurors are punishable for sending for, or receiving, instructions from either of the parties concerning the matter in question. In causes of *nisi prius*, every person whose name shall be drawn, and who shall not appear after being openly called three times, shall, on oath made of his having been lawfully summoned, forfeit a sum not exceeding 5*l*. nor less than 40*s*. unless some reasonable cause of absence be proved, by oath or affidavit, to the satisfaction of the judge. If any juror shall take of either party to give his verdict, he shall, on conviction, by bill or plaint, before the court where the verdict shall pass, forfeit ten times as much as he has taken;

half to the King, and half to him who shall sue. A man who shall assault or threaten a juror for giving a verdict against him, is highly punishable by fine and imprisonment; and if he strike him in the court, in the presence of the judge of assize, he shall lose his hand and his goods, and the profits of his lands during life, and suffer perpetual imprisonment. Juries are, in these Kingdoms, the supreme judges in all courts and in all causes, in which either the life, or reputation, of any man is concerned. This is the distinguishing privilege of every Briton, and one of the most glorious advantages of the British Constitution; for as every one is tried by his peers, the meanest subject is as safe and as free as the greatest.

JURY-MAST, whatever is set up in room of a mast that has been lost in a storm or in an engagement, and to which a lesser yard, ropes, and sails, are fixed.

JUS, [Lat.] law, or right, a term or title used respecting various rights in law. Thus,

JUS CIVILE, among the Romans, signified no more than the interpretation given by the learned, of the laws of the XII tables, though the phrase now extends to the whole system of the Roman laws.

JUS CIVITATIS, signifies freedom of the city of Rome, which entitled those persons who had obtained it, to most of the privileges of the Roman citizens; yet it differs from *Jus Quiritum*, which extended to all the advantages which a free native of Rome was entitled to.

JUS DELIBERANDI, in Scots law, that right which an heir has by law of deliberating for a certain time whether he will represent his predecessor.

JUS DEVOLUTUM, in Scots law, the right of the church, of presenting a minister to a vacant parish, in case the patron shall neglect to use that right within the time limited by law.

JUS HONORARIUM, was a name given to those Roman laws which were made up of edicts of the supreme magistrates, particularly the praetors.

JUSSÆA, in botany, a genus of the monogynia order, and decandria class of plants; natural order, Calycanthemæ. Calyx four or five-parted, superior; petals four or five; capsules four or five-celled, oblong, gaping at the corners; seeds numerous, minute. There are eleven species, mostly herbaceous plants, of America, and the Indies.

JUSTS, a sportive kind of combat on horseback, man against man, armed with lances. The word is by some derived from *jousti*, French, of *juxta*, Latin, because the combatants fought near each other; others from the modern Greek *ζυγχα*. Others from *justa*, which, in the corrupt age of the Latin tongue, was used for this exercise, as it was supposed a more just and equal combat than the Tournament.

JUSTICE, [*justitia*, Lat.] in a moral sense, one of the four cardinal virtues. Civilians distinguish justice into two kinds; communicative and distributive.

i. **JUSTICE, COMMUNICATIVE**, establishes fair dealing in the mutual commerce between man and man; and includes sincerity in our discourse, and integrity in our dealings. The effect of sincerity is mutual confidence, so necessary among the members of the same community; and this mutual confidence is sustained and preserved by integrity of conduct. But there seems to be an essential ingredient in communicative or private justice, which is seldom taken notice of by writers on ethics; we mean mercy. In the present state of human nature, strict justice, such as the utmost rigour of law allows, frequently becomes injustice. This truth we often find exemplified in private life, by rigorous creditors against unfortunate debtors. A striking instance of this kind of justice is recorded of Joseph, the husband of the blessed Virgin, in Matt. i. 19, where he is expressly stiled a just man, because he would not go to the utmost rigour even of the Divine Law.

ii. **JUSTICE, DISTRIBUTIVE**, is that by which the differences of mankind are decided, according to the rules of equity. This is the justice of princes and magistrates.

JUSTICE, [*justiciarius*,] in a legal sense, a person deputed by the king to administer justice to his subjects, whose authority arises from his deputation, and not by right of magistracy. In the courts of king's bench and common pleas there are two judges stiled justices, each of whom retains the title of lord during the time of his continuing in office. The first of these, who is stiled lord chief justice

justice of England, has a very extensive power and jurisdiction in pleas of the crown, and is particularly intrusted not only with the prerogative of the king, but likewise the liberty of the subject. He hears all pleas in civil causes brought before him in the court of king's bench, and also the pleas of the crown; while, on the other hand, the lord chief justice of the common pleas has the hearing of all civil causes between common persons. Besides the lords chief justices there are several other justices appointed by the king for the execution of the laws; such as the lords justices in eyre of the forests, who are two justices appointed to determine all offences committed in the king's forests; justices of assize, who, by a special commission, were formerly sent to hear causes in this or that county, for the ease of the subject; and these judges continue twice a year to pass the circuits by two and two throughout all England, dispatching the different business they meet with by different commissions; for they have one commission to take assizes, another of oyer and terminer, that is, to hear and determine causes, and another of gaol-delivery: from whence they are called justices of oyer and terminer, of gaol-delivery, &c. They are also called justices of nisi prius, and so denominated from the words used in a common form of adjournment of a cause in the court of common pleas. See *NI SI PRIUS*.

JUSTICES OF THE PEACE, are persons appointed by the king's commission to keep the peace of the county in which they reside; and some of these, who are of superior rank or quality, are called justices of the quorum, and without the presence or assent of these, or at least one of them, no business of importance can be dispatched. Every justice of peace hath a separate power, and his office is to call before him, examine, issue warrants for apprehending, and commit to prison, all thieves, murderers, wandering rogues; those that hold conspiracies, riots, and almost all delinquents which may occasion the breach of the peace and quiet of the subject; to commit to prison such as cannot find bail, and to see them brought forth in due time to trial; and bind over the prosecutors to the assizes. And if they neglect to certify examinations and informations to the next gaol-delivery, or do not bind over prosecutors, they shall be fined. A justice may commit a person that doth a felony in his own view, without warrant: but if on the information of another, he must make a warrant under hand and seal for that purpose. If complaint and oath be made before a justice of goods stolen, and the informer, suspecting that they are in a particular house, shews the cause of his suspicion, the justice may grant a warrant to the constable, &c. to search in the place suspected, to seize the goods and person in whose custody they are found, and bring them before him or some other justice. The search on these warrants ought to be in the day-time, and doors may be broke open by constables to take the goods. Justices of peace may make and persuade an agreement in petty quarrels and breaches of the peace, where the king is not entitled to a fine, though they may not compound offences or take money for making agreements. A justice hath a discretionary power of binding to good behaviour; and may require a recognizance, with a great penalty of one, for his keeping of the peace, where the party found is a dangerous person, and likely to break the peace, and do much mischief; and for default of sureties he may be committed to gaol. But a man giving security for keeping the peace in the king's bench or chancery, may have a supersedeas to the justices in the county not to take security: and also by giving surety of the peace to any other justice. If one make an assault upon a justice of peace, he may apprehend the offender, and commit him to gaol till he finds sureties for the peace: and a justice may record a forcible entry on his possession; in other cases he cannot judge in his own cause. Contempts against justices are punishable by indictment and fine at the sessions. Justices shall not be regularly punished for any thing done by them in sessions as judges, and if a justice be tried for any thing done in his office, he may plead the general issue, and give the special matter in evidence; and if a verdict is given for him, or the plaintiff be nonsuit, he shall have double costs; and such action shall only be laid in the county where the offence was committed. 7. Jac. cap. 5. 21. Jac. cap. 12. But if they are guilty of any misdemeanour in office, information lies against them in the king's bench, where they shall be punished by a fine and imprisonment; and all persons, who recover a verdict against a justice for any wilful or malicious injury, are entitled to double costs. By 24 Geo. II. cap. 44, no writ shall be sued out

against any justice of peace, for any thing done by him in the execution of his office, until notice in writing shall be delivered to him one month before the suing out of the same, containing the cause of action, &c. within which month he may tender amends; and if the tender be found sufficient, he shall have a verdict, &c. Nor shall any action be brought against a justice for any thing done in the execution of his office, unless commenced within six months after the act committed. A justice is to exercise his authority only within the county where he is appointed by his commission, not in any city which is a county of itself or town corporate, having their proper justices, &c. but in other towns and liberties he may. The power and office of justices terminate in six months after the demise of the crown, by an express writ of discharge under the great seal, by writ of supersedeas, by a new commission, and by accession of the office of sheriff or coroner. The origin of justices of the peace is referred to the 4th year of Edward III. They were first called conservators, or wardens of the peace, elected by the county, upon a writ directed to the sheriff; but the power of appointing them was transferred by statute from the people to the king; and under this appellation appointed by 1 Edw. III. cap. 16. Afterwards the statute 34 Edw. III. cap. 1, gave them the power of trying felonies, and then they acquired the appellation of justices. They are appointed by the king's special commission under the great seal, the form of which was settled by all the judges, A. D. 1590; and the king may appoint as many as he shall think fit in every county in England and Wales, though they are generally made at the discretion of the lord chancellor, by the king's leave. At first the number of justices was not above two or three in a county. 18 Edw. III. cap. 2. Then it was provided by 34 Edw. III. cap. 1, that one lord, and 3 or 4 of the most worthy men in the county, with some learned in the law, should be made justices in every county. The number was afterwards restrained first to 6, and then to 8, in every county, by 12 Rich. II. cap. 10, and 14 Rich. II. cap. 11. But their number has greatly increased since their first institution. As to their qualifications, the statutes just cited direct them to be of the best reputation and most worthy men in the county; and the statutes 13 Rich. II. cap. 7, orders them to be of the most sufficient knights, esquires, and gentlemen of the law; and by 2 Hen. V. stat. 1, cap. 4, and 2 cap. 1, they must be resident in their several counties. And by 18 Hen. VI. cap. 11, no justice was to be put in commission, if he had not lands to the value of 20*l.* per annum. It is now enacted by 5 Geo. II. cap. 11, that every justice shall have 100*l.* per annum, clear of all deductions: of which he must make oath by 18 Geo. II. cap. 20. And if he acts without such qualification, he shall forfeit 100*l.* It is also provided by 5 Geo. II. that no practising attorney, solicitor, or proctor, shall be capable of acting as a justice of the peace.

JUSTICES OF THE PEACE WITHIN LIBERTIES are justices who have the same authority in cities or other corporate towns as the others have in counties; and their power is the same; only that these have the assize of ale and beer, and wood and victuals, &c. Justices of cities and corporations are not within the qualification act, 5 Geo. II. cap. 18.

JUSTICIA, MALABAR NUT: a genus of the monogynia order, and diandria class of plants; natural order, Personata. Corolla ringent; capsule two-celled, opening with an elastic claw; stamina with a single anther. There are eighty species, mostly natives of the Cape of Good Hope and the East Indies.

JUSTICIAR, in our old laws, an officer instituted by William the Conqueror, as the chief officer of state, who principally determined in all cases civil and criminal. He was called in Latin *capitulis justiciarius totius Angliæ*.

JUSTICIARY, or COURT OF JUSTICIARY, in Scotland, a court of supreme jurisdiction in all criminal cases.

JUSTICES, is a writ directed to the sheriff to do justice in: plea of trespass *vi et armis*, or of any sum above 40*s.* in the county court, of which he hath no cognizance by ordinary power. It is in the nature of a commission to the sheriff, and is not returnable.

JUSTIFICATION, in law, signifies a maintaining or shewing a sufficient reason in court why the defendant did what he is called to answer.

JUSTIFICATION, in theology, that act of grace in which God accepts of the believer in Christ Jesus, and accounts him just & righteous.

ighleous, not imputing his sins to him: none can partake of this favour but the believer, that is the person who cordially embraces the doctrines of the gospel, relies on the merits of the Redeemer, and yields his powers and passions to the government of Christ.

JUSTIN MARTYR, or **JUSTIN**, **St.** one of the earliest and most learned writers of the eastern church, was born at Neapolis, the ancient Shechem of Palestine. His father Priscus, a Gentile Greek, brought him up in his own religion, and had him educated in all the Grecian learning. To complete his studies he travelled to Egypt, and followed the sect of Plato, with whose intellectual notions he was much pleased. He was converted to Christianity by beholding the steadfastness and confidence of some Christian martyrs. Though, according to others, one day walking by the sea-side, wrapt in contemplation, he was met by a grave old man, of a venerable aspect; who, falling into discourse with him, turned the conversation by degrees from the excellence of Platonism to the superior perfection of Christianity; and reasoned so well, as to raise in him an ardent curiosity to inquire into the merits of that religion; in consequence of which inquiry, he was converted about A. D. 132. On his embracing Christianity he quitted neither the profession nor the habit of a philosopher: but a persecution breaking out under Antoninus, he composed "An Apology for the Christians;" and afterwards presented another to Marcus Aurelius, in which he vindicated the innocence and holiness of the Christian religion against Crescens a Cynic philosopher, and other calumniators. He did honour to Christianity by his learning, and the purity of his manners; and suffered martyrdom in 167. Besides his two Apologies, there are still extant his Dialogue with Trypho, a Jew; two treatises addressed to the Gentiles, and another on the unity of God. Other works are also ascribed to him. The best editions of St. Justin are those of Robert Stephens, in 1551 and 1571, in Greek and Latin: that of Morel, in Greek and Latin, in 1656; and that of Don Prudentius Marandus, a learned Benedictine, in 1742, in folio. The works of Justin are written in a pure plain stile, and abound with very valuable quotations, both from sacred and profane writers. His account of the practices of the primitive Christians is peculiarly valuable.

JUSTNESS, the exactness or regularity of anything. It is chiefly used in speaking of thought, language, and sentiments. The justness of a thought consists in a certain precision or accuracy, by which every part of it is perfectly true, and pertinent to the subject. Justness of language consists in using proper and well chosen terms: in not saying either too much or too little.

JUTERBOCK, a town of Upper Saxony, in the province of Querfurt, on the Angerbach, eighteen miles N. E. of Wittenberg.

JUTLAND, a large peninsula, forming the principal part of the kingdom of Denmark. It is bounded on the S. E. by the duchy of Holstein, and is surrounded on the other sides by the German Ocean and the Baltic Sea. It is about 180 miles in length from N. to S. and 50 in breadth from E. to W. The air is very cold, but wholesome; and the soil is fertile in corn and pastures, which feed a great number of bees, that are sent to Germany, Holland, and elsewhere. This was anciently called the Cimbric Chersonesus. It is divided into two parts; called North and South Jutland: the latter is the duchy of Sleswick, and lies between North Jutland and the duchy of Holstein. See **DENMARK**.

JUVENAL, **DECIVS JUVIUS**, the celebrated Roman satirist, was born about the beginning of the emperor Claudian's reign, at Aquinum in Campania. He was bred an orator, studied under Quintilian, and made a distinguished figure at the bar at Rome, where he acquired a considerable fortune before he commenced

poet. It is said he was above forty years of age when he recited his first essay to a small audience of his friends; but being encouraged by their applause, he ventured a greater publication: which reaching the ears of Paris, Domitian's favourite at that time, though but a pantomime player, whom our satirist had severely insulted; that minion complained to the emperor, who banished him by giving him the command of a cohort in the army, at Pentapolis. After Domitian's death Juvenal returned to Rome, sufficiently cautioned against attacking living characters and people in power, under arbitrary princes; and therefore he thus concludes the debate with a friend on this head, in his first satire:

Experiar quid concedator in illos

Quorum Flaminia tegitur cinis atque Latina.

"I will try what liberties I may be allowed with those whose ashes lie under the Flaminian and Latin ways," along each side of which the Romans of the first quality used to be buried. It is believed that he lived till the reign of Adrian in 128. There are still extant sixteen of his satires, in which he discovers great wit, energy, and keenness. He lashed the vices of the court—of the people—of all men with uncommon vehemence, and often with a sufficiency of ill nature, and an unpardonable obscenity of language. However, most poetical misanthropes hold him in high estimation, as by translating, paraphrasing, and accommodating, his satires to their own times, they got enough to sanction and enable them to vent their spleen against mankind at large; who unhappily, at all times, deserve the severest scourge of the keenest satirist.

JUVENTAS, in Roman mythology, the goddess who presided over youth.

JUXTAPOSITION, [*juxta* and *positio*, Lat.] is used by philosophers to denote that species of growth which is performed by the apposition of new matter to the surface or outside of old. In which sense it stands opposed to intussusception, where the growth of a body is performed by the reception of a juice within it diffused through its canals.

IVY, in botany. See **HEDERA**.

IXIA, in botany, a genus of the monogynia order, and triandria class of plants; natural order, *Ensata*. Corolla hexapetalous, patent, and equal; stigmata three, a little upright and petalous. There are fifty-four species, consisting of herbaceous, tuberous, and bulbous-rooted, flowery perennials, natives of warm climates, chiefly of the Cape of Good Hope.

IXION, in fabulous history, king of the Lapithæ, married Dia the daughter of Deionius, to whom he refused to give the customary nuptial presents. Deionius in revenge took from him his horses: when Ixion, dissembling his resentment, invited his father-in-law to a feast, and made him fall through a trap-door into a burning furnace, in which he was immediately consumed. Ixion being afterwards stung with remorse for his cruelty, ran mad; on which Jupiter, in compassion, not only forgave him, but took him up into heaven, where he had the impiety to endeavour to corrupt Juno. Jupiter to be the better assured of his guilt, formed a cloud in the resemblance of the goddess, upon which Ixion begat the centaurs: but boasting of his happiness, Jove hurled him down to Tartarus, where he lays fixed on a wheel encompassed with serpents, which turns without ceasing.

IXORA, in botany, a genus of the monogynia order, and tetrandria class of plants; natural order, *Stellata*. Corolla one-petaled, funnel-shaped, long, superior; stamina above the throat; berry four-seeded. It has nine species.

JYENAGUR, **JYEPOUR**, **JAYPOUR**, **JAYNAGUR**, or **JOINAGUR**, a city of Hindoostan Proper, capita of a territory so named, in the E. quarter of Agimere, 136 miles W. by S. of Agar.

K.

K is the tenth letter of our alphabet, and the seventh consonant. It is articulated by a guttural expression of the breath through the mouth, together with a depression of the lower jaw and opening of the teeth. Its sound is much the same with that of the hard *c* or *qu*; and it is used, for the most part, only before *e*, *i*, and *n*, in the beginning of words; as, *ken*, *kill*, *known*, &c. It is at present very properly omitted at the end of English words, at least of those derived from the Latin; thus, for *publick*, *public*, &c. However, in monosyllables it is still retained, as *jack*, *block*, *muck*, &c. **K** is borrowed from the Greek kappa, and was but little used among the Latins: Priscian says, it was never used except in words borrowed from the Greek. As an abbreviation, **K** has various significations in old charters and diplomas; *e. g.* **K R** stood for chorus, **K R. C.** for *cara civitas*, **K R M.** for earthen, **K R. A M.** *N. carus amicus noster*, **K S.** chaos, **K T.** capite tonsus, &c. Sometimes **K** alone stood for Carthage. **M. Berger** observes, that a capital **K**, on the reverse of the medals of the eastern emperors, signified Konstantinus; and on the Greek medals he will have it to signify ΚΟΛΙΑ ΣΥΡΙΑ, *Catasyria*. **K** as a numeral signified 250, according to the verse; "C quoque ducentos et quinquaginta tenebit." When it had a stroke at top, (κ) it stood for 250,000.

KAARTA, a kingdom of Africa, between the Gambia and the Niger, consisting partly of rocky hills, but chiefly of sandy plains. **Kembo** is the capital.

KABOBIQUAS, a nation of South Africa, who had never seen a white man till 1785, when **M. Vaillant** visited them. Having received previous intimation of his approach from some of the adjacent tribes, their curiosity was wound up to the highest pitch; and, upon the first appearance of his company, the whole horde quitted their kraal, and ran out to meet him. Hardly able to believe their eyes, they felt his hair, his hands, feet, and almost every part of his body. His beard astonished them, and believing him to be all over hairy, they half unbuttoned his clothes before they could be satisfied of the contrary. The children were dreadfully frightened, but were soon reconciled to him by presents of sugar-candy. Their chief shewed him every mark of respect. He was a majestic figure, advanced in life, and wore a long mantle made of four jackal-skins. The Kabobiquas have neither the flat nose nor plump cheeks of the Hottentots. They are as tall and as black as the Caffres. Their hair is very short, much curled, and ornamented with small copper-buttons. They go almost entirely naked, during the hot weather, yet their manners are uncommonly chaste, and no females can be more reserved than their women. They wear a long mantle made of skins. Their only ornaments are glass-beads, which they wear as bracelets. **M. Vaillant** gave them a number of glass-bottles, which they greatly admired, and called solid water, having seen ice, and having no idea that any other solid substance could be formed transparent. They supposed **M. Vaillant** prevented them from melting before their fires, by magic. They believe in "a Supreme Being, who exists far beyond the stars, and who made and governs all things."

KADESH, **KADESH-BARNEA**, or **EN-MISHPAT**, in ancient geography, a city in the wilderness of Zin, where Miriam the sister of Moses died, (*Num. xx. 1.*) and where Moses and Aaron, shewing a distrust in God's power when they smote the rock at the waters of strife, were condemned to die without the consolation of entering the promised land. (*xxvii. 14.*)

KADMONEL, or **CADMONÆI**, an ancient people of Palestine, said to dwell at the foot of Mount Hermon.

KALIPPERIA, **ZEDOARY**: in botany, a genus of the monogynia order, and monandria class of plants; natural order, Scitamineæ. Corolla six parted. three of the parts larger, spreading, one two-parted; stigma two-plated. There are two species, viz.

K. galanga, galangale; and **K. rotunda**, natives of the East Indies.

KAJAAGA, a kingdom of Africa, called also Gallam, bounded on the S. and S. E. by Bambouk, N. by the Senegal, and W. by Bondou and Fouta Torra. **Mr. Park** says, the air is more pure and salubrious than at any settlement on the coast, and the surface is beautiful and picturesque.

KALENDAR, or **CALENDAR**. See **CALENDAR**.

KALI, SEA-WEED, [*Sp.* Heb. *kali*, Arab.] the ashes of which are used in the glass-manufacture. See **SALICORNIA**, and **SAL-SOLA**.

KALISCH, a province of Lower Poland, bounded on the S. by Silesia. It was seized by the King of Prussia in 1793.

KALISCH, the capital of the above province. Lon. 18. 0. E. Lat. 52. 20. N.

KALMIA, in botany, a genus of the decandria monogynia class and order. Natural order, Bicornes. Calyx five-parted; corolla salver-form, with the border five-horned beneath; capsule five-celled. There are four species.

K. LATIFOLIA is a most beautiful shrub, which rises usually to five or six feet, and sometimes twice that height. This plant is a native of Carolina, Virginia, and other parts of the northern continent of America. Its noxious qualities lessen that esteem which its beauty claims: for although deer feed on its green leaves with impunity, yet when cattle and sheep, by severe winters deprived of better food, feed on the leaves of these plants, many of them die annually.

KALMUCS. See **CALMUCS**.

KALNICK, a strong town of Poland, in the palatinate of Bracklaw. Lon. 29. 18. E. Lat. 48. 59. N.

KALO, or **KALOO**, a town of Upper Hungary, twenty-two miles S. E. of Tokay.

KALUGA, a government of the Russian empire, formerly a province of Moscow, containing twelve districts.

KALUGA, the capital of the above government, is seated on the Occa.

KAMAKURA, an island of Japan, on the S. coast of Nippon, in which they confine their great men when they have committed any fault.

KAMBALA, a ridge of mountains in Thibet, between the lake Palte, and the Burrampooter.

KAMINIECK, a town of Russian Poland, capital of Podolia, eighty-five miles W. of Bracklaw.

KAMIS, or **CAMIS**, in the Japanese theology, denote deified souls of ancient heroes, who are supposed still to interest themselves in the welfare of the people over whom they anciently commanded.

KAMP-FIGHT, in old law-writers, denotes the trial of a cause by duel, or a legal combat, of two champions in the field, for decision of some controversy. In this mode of trial the person challenged must either accept, or acknowledge, himself guilty of the crime whereof he was accused. If it was a crime deserving death, the camp-fight was for life and death: if the offence deserved only imprisonment, the camp-fight was accomplished when one combatant had subdued the other, so as either to make him yield or take him prisoner. The accused had liberty to choose another to fight in his stead, but the accuser was obliged to perform it in his own person, and with equality of weapons. No women were permitted to be spectators, nor men under the age of thirteen. The priest and the people who looked on, were engaged silently in prayer, that the victory might fall to him who had right. None might cry, shriek, or give the least sign; which in some places was executed with so much strictness, that the executioner stood ready with an axe to cut off the right hand or foot of the party that should

should offend herein. He that, being wounded, yielded himself, was at the other's mercy to be killed or suffered to live. But if life were granted, he was declared infamous by the judge, and disabled from ever bearing arms, or riding on horseback.

KAMSIK, a destructive hot wind that returns periodically in Egypt.

KAMTSCHATKA, KAMSCHATKA, or KAMCHIATKA; a large peninsula on the N. E. part of Asia, lying between 51° and 62° Lat. N. and between 155° and 164° Lon. E. It is bounded on the E. and S. by the sea of Kamtschatka, on the W. by the seas of Ochotsk and Penshinsk, and on the N. by the country of the Koriaes. The face of the country throughout the peninsula is chiefly mountainous. It produces, in some parts, birch, poplars, elders, willows, underwood, and berries, of different sorts. Greens and other vegetables are raised with great facility; such as white cabbage, turnips, radishes, beets, carrots, and some cucumbers. Agriculture is in a very low state, owing chiefly to the nature of the soil, and the severe hoar-frosts; for though some trials have been made to cultivate grain and oats, barley, and rye, have been sown, yet no crop has ever been procured, sufficient in quantity or quality to answer the trouble of raising it. Hemp, however, has of late years been cultivated with success. This peninsula was discovered by the Russians about the end of the seventeenth century; and in 1711 the whole peninsula was reduced under the dominion of the Russians. Kamtschatka is divided by the Russians into four districts; and the government of the whole is dependent upon, and subject to, the inspection of the chancery of Ochotsk. The whole Russian force stationed in this peninsula amounts to no more than 300 men. The population of Kamtschatka amounts to scarcely 4000 souls. Formerly the inhabitants were more numerous; but in 1768, the small-pox carried off 5368 persons. There are now only about 700 males in the whole peninsula who are tributary, and few more than 100 in the neighbouring islands, called the Kurile Isles, who are subject to Russia. The fixed annual tribute consists in 279 sables, 464 red foxes, 50 sea-otters with a dam, and 38 cub-otters. All furs exported from Kamtschatka and the neighbouring islands pay a duty of ten per cent to the crown. The Kamtschatkans commonly travel in sledges drawn by dogs. The animals used for this purpose differ very little from the common house-dogs; they are of a middling size, of various colours, though there seem to be more white, black, and grey, than of any other. In travelling, they make use of those that are castrated, and generally yoke four to a sledge. They drive and direct their dogs with a crooked stick about four feet long, which they sometimes adorn with different coloured thongs; this is looked upon as a great piece of finery. They drive their sledge sitting upon their right side, with their feet hanging down; for it would be looked upon as a disgrace for a man to sit down at the bottom of the sledge, or to allow any person to drive him. It is very difficult to travel in these sledges; for unless a man keeps the exactest balance, he is liable every moment from the height and narrowness of them to be overturned: in a rugged road this would be very dangerous, as the dogs never stop till they come to some house, or are entangled by something upon the road; especially in going down steep hills, when they run with all their force, and are scarcely to be kept in; for which reason, in descending any great declivity, they unyoke all the dogs except one, and lead them softly down. They likewise walk up hills; for it is as much as the dogs can do to drag up the sledge empty. The trade of Kamtschatka is almost entirely confined to procuring the immediate necessities and conveniences of life. They sell the Koreki sables, fox and white dog-skins, dried mushrooms, and the like, in exchange for clothes made of deer-skins and other hides. Their domestic trade consists in dogs, boats, dishes, troughs, nets, hemp, yarn, and provisions; and this kind of barter is carried on under a great show of friendship; for when one wants any thing that another has, he goes freely to visit him, and without any ceremony makes known his wants, although, perhaps, he never had any acquaintance with him before: the host is obliged to behave according to the custom of the country, and give his guest what he has occasion for; but he may afterwards return the visit, and must be received in the same manner. Their foreign trade is solely with Russia. Every year a vessel belonging to the crown sails from Ochotsk to Kamtschatka laden with salt, provisions, corn, and Russian manufactures; and returns in June or July of the following year with skins and furs.

†

KAN, or **KHAN**, an officer in Persia, answering to that of governor in Europe.

KANDEGHERE, a town of Hindoostan, in the Carnatic, fifty miles S. W. of Nellore, and seventy N. W. of Madras.

KANHAWAY, GREAT, a large river formed by the union of the Green Brier River and New River. Its navigation is interrupted by the Great Falls, ninety miles above its mouth, where it is 280 yards broad.

KANHAWAY, LITTLE, is navigable for ten miles above its mouth, where it is 150 yards broad.

KANISCA, a town of Lower Hungary. Lon. 17° . 37° E. Lat. 46° . 23° N.

KAN-TCHEOU, a flourishing town of China, in the province of Kiang-si. Its rivers, port, riches, and population, all contribute to attract strangers.

KAOLIN, an earth which is used as one of the two ingredients in oriental porcelain. Some of this earth was brought from China, and examined by Mr. Reaumur. He found that it was perfectly infusible by fire, and believed that it is a talky-earth; but Mr. Macquer observes, that it is more probably of an argillaceous nature, from its forming a tenacious paste with the other ingredient, called petuntse, which has no tenacity. Mr. Bomare says, that by analysing some Chinese kaolin, he found it was a compound earth consisting of clay, to which it owed its tenacity; of calcareous earth, which gave it a mealy appearance; of sparkling crystals of mica; and of small gravel, or particles of quartz-crystals.

KAOLIN, a town of China, in the province of Chen-si, 25 miles S. of Yao.

KAPOSWAR, a fort of Lower Hungary, 55 miles W. of Tolna.

KAPPAS, an Indian town of North America, in Louisiana, on the west side of the Mississippi. Lon. 96° . 57° W. Lat. 34° . 35° N.

KARAITES, or **CARAITES**, an ancient religious sect among the Jews, whereof there are some subsisting in Poland, Russia, Constantinople, Cairo, and other places of the Levant; whose distinguishing tenet is, to adhere closely to the letter of the scripture, exclusive of allegories, traditions, and the like. Aben Ezra, and some other rabbins, treat the Karaites as Sadducees; but Leo de Juda calls them, more accurately, Sadducees reformed; because they believe the immortality of the soul, paradise, hell, resurrection, &c. which the ancient Sadducees denied. But he adds, however, that they were doubtless originally real Sadducees.

KARAVAN. See **CARAVAN**.

KARAVANSERA. See **CARAVANSERA**.

KARECK, or **KAREK**, an island in the Persian gulph, ninety miles from the mouth of Bassora river, where all ships bound to that port must call for pilots.

KAREK, a town of Persia, in Segestan.

KARGAPOL, the capital of a territory of the same name, in the province of Dwina, in Muscovy.

KARIKAL, or **CARICAL**, a town of Hindoostan, on the coast of Tanjore, on a branch of the Cauvery, 6 miles S. of Tranquebar, and 12 N. of Negapatam.

KARS, or **CARS**, a town of Armenia. Lon. 43° . 50° E. Lat. 41° . 30° N.

KASAN, a large country of the Russian empire, lying on both sides of the Volga, formerly an independent kingdom. It now forms the three Russian governments, of Kasan, Simbirsk, and Penza.

KASAN, the capital of the above government, is seated on the Kazanka, at its junction with the Volga, 414 miles E. by N. of Moscow.

KASHGAR, KASCHGAR, or CASHGUR, a city of Asia, which formerly gave name to Little Bukharia, of which it was the capital, 350 miles N. E. of Cashemire.

KASTANOVITZ, a town of Croatia, on the Unna, which divides Christendom from Turkey. Lon. 17° . 20° E. Lat. 45° . 40° N.

KATTEGATTE, or **CATEGATE**, a noted sea lying between part of Jutland and the coast of Sweden, towards the latter interspersed with a great number of isles.

KAVIA, or **CAVEAR**, the hard roes of sturgeons made into cakes an inch thick, and about four inches broad: they are salted and dried in the sun. The Russians are very fond of this food; it is also in great repute among the Italians.

KAYE'S

KAYE'S, or KAY'S, ISLAND, an island in the north Pacific Ocean. Water-fowls, humming-birds, and beautiful kingfishers abound in it. Lon. 144. 48. W. Lat. 59. 56. N.

KAYERSBERG, a town of France, in the department of the Upper Rhine, and late province of Alsace, 5 miles N.W. of Colmar.

KAYSERESCH, a town of France in the department of the Rhine and Moselle, and late electorate of Treves, 12 miles W. of Coblenz.

KAYSERSLAUTERN, or LAUTERN, a town and late duchy of Germany, now annexed to France, included in the department of Mont Tonnerre.

KAYSERSTHUL, or KEISERSTOUL, a town of Switzerland, in Baden, 8 miles S.E. of Zurzach.

KAYSERSVERD, or KEYSERSWERT, a town in Westphalia, 8 miles N. of Düsseldorf.

KAZANSKOE, or KASON, a government of Russia, 100 miles long, and about 100 broad. See **KASAN**.

KAZY, in the East Indies, a Mohammedan judge or magistrate, appointed originally by the court of Delhi to administer justice according to their written law.

KEBLA, an appellation given by the Mohammedans to that part of the world where the temple of Mecca is situated, towards which they are obliged to turn their faces when they pray.

KECKLE, or KECKLING, in the sea-language, is the winding of old ropes about cables, to prevent them from galling.

KEDAR, in ancient geography, a district in the desert of the Saracens, on the north of Arabia Felix; so called from Kedar, the son of Ishmael.

KEDES, in ancient geography, a city of refuge and Levitical city in the tribe of Naphthali, on the confines of Tyre and Galilee.

KEDES, a city in the tribe of Issachar (1 Chron. vi. 72), which seems to be called Kishion in Joshua xix.

KEDGE, a small anchor, used to keep a ship steady whilst she rides in a harbour or river.

KEDGING, in the sea-language, is when a ship is brought up or down a narrow river by means of the tide, the wind being contrary. To do this they use to set their fore-cour-e, or fore-top-sail and mizen, that so they may flat her about; and if she happen to come too near the shore, they let fall a kedge-anchor, with a hawser fastened to it from the ship, in order to turn her head about; which work is called kedging.

KEDRON, or CEDRON, in ancient geography, a town which, from the defeat and pursuit of the Syrians (1 Mac. xvi.), appears to have stood on the road which led from the Higher India to Azotus: in this war it was burnt by the Jews.

KEDRON, or CEDRON, in ancient geography, a brook or rivulet of Judea, between Jerusalem and Mount Olivet, on the east.

KEEL, [*keel*, Saxon; *kiel*, Dutch; *quille*, Fr.] the principal piece of timber in a ship, which is usually first laid on the blocks in building. If we compare the carcase of a ship to the skeleton of a human body, the keel may be considered as the back-bone, and the timbers as the ribs. It therefore supports and unites the whole fabric, since the stem and stern-post, which are elevated on its ends, are in some measure a continuation of the keel, and serve to connect and inclose the extremities of the sides by transoms; as the keel forms and unites the bottom by timbers. The keel is generally composed of several thick pieces placed lengthways, which after being scarfed together, are bolted and clenched upon the upper side. When these pieces cannot be procured large enough to afford a sufficient depth to the keel, there is a strong thick piece of timber bolted to the bottom thereof, called the false keel, which is also very useful in preserving the lower side of the main keel. In our largest ships of war, the false keel is generally composed of two pieces, which are called the upper and the lower false keel.

KEEL is also a name given to a low flat-bottomed vessel, used in some rivers.

KEEL-HAULING, a punishment inflicted for various offences in the Dutch navy. It is performed by plunging the culprit repeatedly under the ship's bottom on one side, and hoisting him up on the other, after having passed under the keel. The blocks or pulleys by which he is suspended are fastened to the opposite extre-

mities of the main-yard, and a weight of lead or iron is hung upon his legs, to sink him to a competent depth. By this apparatus he is drawn close up to the yard-arm, and thence let fall suddenly into the sea, where passing under the ship's bottom, he is hoisted up on the opposite side of the vessel.

KEELSON, the interior or counter-part of the keel; as it is laid upon the middle of the floor-timbers, immediately over the keel, and, like it, composed of several pieces scarfed together. To sit with more security upon the floor-timbers and crotches, it is notched about an inch and a half deep, opposite to each of those pieces, and thereby firmly scored down upon them to that depth, where it is secured by spike-nails.

KEENE, a flourishing town of New Hampshire, in Cheshire county, 86 miles W. of Boston.

KEEP, in ancient military history, a kind of strong tower which was built in the centre of a castle or fort, to which the besieged retreated, and made their last efforts of defence. Of this description is the keep of Windsor-castle.

KEEPER OF THE FOREST, an officer that has the chief management of every thing belonging to a royal forest, as well as the government of all the other officers.

KEEPER OF THE GREAT SEAL, [*custos magni sigilli*, Lat.] is a lord by his office, and called lord keeper of the great seal of England, and is of the king's privy-council, under whose hand pass all charters, commissions, and grants, of the king. This lord keeper, by the statute of 5 Eliz. c. 18, hath the like jurisdiction, and all other advantages, as hath the lord chancellor of England. The keeper of the great seal is constituted by the delivery of the great seal, &c.

KEEPER OF THE PRIVY SEAL, is also a lord by office, through whose hands all grants, pardons, &c. pass before they come to the great seal; and even some things pass his hands which do not pass the great seal at all. He is also one of the privy council, and was anciently called clerk of the privy seal. His duty is to put the seal to no grant, &c. without a proper warrant; nor with warrant where it is against law, or inconvenient, but shall first acquaint the king therewith.

KEEPING, in painting, denotes the representation of objects in the same manner that they appear to the eye at different distances from it; for which the painter should have recourse to the rules of perspective. The famous Raphael Urbin twice transgressed these rules; in one of his cartoons, representing miraculous draught of fishes, the men in each of the boats appear to be in full size, while the boats are represented so small, and the men so big, that any one of the fishermen appears sufficient to sink either of the boats by his weight. The other instance occurs in his picture of our Saviour's transfiguration on the mount.

KEILL, JAMES, M.D. an eminent physician, was born in Scotland about 1673; and having travelled abroad, read lectures of anatomy with great applause, in the universities of Oxford and Cambridge, from the latter of which he received the degree of M.D. In 1700 he settled at Northampton, where he had considerable practice as a physician; and died there of a cancer in the mouth, in 1719. He published, 1. An English translation of Lennery's Chemistry. 2. An Account of Animal Secretion, the Quantity of Blood in the Human Body, and Muscular Motion. 3. A Treatise on Anatomy. And, 4. Several pieces in the Philosophical Transactions.

KEILL, JOHN, M.D. elder brother to Dr. James, a celebrated astronomer and mathematician, born at Edinburgh in 1671. He studied in the university of that city, and in 1694 went to Oxford, where, being admitted of Balliol college, he read lectures according to the Newtonian system, in his private chamber in that college. He is said to have been the first who taught Sir Isaac Newton's principles by the experiment on which they are founded. This he did by an apparatus of instruments of his own providing, by which he acquired great reputation in the university. The first specimen he gave the public of his skill in mathematical and philosophical knowledge was, his "Examination of Dr. Burnet's Theory of the Earth, with Remarks on Mr. Whiston's Theory;" and these theories being defended by their respective inventors, drew from Mr. Keill, "An Examination of the Reflections on the Theory of the Earth, together with A Defence of the Remarks on Mr. Whiston's New Theory." In 1701, he published his celebrated treatise, intitled, "Introductio ad veram Physicam,"

am," which contains fourteen lectures; but in the following editions he added two more. This work has been translated into English, under the title of *An Introduction to Natural Philosophy*. Afterwards, being made F. R. S. he published, in the *Philosophical Transactions*, a paper on the laws of attraction; and being offered at a passage in the *Acta Eruditorum* of Leipsic, warmly vindicated against Mr. Leibnitz Sir Isaac Newton's right to the honour of the first invention of his method of fluxions. In 1709 he went to New England as treasurer of the Palatines. About 1711, objections being urged against Newton's philosophy, in support of Des Cartes's notions of a plenum, Mr. Keill published a paper in the *Philosophical Transactions* on the rarity of matter, and the tenuity of its composition. While he was engaged in this dispute, Queen Anne appointed him her decypherer; and he continued in that place till 1716. He had also the degree of M. D. conferred on him by the university of Oxford in 1713. He died in 1721. He published also *Introductio ad veram Astronomiam*, which he translated into English; and an edition of *Commandinus's Euclid*, with additions of his own.

KELLINGTON, or **CALLINGTON**, a borough in Cornwall, twelve miles S. of Launceston. Lon. 4. 35. W. Lat. 50. 30. N.

KELLS, a borough of Ireland, in the county of Meath, Leinster, thirty-one miles from Dublin.

KELLS, an ancient town of Ireland, in Kilkenny, sixty-four miles from Dublin, seated on King's River.

KELP, in the glass-trade, a term used for a sort of impure alkali, made use of in many of the glass-works. It is the calcined ashes of a plant called by the same name; and in some places, of sea-thongs, a sort of thick-leaved fucus, or sea-wrack. The process of making it is this: the rocks, which are dry at low water, are the beds of great quantities of sea-weed; which is cut, carried to the beach, and dried; and a hollow is dug in the ground three or four feet wide; round its margin is laid a row of stones, on which the sea-weed is placed, and set on fire within, and quantities of this fuel being continually heaped upon the circle, there is in the centre a perpetual flame, from which a liquid like melted metal drops into the hollow beneath: when it is full, as it commonly is ere the close of day, all heterogeneous matter being removed, the kelp is wrought with iron rakes, and brought to an uniform consistence in a state of fusion. When cool, it consolidates into a heavy, dark-coloured, alkaline, substance, which undergoes, in the glass-houses, a second vitrification, and assumes a perfect transparency. See **GLASSMAKING**.

KELSO, a town of Scotland, in Roxburgshire, pleasantly situated on the Tweed. Lon. 1. 20. W. Lat. 55. 38. N.

KELVIN, a river of Scotland, in Lanarkshire.

KEMMOO, a city of Africa, the capital of Kaarta. Mr. Park was graciously received by the king, who gave him a guard to Jarra, a frontier-town of Ludamar. Lon. 7. 20. W. Lat. 14. 15. N.

KEMP, or **KEMPEN**, a town of Germany, in the late electorate of Cologne; now included in the department of the Roer; fifteen miles N. E. of Ruremond. Lon. 6. 30. E. Lat. 51. 18. N.

KEMPIS, **THOMAS A**, a pious and learned regular canon, born at the village of Kemp, in the diocese of Cologne, in 1380; from which he took his name. He studied at Deventer, in the community of poor scholars, established by Gerard Groot; where he made great progress in the sciences. In 1399, he entered the monastery of the regular canons of Mount St. Agnes, near Zwoll, of which his brother was prior. Thomas à Kempis there distinguished himself by his eminent piety, his respect for his superiors, his charity to his brother canons, &c. He died in 1450, aged 70. The best editions of his works, which consist of sermons, spiritual treatises, and lives of holy men, are those of Paris in 1649, and of Antwerp in 1677. The famous book, "*De Imitatione Christi*," which has been translated into almost all languages, having been found printed under the name of Gerson, has been on this account, as well as on the credit of some MSS. since ascribed to the abbot Gerson. This occasioned a violent dispute between the canons of St. Augustine and the Benedictines.

KEMPTEN, a territory in Suabia, between the bishopric of Augsburg, and the barony of Walburg.

KEMPTEN, a town in the above territory. Lon. 10. 35. E. Lat. 47. 47. N.

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KEN, a river of England, which runs into the Ex, below Exeter.

KEN, or **KAN**, a river of Westmoreland, which flows by Kendal.

KEN, a river of Scotland, in Kircudbrightshire, and New Galloway.

KENA, a town of Egypt, anciently called Canopolis; four miles N. E. of Dendera.

KENDAL, a town of Westmoreland, forty-six miles S. of Carlisle. Lon. 2. 52. W. Lat. 54. 15. N.

KENDRICK'S ISLAND, an island of America, which forms the W. side of Nootka Sound.

KENMARE, a river of Ireland; in the S. W. part of Kerry county.

KENNEDY, **JOHN**, M. D. a learned Scotch physician, of the eighteenth century, who resided several years at Smyrna. He made a valuable collection of coins and pictures: and published a *Dissertation on the Coins of Carausius*, which produced a controversy between him and Dr. Stukely. He died in 1760.

KENNET, **DR. WHITE**, bishop of Peterborough, a learned English writer, was born at Dover, Aug. 10th, 1660; and bred at St. Edmund's Hall, Oxford; where he soon distinguished himself by his translations of several books into English, and other publications. In 1695, he published his "*Parochial Antiquities*." A sermon preached by him on the 30th of January 1703, at Aldgate, exposed him to great clamour. It was printed under the title of "*A Compassionate Inquiry into the Causes of the Civil War*." In 1706, he published his "*Case of Improvements*," and two other tracts on the same subject. In 1709, he published the third volume of "*The Complete History of England*;" the two former being compiled by Mr. Hughes. In 1709, he published "*A Vindication of the Church and Clergy of England from some late reproaches rudely and unjustly cast upon them*;" and, "*A true Answer to Dr. Sacheverel's Sermon*." Dr. Kennet was exposed to great odium as a low-church man. In 1713, he presented the Society for propagating the Gospel with a great number of books, suitable to their design; published his "*Bibliotheca Americana Primordia*," and founded an antiquarian and historical library at Peterborough. Upon the death of Dr. Cumberland, bishop of Peterborough, he was promoted to that see, in 1718; which he held till his death, in 1728. He was an excellent philologist, a good preacher, whether in English or Latin, and well versed in the history and antiquities of England.

KENNICOTT, **BENJAMIN**, a learned divine, was born in 1718, at Totness, in Devonshire, of which place his father was parish-clerk. By the liberality of some gentlemen, he was sent to Exeter college, Oxford, where he applied to his studies with such diligence, that while an under-graduate he published two dissertations on the Tree of Life, and Cain and Abel, for which the university presented him his bachelor's degree, without fees, and before he had completed his terms. He next undertook to publish a correct edition of the text of the Hebrew Scriptures, collated from ancient manuscripts. In this great work, for which he was admirably fitted by patience, industry, and learning, he met with extensive encouragement, and many sovereigns and other illustrious personages appeared in his list of subscribers. To enable him to perfect his design, he was made keeper of the Radcliffe library, and canon of Christ church. The first volume he published in 1776, and the last, which is the 8th, in 1780. He died at Oxford, in 1783. After his death appeared his *Remarks on certain Passages of the Old Testament*. *Watkins*.

KENSINGTON, a populous village of Middlesex, on the W. road from London, near two miles from Hyde-Park corner. Besides the palace, now neglected, it contains many genteel houses, and several boarding-schools. The palace, which was the seat of Lord Chancellor Finch, afterwards Earl of Nottingham, was purchased by King William III. who greatly improved it, and caused a royal road to be made to it, through St. James's and Hyde-Parks, with lamp-posts erected at equal distances on each side. Queen Mary II. enlarged the gardens. Queen Anne improved what Mary had begun; and was so pleased with the place, that she frequently supped during the summer in the greenhouse, which is very beautiful: but Queen Caroline completed the design by extending the gardens from the great road in Kensington to Acton; by bringing the Serpentine river into them; and by taking in some acres from Hyde-Park, on which she caused a mount to be erected, with a chair on it that could be

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easily

easily turned round for shelter from the wind, since decayed. At this palace King William, Prince George of Denmark, Queen Anne, and King George II. died. The old church was pulled down in 1696, and a much better one built in its room.

KENT, a county of England, situated at the S. E. corner of the island, and thence enjoying many advantages. The capacious estuary of the Thames washes it on the N. as the sea does on the S. E. whence some have styled it a peninsula. In point of extent, this is the fifth county in South Britain. Kent is supposed to be so named from the ancient British word *kant*, signifying a corner, or, when applied to a county, a head-land. The Romans called the province Cantium, and the people Cantii. Climate, various. In the low flat lands, and marshes, the air is heavy and unhealthy; though not to such a degree as it has been sometimes represented. But, in the rest of the county, the air is as pure and wholesome, as in any part of Britain. No region is more happily or beautifully diversified in regard to soil; and in no county are the various soils more fertile than in this. The flat country is renowned for its meadows; and Romney Marsh has hardly its equal. The natural products of Kent are numerous, and of great value. In the bowels of the earth they find a rough hard stone for paving: exquisite fullers earth, rich marl, fine chalk, and iron ore. Prodigious heaps of copper stones are thrown on the coast. The Isle of Sheppey, and all the adjacent shores as far as Reculver, are justly famous for wheat. Thanet has no less credit for both barley and wheat. Horses, black cattle, and sheep, are numerous and remarkable in size; and the hop-grounds, in all parts of the county, turn to very considerable account. Weld, or dyers weed, is also a very profitable commodity, of which great quantities grow near Canterbury; madder also, is occasionally cultivated. The rivers and sea-coasts abound with fish. The excellency of its oysters on the eastern shore is celebrated by the Roman poets.

KENT, a populous and fertile county of Delaware, bounded on the E. by the Delaware. Dover is the capital.

KENT, a county of Maryland, on the eastern shore, bounded on the W. by Chesapeake Bay. Chester is the capital.

KENTUCKY, one of the 17 United States of N. America. It is situated between 83° and 89° Lon. W. of London; and between 36° 30' and 39° 30' Lat. N. It is bounded on the N. W. and N. by the Ohio; E. by Great Sandy river, and a line drawn due S. till it reaches the N. boundary of N. Carolina; S. E. by Cumberland Mountain; S. by the State of Tennessee; and W. by Cumberland river, in length 250 miles, and breadth 200; it lies nearly in the form of a triangle. It is divided into 19 counties; Jefferson, Fayette, Lincoln, Mason, Woodford, Bourbon, Maddison, Mercer, Nelson, Washington, Franklin, Scott, Logan, Shelby, Hardin, Greene, Clarke, Harrison, and Campbell. The principal rivers are the Ohio, Kentucky, Licking River, Red River, Elkhorn, Dicks River, Green River, Cumberland River, and Great Kanaway or New River. These are all navigable for boats almost to their sources, without rapids, for the greatest part of the year. The country is generally level, and abounds with limestone, which usually lies about six feet deep, except in hollows, where streams run, where the rock is in the bottom of the channel. The springs and streams lessen in June, and continue low, hindering navigation, until November, when the autumnal rains soon replenish the whole country with water. The soil is amazingly fertile. The inhabitants distinguish its quality by 1st, 2d, and 3d rate lands; and scarcely a marsh or swamp is to be found. This country is more temperate and healthy than the other settled parts of America. The winter begins about Christmas, and ends about the first, or at farthest, the 15th of March; and is so mild, that cattle can subsist without fodder. Snow seldom falls deep, or lies long. The country, in general, may be considered as well timbered, producing large trees of many kinds, and exceeded by no country in variety. Those which are peculiar to Kentucky are, the sugar-tree, which grows in all parts in great plenty, and furnishes every family with plenty of excellent sugar; and the honey-locust, which is curiously surrounded by large thorny spikes, bearing broad and long pods in form of peas; it has a sweet taste, and makes excellent beer. The coffee-tree, which resembles the black oak, grows large; the papaw-tree, which does not grow to a great size, is a soft wood, bears a fine fruit, like a cucumber in shape and size, but tastes sweet; the cucumber-tree, which is small and soft, with remarkable leaves, and

bears a fruit much resembling that from which it is named; black mulberry-trees in abundance; the wild cherry-tree, which is of a large size, and supplies the inhabitants with boards for all their buildings; the buck eye, a very soft wood, bearing a remarkable black fruit; and some other kinds of trees not common elsewhere. The fields are covered with wild herbage not common to other countries; as the Shawanese sallad, with lettuce, pepper-grass, &c. Throughout the year, excepting the winter-months, the plains and valleys are adorned with numberless flowers of admirable beauty. The tulip-bearing laurel-tree, or magnolia, which has an exquisite smell, continues to blossom and seed for several months together. Iron ore and lead are found in abundance. The western waters produce plenty of fish. The land-fowls are, turkeys; a species of grouse, which the inhabitants call pheasants; quails, which they call partridges; the parroquet, a bird resembling a parrot, but much smaller; and the ivory bill woodcock, of a whitish colour, with a white plume. Serpents are not numerous, except the bull, the horned, and the mockason snakes. Among the native animals is the buffalo, or American Bison. See Bos. There are many deer, elks, bears, panthers, wild cats, wolves, beavers, otters, minks, musk-rats, foxes, rabbits, squirrels, racoons, ground-hogs, pole-cats, and opossums. Most of the domestic quadrupeds introduced since the settlement, as horses, cows, sheep, and hogs, are prodigiously multiplied, suffered to run in the woods without a keeper, and brought home only when wanted. Many caves are found in this country amazingly large; in some of which one may travel several miles under a fine limestone rock, supported by curious arches and pillars: in most of them runs a stream of water. Lexington and Frankfort are the chief towns.

KENTUCKY, a river of N. America, in the above state.

KEPLER, JOHN, one of the greatest astronomers of his age, was born at Wiel, in the county of Wirtemberg, in 1571. His father had been an officer in the imperial service, but was so much reduced, as to be obliged to keep a public house. Young Kepler, however, studied astronomy and mathematics under Mastlinus, and made such rapid progress, that in 1593, he was appointed professor of mathematics at Gratz. In 1595, he wrote an excellent book, which was printed at Tubingen, in 1596, entitled "*Prodromus Dissertationum de Proportionibus Orbium celestium, deque Causis Caelorum Numeri, Magnitudinis, Motuumque periodicorum genuinis et propriis, &c.*" Tycho Brahe having settled at Bohemia, under the patronage of the emperor Rodolphus, he prevailed upon Kepler to leave the university of Gratz, and remove into Bohemia with his family and library in 1600. Kepler in his journey was seized so violently with the quartan ague, that he could not do Tycho Brahe the services of which he was before capable. He was also dissatisfied with the reservedness which Tycho Brahe shewed, for he did not communicate to him all that he knew; and as he died in 1601, Kepler had not time to be very useful to him. Upon Brahe's death, the emperor appointed him his mathematician for life, and he daily acquired additional reputation by his works. The emperor ordered him to finish the tables of Tycho Brahe, which were called the Rodolphine Tables. Kepler applied himself to it vigorously; but the imperial treasurers were so ill-affected toward our author, that he could not publish these tables till 1627. He died at Ratisbon, where he was soliciting payment of the arrears of his pension, in 1630. The principal works of this astronomer are, 1. *Prodromus Dissertationum* abovementioned, which he also entitled *Mysterium Cosmographicum*, and esteemed more than any other of his works. 2. *Harmonia Mundi*, with a defence of that treatise. 3. *De Cometis, libri tres*. 4. *Epitome Astronomiæ Copernicanae*. 5. *Astronomiæ nova*. 6. *Chilias Logarithmorum, &c.* 7. *Nova Stereometria Soliorum, vinariorum, &c.* 8. *Dioptrica*. 9. *De vero natali anno Christi*. 10. *Ad Vitellionem Paralipomena, quibus Astronomiæ Pars optica traditur, &c.* 11. *Somnium, Lunarise Astronomiæ*; in which he began to draw up that system of comparative astronomy which was afterwards pursued by Kircher, Huygens, and Gregory. His death happened while the work was printing; upon which James Bartschius his son-in-law undertook the care of it, but was also interrupted by death; and Lewis Kepler his son, who was then a physician at Königsberg in Prussia, was so much startled at these disasters, that it was with difficulty he could be prevailed upon to attempt to finish it, lest it should prove fatal to him: he completed

the task, however, without injury. For Kepler's discoveries in astronomy. See ASTRONOMY.

KEPLER'S PROBLEM is the determining the true from the mean anomaly of a planet, or the determining its place, in its orbit, answering to any given time. The general state of the problem is this: to find the position of a right line, which, passing through one of the foci of an ellipsis, shall cut off an area which shall be in any given proportion to the area of the ellipsis; which results from this property, that such a line sweeps areas that are proportional to the times. Many solutions have been given of this problem, some direct and geometrical, others not: viz. by Kepler, who first proposed it; Bulliald, Ward, Newton, Keill, Machin, &c. See Newton's Princip. lib. 1, prop. 31, Keill's Astron. Lect. 23, Philos. Trans. abr. vol. 8. p. 73, &c.

KERCOLANG, an island of Asia, in the Indian Ocean, between 80 and 100 miles in circumference. Lon. 126. 31. E. Lat. 4. 28. N.

KERGUELEN'S LAND, in the S. Pacific Ocean, was visited by Captain Cook, in 1779. From its sterility, it might properly have been called the Island of Desolation. Lon. 69. 37. E. Lat. 49. 3. S.

KERI CETIB are various readings in the Hebrew Bible: *keri* signifies that which is read; and *cetib*, that which is written. For where any such various readings occur, the wrong reading is written in the text, and that is called the *cetib*; and the true reading is written in the margin, with ρ under it, and called the *keri*. It is generally said by the Jewish writers, that these corrections were introduced by Ezra; but it is most probable, that they had their original from the mistakes of the transcribers after the time of Ezra, and the observations and corrections of the Masorites. Those *Keri-cetibs*, which are in the sacred books written by Ezra himself, or which were taken into the canon after his time, could not have been noticed by Ezra himself; and this affords a presumption, that the others are of a late date. These words amount to about 1000; and Dr. Kennicott, in his *Dissertatio Generalis*, remarks, that all of them, excepting 14, have been found in the text of MSS.

KERMAN, a province in the S. of Persia on the Persian Gulf. See CARMANIA.

KERMAN, the capital of the above province, is seated in Lon. 50. 30. E. Lat. 30. 0. N.

KERMES, [קֶרְמֶס, Arab.] in zoology, an insect produced in the excrescences of a species of the oak. See COCCUS.

KERMES MINERAL, in chemistry, an antimonial compound much used as a medicine about the beginning of the seventeenth century; in the new chemical nomenclature, it is denominated hydro-sulphuret of antimony. It is made thus, sixteen parts of sulphuret of antimony, eight parts of potash, and one of sulphur, are triturated together in a mortar, melted in a crucible, and the mass poured into an iron-vessel. When cold it is pounded, and boiled in a sufficient quantity of water, and the solution is filtered while hot. On cooling, it deposits the kermes abundantly in the state of a yellow powder, which isedulcorated with water, and dried.

KERPEN, a town of Germany, now annexed to France, and included in the department of the Roer. It is 14 miles S. E. of Juliers. Lon. 6. 56. E. Lat. 50. 5. N.

KERRY, a county of Ireland, in the province of Munster, anciently called *Corrigia*, or the rocky country, from *Cerrig* or *Car-ric*, a rock. It is bounded on the N. by the Shannon, which divides it from Clare. The S. parts are plain and fertile, but the N. full of high mountains, which, though remarkably wild, produce a great number of natural curiosities. The principal rivers are the Blackwater, Feal, Gale and Brick, Cashin, Mang, Lea, Fleck, Laune, Carin, Fartin, Inry, and Roughty, and the principal lake is Killarney. There are some good medicinal waters; particularly those of Killarney, Iverag, Spa, Felloswell, Dingle, Castlemain, and Tarlee; a saline spring at Maherybeg. Some rare and useful plants grow in Kerry, of which Dr. Smith gives a particular account in his history of that country.

KESSEL, a town of France, in the department of the Roer, and late province of Upper Guelderland. Lon. 6. 13. E. Lat. 41. 22. N.

KESTEVEN, one of the divisions of Lincolnshire, containing the W. part of the county, from the middle to the S. extremity.

KESWICK, a town of Cumberland, 25 miles N. W. by N. of Kendal, and 287 N. N. W. of London.

KESWICK, VALE OF, a delightful spot in the S. part of Cumberland, much visited by the admirers of nature. Here is the lake of Keswick, or, more properly, the lake of Derwent-water. To the N. of this romantic piece of water soars the lofty mountain Skiddaw, one of the most distinguished in England, and the haunt of eagles and other birds of prey. To the S. is the dreary region of Borrodale.

KETCH, [from *caicchio*, Italian, a barrel,] a vessel equipped with two masts, viz. the main-mast and mizen-mast, and usually from 100 to 250 tons burden. Ketches are principally used as yachts, or as bomb-vessels; the former of which are employed to convey princes of the blood, ambassadors, or other great personages, from one part to another; and the latter to bombard citadels, towns, or fortresses. The bomb-ketches are therefore furnished with all the apparatus necessary for a vigorous bombardment; they are built remarkably strong, as being fitted with a greater number of riders than any other vessel of war; and indeed this reinforcement is absolutely necessary to sustain the violent shock produced by the discharge of their mortars, which would otherwise soon shatter them to pieces.

KETTERING, a town of Northamptonshire, 12 miles N. E. of Northampton, and 75 N. W. of London.

KETTLE, in the art of war, is a term the Dutch give to a battery of mortars, because it is sunk under ground.

KETTLE-DRUMS, drums formed of two large basins of copper or brass, rounded at the bottom, and covered over with vellum or goat-skin, which is kept fast by a circle of iron, with several holes in it, fastened to the body of the drum, and a like number of screws to screw up and down, and a key for that purpose. The two basins are kept fast together by two straps of leather, which go through two rings, and are fastened the one before and the other behind the pommel of the kettle-drum's saddle. They have each a banner of silk or damask, richly embroidered with the sovereign's arms, or with those of the colonel, and are fringed with silver or gold; and, to preserve them in bad weather, they have each a cover of leather.

KEW, a village of Surrey, on the banks of the Thames, about seven miles W. by S. of London. It was formerly a hamlet to Kingston; but in 1769, an act of parliament was passed, forming Kew and Petersham into one vicarage. Kew House, a royal palace, is celebrated for its fine gardens, and his majesty's exotic garden. This last has been brought to great perfection by the introduction of many new plants from Africa and New South Wales; and is known throughout all Europe by the late Mr. Aiton's *Hortus Kewensis*. From Kew to Brentford is a handsome stone-bridge of seven arches over the Thames, built, in 1789, from a design of the late Mr. Paine. Kew gardens are open to the public, every Monday from midsummer to the end of autumn.

KEXHOLM, a province of Finland, in Sweden, which borders upon Russia. The lake Ladoga crosses it, and divides it into two parts. By the treaty between Russia and Sweden in 1721, the Swedes were obliged to abandon the East, which is the best part of it, to the Russians. The country in general is full of lakes and marshes, thinly inhabited, and badly cultivated.

KEXHOLM, or **CARELGOROD**, a town of Russia in the above province, not very large, but well fortified, with a strong castle. Lon. 30. 25. E. Lat. 61. 12. N.

KEY, a well known instrument for opening and shutting the locks of doors, chests, &c. See LOCK.

KEY, or **KEY NOTE**, in music, a certain fundamental note or tone, to which the whole of a movement has a certain relation or bearing, to which all its modulations are referred and accommodated, and in which it both begins and ends. There are but two species of keys: one of the major, and one of the minor mode: all the keys in which we employ sharps or flats being deduced from the natural keys of C major and A minor; of which they are mere transpositions.

KEY is also used for ecclesiastical jurisdiction; particularly for the power of excommunicating and absolving. The Romanists say, the pope has the power of the keys, and can open and shut Paradise as he pleases; grounding their opinion on that expression of our Lord to Peter, "I will give thee the keys of the kingdom of heaven."

KEY, or QUAY. See QUAY.

KEYS are also certain sunken rocks lying near the surface of the water, particularly in the West Indies.

KEYS OF AN ORGAN, HARPSICORD, &c. those little pieces in the fore-part of those instruments, by means whereof the jacks play, so as to strike the strings. These are in number 28 or 29. In large organs there are several sets of the keys, some to play the secondary organ, some for the main body, some for the trumpet, and some for the echoing trumpet, &c. in some there are but a part that play, and the rest are only for ornament. There are twenty slits in the large keys, which make half-notes. See ORGAN, &c.

KEYNSHAM, a town of Somersetshire, 116 miles from London, in the lower road between Bath and Bristol.

KEYSLER, JOHN GEORGE, F. R. S. a learned German antiquarian, born at Thourneau in 1689. After studying at the university of Halle, he was appointed preceptor to Charles Maximilian and Christian Charles, the Counts of Giech; with whom he travelled through Germany, France, and the Netherlands, and gained great reputation among the learned, by illustrating several monuments of antiquity, particularly some fragments of Celtic idols discovered in the cathedral of Paris. In 1716 he was employed to superintend the education of two grandsons of Baron Bernstorff, first minister to king George I. as elector of Brunswick Lunenburg. However, obtaining leave, in 1718, to visit England, he was elected F. R. S. for a learned essay *De Dea Nabalena Numine veterum Walachorum topico*. He gave also an explanation of the ancient monument on Salisbury plain, called Stonehenge, with A Dissertation on the Consecrated Mistletoe of the Druids. These detached essays, with others, he published on his return to Hanover, under the title of *Antiquitates selectæ Septentrionales et Celticæ*, &c. He afterwards made the grand tour with the young barons, to which we owe the publication of his travels; which were translated into English, and published in 1756, in four vols. 4to. Mr. Keyser on his return spent the remainder of his life under the patronage of his noble pupils, who committed their fine library and museum to his care, with a handsome income. He died in 1743.

KEY-STONE, OF AN ARCH OR VAULT, is the last stone placed at the top; which being wider and fuller at the top than bottom, wedges and binds all the rest. The key is different in the different orders; in the Tuscan and Doric it is a plain stone only projecting; in the Ionic it is cut, and waved somewhat after the manner of consoles; in the Corinthian and Composite it is a console enriched with sculpture, foliages, &c.

KHALIF, KALIPH, or CALIPH, [*Khalifah*, Arab, *i. e.* a Successor, or heir,] a successor of Mohammed in the spiritual as well as temporal empire erected by that legislator. After the death of Mohammed, Abubeker, having been elected by the Mussulmans to supply this place, he would take no other title but that of *khalifah resoulallah*, *i. e.* vicar of the prophet, or Messenger of God. Omar, who succeeded Abubeker, declined the title, preferring that of *emir moumenin*, *i. e.* Prince of the believers; but his successors resumed that of *khalif*, which thus came to signify, the supreme ecclesiastical dignity among the Saracens; or, sovereign dignity among the Mohammedans, vested with absolute authority in all matters relating both to religion and policy. In the Arabic it signifies also vicar; the *khalifs* bearing the same relation to Mohammed that the popes pretend they do to Jesus Christ or St. Peter. It is still one of the Grand Signior's titles, as successor of Mohammed; and of the Sophi of Persia, as successor of Ali. One of the chief functions of the *khalif*, in quality of man or chief priest of Musulmanism, was to begin the public prayers every Friday in the chief mosque, and to deliver the *khotbak* or sermon. In after-times, they had assistants for this latter office; but the former the *khalifs* always performed in person. The *khaliph* was also obliged to lead the pilgrims to Mecca in person, and to march at the head of the armies of his empire. He granted investiture to princes; and sent swords, standards, gowns, and the like, as presents to princes of the Mohammedan religion; who, though they had thrown off the yoke of the caliphate, nevertheless held of it as vassals. The *khalifs* usually went to the mosque mounted on mules; and the sultans *selgiucides*, though masters of Bagdad, held their stirrups, and led their mule by the bridle some distance on foot, till such time as the *khalifs* gave them the sign to

mount on horseback. At one of the windows of the *khalif's* palace, there always hung a piece of black velvet twenty cubits long, which reached to the ground, and was called the *khalif's* sleeve: which the *grandeens* of his court never failed to kiss every day, with great respect. After the destruction of the caliphate by Hulaku, the Mohammedan princes appointed a particular officer, in their respective dominions, who sustains the sacred authority of *khalif*. In Turkey he goes under the denomination of *mufti*, and in Persia under that of *sadne*. After the death of Mohammed, the succession of *khalifs* continued in Arabia and Bagdad, till the 655th year of the Hegira, when Bagdad was taken by the Tartars. After this, however, there were persons, who claimed the *khaliphate*, as pretending to be of the family of the *Abassides*, and to whom the sultans of Egypt rendered great honours at Cairo, as the true successors of Mohammed; but this honour was merely titular, and the rights allowed them only in matters relating to religion; and though they bore the sovereign title of *khalifs*, they were nevertheless subjects and dependents of the sultans. In the year of the Hegira 361, a kind of *kaliphate* was erected by the *Fatimites* in Africa, and lasted till it was suppressed by *Saladin*. Historians also speak of a third *khaliphate* in Gemen or Arabia Felix, erected by some princes of the family of the *Jobites*. The emperors of Morocco assume the title of grand *cherifs*; and pretend to be the true *khalifs*, or successors of Mohammed, though under another title. See MOHAMMED.

KHAN, or CHAM, the title given to the sovereign princes of Tartary. The word in Persian, signifies mighty lord, in the Sclavonic, emperor. *Sperlingius*, in his Dissertation on the Danish term of Majesty, *konig*, king, thinks the Tartarian *cham* may be derived from it; adding that in the north they say *kan*, *konnen*, *konge*, *konning*, &c. The term is also applied, among the Persians, to the great lords of the court, and the governors of provinces.

KHARKOF, a government of the Russian empire, formerly in that of Ukrania. *Kharkof*, its capital, is seated on the *Uda*.

KHAULAN, a district of Arabia, in Yemen.

KIAM, a great river of China, which rises near the west frontier, crosses the whole kingdom eastward, and falls into the bay of Nanking, below that city.

KIANG-NAN, a province of China, and one of the most fertile, commercial, and richest, in the empire. It is bounded on the W. by Ho-nan and Hou-quang; S. by Tche-kiang and Kiang-si; E. by the gulph of Nanking; and N. by Chan-tong.

KIANG-SI, a province of China, bounded on the N. by that of Kiang-nan, W. by Hou-quang, S. by Quang-tong, and E. by Fokien and Tche-kiang. The country is extremely fertile, but so populous, that it can scarcely supply the wants of its inhabitants, who are therefore very economical.

KIAYAS, in Turkish polity, commanding officers of the Janizaries, Arabs, &c. who after the first year, lay down their employments, become veterans, and have a voice in the *Divan*.

KIBES. See CHILBLAIN.

KICKAPOUS, a nation of North American Indians, who inhabit the country near the entrance of Lake Superior.

KID, in zoology. See CAPRA.

KIDDERS, in law, are those that badge or carry corn, dead victuals, or other merchandise, up and down to sell: every person being a common badger, *kidder*, *lder*, or carrier, &c. says the stat. 5 Eliz. cap. 12. They are called *kiddiers*, 13 Eliz. cap. 25.

KIDDERMINSTER, or KEDDERMINSTER, a town of Worcestershire, seated under a hill on the Stour, near the Severn, 128 miles from London. Lon. 2. 15. W. Lat. 52. 28. N.

KIDDINGTON, a town of Oxfordshire, four miles from Woodstock, and 12 from Oxford.

KIDNAPPER, one who steals human beings; a manstealer.

KIDNAPPING, the forcible abduction or stealing away of man, woman, or child, from their own country, and sending them into another. This crime was capital by the divine law: See Exodus xxi. 16. So likewise in the civil law, the offence of stealing men and children, which was called *plagium*, and the offenders *plagiarii*, was punished with death. This is unquestionably a very heinous crime, as it robs the king of his subjects, banishes a man from his country, and may in its consequences be productive of the

the most cruel and disagreeable hardships; and therefore the common law of England has punished it with fine, imprisonment, and pillory. And also the statute 11 and 12 W. III. c. 7, though principally intended against pirates, has a clause that extends to prevent the leaving such persons abroad as are thus kidnapped or spirited away; by enacting, that if any captain of a merchant-vessel shall (during his being abroad) force any person on shore, or wilfully leave him behind, or refuse to bring home all such men as he carried out, if able and desirous to return, he shall suffer three months imprisonment.

KIDNEY'S. See **ANATOMY**.

KIDNEY-BEAN. See **PHASEOLUS**.

KIDWELLY, a town of S. Wales, in Carmarthenshire, eight miles S. of Carmarthen, and 224 W. by N. of London. Lon. 4. 20. W. Lat. 56. 44. N.

KIEL, a strong, rich, and considerable town of Germany, capital of the duchy of Holstein, with a castle, and a university, founded in 1665. It stands upon a small peninsula in a bay of the Baltic, and has a very commodious harbour for ships of the largest size. Kiel is 37 miles N. W. of Lubec, and 46 N. of Hamburg. Lon. 10. 0. E. Lat. 54. 20. N.

KIGGELARIA, **BASTARD EUONYMUS**, in botany, a genus of the decandria order, and diœcia class of plants; natural order Columnifera. Male calyx: the corolla five-parted, five-petaled; antheræ perforated at top: female, calyx and corolla as in the male; glands five; styles five; capsule three-lobed, one-celled, five-valved, containing many seeds. It has but one species, a native of the Cape of Good Hope.

KILAN, or **GHILAN**, a very fertile province of Persia, bounded on the N. by those of Adirbeizan, and Schirvan; N. E. and E. by the Caspian, and the province of Mezanderan; S. by the Persian Irak, and W. by Curdistan, and Adirbeizan. It is 200 miles long from E. to W. and 150 broad. It produces olives, silk, rice, and fruit of all kinds, in great plenty.

KILBEGGAN, a borough-town of Ireland, in the county of W. Meath, 44 miles from Dublin.

KILDA, **Str.** one of the Western Islands of Scotland. It lies in the Atlantic, and is about three miles long from E. to W. and two broad from N. to S. The soil is better calculated for pasture than tillage. The natives prefer rearing sheep, and killing wild fowl, to the more toilsome business of husbandry.

KILDARE, a county of Ireland, in the province of Leinster, 37 miles long and 20 broad; bounded on the E. by Dublin and Wicklow.

KILDARE, the capital of the above county, is situated 28 miles S. W. of Dublin.

KILDERKIN, a liquid measure which contains two firkins.

KILKENNY, a county of Ireland, in the province of Leinster, bounded on the S. by that of Waterford, and N. by Queen's county.

KILKENNY, the capital of the above county, lies 37 miles S. W. of Dublin.

KILLALA, a sea-port of Ireland, in the county of Mayo, with a bishop's see, 21 miles north of Castlebar. Lon. 9. 11. W. Lat. 54. 15. N.

KILLALOE, a town and bishop's see in the county of Clare and province of Munster, in Ireland, 86 miles from Dublin, otherwise called Lounia. It was anciently written Kill-da-Lua, i. e. the church of Lua, from Lua, or Moluu, who about the beginning of the sixth century founded an abbey near this place.

KILLARNEY, a town of Ireland in Kerry, near Lough Leam, or the Lake of Killarney.

KILLARNEY, a beautiful lake of Ireland, in the county of Kerry, otherwise called Lough Leam, from its being surrounded by high mountains. It is divided into three parts, called the Lower, Middle, and Upper Lake. The northern, or lower lake, is six miles in length, and from three to four in breadth. On the side of one of the Mountains is O'Sullivan's Cascade, which falls into the lake with a roar that strikes the timid with awe. The view of this sheet of water is uncommonly fine, appearing as if it were descending from an arch of wood which overhangs it above 70 feet in height from the point of view. The islands are not so numerous in this as in the upper lake; but there is one of uncommon beauty, called Inisfallen, nearly opposite O'Sullivan's Cascade. The coast is formed into a variety of bays and promontories.

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KILLERIE'S HARBOUR, a bay on the W. coast of Ireland, between Mayo and Galway. Lon. 9. 46. W. Lat. 53. 38. N.

KILLEEVAN, a town of Ireland, in Monaghan, eight miles S. W. of Monaghan. Lon. 7. 26. W. Lat. 54. 10. N.

KILLICKRANKIE, a noted pass of Perthshire, formed by the lofty mountains impending over the Garrie, which rushes through in a deep, dark-ome, and horrid channel, beneath. In the last century this was a pass of much danger and difficulty; a path hanging over a tremendous precipice threatened the traveller with destruction upon the least false step. At present a fine road formed by the soldiery gives an easy access to the Highlands; and the two sides are joined by a fine arch. Near the N. end of this pass, in its open and unimproved state, was fought in 1659 the battle of Killickrankie, between the adherents of James II. under Viscount Dundee, and of William III. under General Mackay, in which Viscount Dundee was slain, and with him fell all the hopes of king James.

KILLONY, a town of Ireland in Sligo, eight miles S. of Sligo.

KILLILEAGH, or **KILLY-LEAGH**, a town of Ireland, in the county of Down, 80 miles from Dublin.

KILLLOUGH, or **PORT ST. ARNE**, a port of Ireland, in the county of Down. Lon. 5. 30. W. Lat. 54. 14. N.

KILLYBEGS, a borough of Ireland in the county of Donegal. Lon. 8. 6. W. Lat. 54. 40. N.

KILMAC-THOMAS, a town of Ireland in Waterford, 12 miles S. E. of Waterford. Lon. 7. 10. W. Lat. 52. 14. N.

KILMALLOCK, a town of Ireland, in the county of Limerick, 16 miles from Limerick, and 107 from Dublin.

KILMARNOCK, a populous and flourishing town of Scotland in Ayrshire, fifteen miles S. W. of Glasgow.

KILMORE, a bishop's see of Ireland, in the county of Cavan, three miles S. W. of Cavan.

KIMBOLTON, a town of Huntingdonshire. Lon. 0. 15. W. Lat. 52. 18. N.

KINBURN, a fort, of the Russian empire, at the mouth of the Dnieper, opposite Oczakow.

KINCARDINE, a town of Scotland in Perthshire, nine miles W. of Dunfermline, and 20 S. of Perth.

KINDRED, in law, persons related to one another, whereof the law reckons three degrees or lines, viz. the descending, ascending, and collateral line. See **CONSANGUINITY**, **DESCENT**, and **INHERITANCE**.

KINETON, or **KYNETON**, a town in Warwickshire, ten miles S. S. E. of Warwick, and 88 N. W. of London.

KING, [*konning* or *konnen*, Teut.] a potentate who rules singly and sovereignly over a people.—The Latin word *rex*, the Scythian *reix*, the Punic *resch*, the Spanish *rey*, and French *roy*, come all, according to Postel, from the Hebrew ראש *rosch*, chief, or head. Kings were not known amongst the Israelites till the reign of Saul, though Abimelech usurped a partial royalty over the Shechemites. Most of the Grecian states were governed at first by kings, who were chosen by the people to decide differences and execute a power which was limited by laws. They commanded armies, presided over the worship of the gods, &c. The royalty was generally hereditary: but if the vices of the heir to the crown were odious to the people, or if the oracle had so commanded, he was cut off from the right of succession; yet kings were supposed to hold their sovereignty by the appointment of Jupiter. The ensign of majesty was the sceptre, which was made of wood adorned with studs of gold, and ornamented at the top with some figure; commonly that of an eagle, the bird of Jove. Rome also was governed at first by kings, who were elected by the people, with the approbation of the senate and concurrence of the augurs. Their power extended to religion, the revenues, the army, and the administration of justice. The monarchy subsisted 244 years in Rome, under seven kings. Among the Greeks the king of Persia had anciently the appellation of the great king; the king of France had that of the most Christian king; and the king of Spain has that of Catholic king. The king of the Romans is a prince chosen by the emperor, as a coadjutor in the government of the empire. The kings of England, by the Lateran council, under Pope Julius II. had the title of Christianissimus conferred on them; and that of defender of the faith was added by pope Leo X. though it had been used by them some time before. The title of grace was first given to our kings about the time of Henry IV. and that of majesty first to Henry VIII. before which time our kings were called

called grace, highness, &c.—In all public instruments and letters, the king styles himself nos “we;” though till the time of king John he spoke in the singular number. In Great Britain, the power of the king is subject to great limitations; but they are the limitations of wisdom, and the sources of dignity; being so far from diminishing his honour, that they add a peculiar glory to his crown: for while other kings are absolute monarchs over innumerable multitudes of slaves, the king of Britain has the distinguished glory of governing a free people, the least of whom is protected by the laws: he has great prerogatives, and a boundless power in doing good; and is at the same time only restrained from acting inconsistently with his own happiness, and that of his people. To understand the royal rights and authority in Britain, we must consider the king under six distinct views. 1. With regard to his title. 2. His royal family. 3. His councils. 4. His duties. 5. His prerogative. 6. His revenue. I. his title. See HEREDITARY RIGHT, and SUCCESSION. II. His royal family. See ROYAL FAMILY. III. His councils. See COUNCIL. IV. His duties. By the British constitution, there are certain duties incumbent on the king; in consideration of which, his dignity and prerogative are established by the laws of the land: it being a maxim in the law, that protection and subjection are reciprocal. And these reciprocal duties are what Sir William Blackstone apprehends were meant by the convention in 1688, when they declared that king James had broken the original contract between king and people. But, however, as the terms of that original contract were in some measure disputed, being alleged to exist principally in theory, and to be only deducible by reason and the rules of natural law, in which deduction different understandings might very considerably differ; it was, after the revolution, judged proper to declare these duties expressly, and to reduce that contract to a plain certainty. So that, whatever doubts might be formerly raised by weak and scrupulous minds about the existence of such an original contract, they must now entirely cease; especially with regard to every prince who hath reigned since the year 1688. The principal duty of the king is, To govern his people according to law. *Nec regibus infinita aut libera potestas.* And this is not only consonant to the principles of nature, of liberty, of reason, and of society; but has always been esteemed an express part of the common law of England, even when prerogative was at the highest. “The king (saith Bracton, who wrote under Henry III.) ought not to be subject to man: but to God, and to the law: for the law maketh the king; for he is not truly king, where will and pleasure rules, and not the law.” And Fortescue lays it down as a principle, that “the king of England must rule his people according to the decrees of the laws thereof; inasmuch that he is bound by an oath at his coronation to the observance and keeping of his own laws.” But to obviate all doubts, it is expressly declared by statute 12 and 13 W. III. c. 1, “that the laws of England are the birthright of the people thereof; and all the kings and queens who shall ascend the throne of this realm ought to administer the government of the same according to the said laws, and all their officers and ministers ought to serve them respectively according to the same; and therefore all the other laws and statutes of this realm, for securing the established religion, and the rights and liberties of the people thereof, and all other laws and statutes of the same now in force, are by his majesty, by and with the advice and consent of the lords spiritual and temporal, and commons, and by authority of the same, ratified and confirmed accordingly. V. His prerogative. See PREROGATIVE. VI. His revenue. See REVENUE.

KING, CORONATION OATH OF THE BRITISH. The terms of the original contract between king and people are now couched in the coronation-oath, which by the stat. 1 W. and M. st. 1, c. 6, is to be administered to every king and queen who shall succeed to the imperial crown of these realms, by one of the archbishops or bishops of the realm, in the presence of all the people; who on their parts do reciprocally take the oath of allegiance to the crown. This coronation-oath is conceived in the following terms: “*The Abp. or Bp. shall say, Will you solemnly promise and swear to govern the people of this kingdom of Britain, and the dominions thereto belonging, according to the statutes in parliament agreed, and the laws and customs of the same?—The king or queen shall say, I solemnly promise so to do. Abp. or Bp. Will you to your power cause law and justice, in mercy, to be executed in all your judgements?—K. or Q. I will. Abp. or Bp. Will you to the*

utmost of your power maintain the laws of God, the true profession of the gospel, and the Protestant reformed religion established by the law? And will you preserve unto the bishops and clergy of this realm, and to the churches committed to their charge, all such rights and privileges as by the law do or shall appertain unto them, or any of them?—K. or Q. All this I promise to do. *After this the king or queen, laying his or her hand upon the holy gospel, shall say, The things which I have here before promised, I will perform and keep; so help me God. And then shall kiss the book.*” This is the form of the coronation-oath, as it is now prescribed by our laws. In the king’s part of this contract are expressed all the duties which a monarch can owe to his people, viz. to govern according to law; to execute judgement in mercy; and to maintain the established religion. And with respect to the latter of these three branches, by the act of Union, 5 Ann. c. 8, two preceding statutes are recited and confirmed; the one of the parliament of Scotland, the other of the parliament of England: which enact; the former that every king at his accession shall take and subscribe an oath, to preserve the Protestant religion, and presbyterian church government in Scotland; the latter, that at his coronation he shall take and subscribe a similar oath, to preserve the settlement of the church of England within England, Ireland, Wales, and Berwick, and the territories thereunto belonging.

KING, INFLUENCE OF THE BRITISH. Having in the preceding sections chalked out all the principal outlines of this vast title of the law, the supreme executive magistrate, or the king’s majesty, considered in his several capacities and points of view; it may not be improper to take a short comparative review of the power of the executive magistrate, or prerogative of the crown, as it stood in former days, and as it stands at present. And we cannot but observe, that most of the laws for ascertaining, limiting, and restraining, this prerogative, have been made within little more than a century past; from the petition of right in 3 Car. I. to the present time. So that the powers of the crown are now to all appearance greatly curtailed and diminished since the reign of king James I. particularly by the abolition of the star-chamber and high-commission courts in the reign of Charles I. and by the disclaiming of martial law, and the power of levying taxes on the subject, by the same prince: by the disuse of forest-laws for a century past; and by the many excellent provisions enacted under Charles II. especially the abolition of military tenures, purveyance, and pre-emption; the habeas corpus act; and the act to prevent the discontinuance of parliaments for above three years; and since the revolution, by the strong and emphatical words in which our liberties are asserted in the bill of rights, and act of settlement; by the act for triennial, since turned into septennial, elections; by the exclusion of certain officers from the house of commons; by rendering the seats of the judges permanent, and their salaries independent; and by restraining the king’s pardon from obstructing parliamentary impeachments. Besides all this, if we consider how the crown is impoverished and stripped of all its ancient revenues, so that it greatly depends on the liberality of parliament for its necessary support and maintenance, we may perhaps be led to think that the balance is inclined pretty strongly to the popular scale, and that the executive magistrate has neither independence nor power enough left, to form that check upon the lords and commons which the founders of our constitution intended. But, on the other hand, it is to be considered, that every prince, in the first parliament after his accession, has by long usage a truly royal addition to his hereditary revenue settled upon him for his life; and has never any occasion to apply to parliament for supplies, but upon some public necessity of the whole realm. This restores to him that constitutional independence, which at his first accession seems to be wanting. And then with regard to power we may find perhaps that the hands of government are sufficiently strengthened; and that a British monarch is now in no danger of being overborn by either the nobility or the people. The instruments of power are not perhaps so open and avowed as they formerly were, and therefore are the less liable to jealous and invidious reflections; but they are not the weaker upon that account. In short, our national debt and taxes (besides the inconveniences before mentioned,) have also in their natural consequences thrown such a weight of power into the executive scale of government, as we cannot think was intended by our patriotic ancestors; who gloriously struggled for the abolition of the then formidable parts of the

prerogative, and by an unaccountable want of foresight established this system in their stead. The entire collection and management of so vast a revenue, being placed in the hands of the crown, have given rise to such a number of new officers, created by, and removable at, the royal pleasure, that they have extended the influence of government to every corner of the nation. Witness the commissioners, and the multitude of dependents on the customs, in every port of the kingdom; the commissioners of excise, and their numerous subalterns, in every inland district; the postmasters and their servants, planted in every town, and upon every public road; the commissioners of the stamps, and their distributors, which are fully as scattered, and fully as numerous; the officers of the salt duty, which, though a species of excise, and conducted in the same manner, are yet made a distinct corps from the ordinary managers of that revenue; the surveyors of houses and windows; the receivers of the land-tax; the managers of lotteries; and the commissioners of hackney-coaches; all which are either mediately or immediately appointed by the crown, and removable at pleasure without any reason assigned; these must give that power, on which they depend for subsistence, an influence most amazingly extensive. To this may be added the frequent opportunities of conferring particular obligations, by preference in loans, subscriptions, tickets, remittances, and other money-transactions, which will greatly increase this influence; and that over those persons whose attachment, on account of their wealth, is frequently the most desirable. All this is the natural, though perhaps the unforeseen consequence of erecting our funds of credit, and, to support them, establishing our perpetual taxes; the whole of which is entirely new since the restoration in 1660; and by far the greatest part since the revolution in 1688. And the same may be said with regard to the officers in our numerous army, and the places which the army has created. All which put together give the executive power so persuasive an energy with respect to the persons themselves, and so prevailing an interest with their friends and families, as will amply make amends for the loss of external prerogative.

KING, POWER OF THE BRITISH. Though this profusion of offices should have no effect on individuals, there is still another newly acquired branch of power; and that is, not the influence only, but the force of a disciplined army; paid indeed ultimately by the people, but immediately by the crown; raised by the crown, officered by the crown, commanded by the crown. They are kept on foot, it is true, only from year to year, and that by the power of parliament: but during that year, they must by the nature of our constitution, if raised at all, be at the absolute disposal of the crown. And there need but few words to demonstrate how great a trust is thereby reposed in the prince by the people: a trust that is more than equivalent to a thousand little troublesome prerogatives. Add to all this, that besides the civil list, the immense revenue of almost seven millions sterling, which is annually paid to the creditors of the public, or carried to the sinking fund, is first deposited in the royal exchequer, and thence issued out to the respective offices of payment. This revenue the people can never refuse to raise, because it is made perpetual by act of parliament; which also, when well considered, will appear to be a trust, therefore, of great delicacy and high importance. Upon the whole, it seems clear, that whatever may have become of the nominal, the real power of the crown has not been too far weakened by any transactions of the 17th century. Much is indeed given up; but much is also acquired. The stern commands of prerogative have yielded to the milder voice of influence: the slavish and exploded doctrine of non-resistance has given way to military establishment by law; and to the disuse of parliament has succeeded a parliamentary trust of an immense perpetual revenue. When, indeed, by the free operation of the sinking fund, our national debts shall be lessened; when the posture of foreign affairs, and the universal introduction of a well-planned and national militia, will suffer our formidable army to be thinned and regulated; and when (in consequence of all) our taxes shall be gradually reduced; this adventitious power of the crown will slowly and imperceptibly diminish, as it slowly and imperceptibly rose. But till that shall happen, it will be our duty, as good subjects, to reverence the crown, and yet guard against corrupt and servile influences from those who are entrusted with its authority; to be loyal, yet free; obedient, and yet independent.

KING AT ARMS, or OF ARMS, an officer of great antiquity, and anciently of great authority, whose business it is to direct the heralds, preside at their chapters, and have the jurisdiction of armouery. In England there are three kings of arms, viz. **GARTER**, **CLARENCEUX**, and **NORROY**. See these articles. These two last are also called provincial heralds, as they divide the kingdom between them into provinces. They have power to visit noblemen's families, to set down their pedigrees, distinguish their arms, appoint persons their arms, and with garter direct the other heralds. Anciently the kings at arms were created and crowned by the kings of England themselves; but of late, the earl-marshal has a special commission at every creation to personate the king.

KING, SIR PETER, lord high chancellor of England, and nephew of the great John Locke, was born at Exeter, in 1669. His father was a grocer in that city, and intended to breed him up to the same business; but his passion for learning soon appearing, he was allowed to follow his inclination. In this he was also encouraged by his uncle, who left him half of his valuable library. By his advice, he went to Leyden, and on his return, studied the law at the Inner Temple. But he did not neglect other studies; for in 1691, he published anonymously, "An Inquiry into the Constitution, Discipline, Unity, and Worship, of the Primitive Church within the first 300 Years after Christ." Lond. 1691, 8vo. He afterwards published a second part of this work; which gave rise to a controversy with Mr. Elys. In 1669, he was elected member of parliament for Beer-Alston; which he represented in seven successive parliaments. In 1702, he published his "History of the Apostles' Creed," a work of great merit and learning. In 1708, he was chosen recorder of London, and knighted. In 1709, he was appointed one of the managers of Dr. Sacheverel's trial. In 1714, on the accession of king George I. he was made lord chief justice of the common pleas: in 1725, created a peer, by the title of Lord King, baron Ockham, &c. and on the 1st of June, appointed lord chancellor. He resigned the seals in 1733, and died in 1734, leaving four sons and two daughters.

KING, WILLIAM, D. D. Archbishop of Dublin in the 18th century, was descended from an ancient family in the north of Scotland, but born in the county of Antrim in Ireland. In 1674, he went into orders. In 1679, he was promoted by Dr. Parker, archbishop of Dublin, to the chancellorship of St. Patrick. In 1687, Peter Manby, dean of Londonderry, having published at London, in 4to. a pamphlet entitled "Considerations which obliged Peter Manby to embrace the Catholic Religion," Dr. King immediately wrote an answer. Mr. Manby published a reply, entitled "A reformed Catholicism, &c. in reply to Mr. King's Answer, &c." Dr. King rejoined in "A Vindication of the Answer." In 1689, he was twice confined in the tower by order of king James II. and the same year commenced D. D. In 1690, upon king James's retreat after the battle of the Boyne, he was advanced to the see of Derry. In 1692, he published at London in 4to. "The State of the Protestants of Ireland under the late King James's Government, &c." In 1702, he published at Dublin, in 4to. his celebrated treatise "De Origine Mali." Edmund Law, M. A. fellow of Christ's College, Cambridge, published an enlarged edition of this work in English, with notes. He died in 1720.

KING, in geography, three cities of China; viz. 1. of the first rank, in the province of Quangsi, 1037 miles S. S. W. of Peking; 2. of the second rank, in Pe-tche-li, 130 miles S. of Peking; and, 3. of the third rank, in Kiang-nan, 20 miles S. W. of Ning-koue.

KI-NGAN, a city of China, of the first rank, in the province of Kiang-si, on the Kan: 795 miles S. of Peking.

KINGDOMS, in natural history. Most naturalists and chemists divide all natural bodies into three great classes, which they call kingdoms. These are the mineral, the vegetable, and the animal kingdoms. This great and first division is founded on this consideration, that any plant or vegetable which is produced, which grows, which is organized, which contains a seed, and which produces its like, seems to be a being very distinct and different from a stone or a metal, in which we at most observe only a regular arrangement of parts, but not a true organization, and which contains no seed by which it is capable of reproduction;

tion; and another foundation of this division is, that an animal differs no less from a simple plant, by sensation, by the use of its senses, and by the power of voluntary motion which it possesses, while these qualities do not belong to any thing which is merely vegetable.

KING GEORGE, a fort in East Florida.

KING GEORGE, a populous county of Virginia, 22 miles long and 14 broad, bounded on the E. and N. by the Patowmac, which divides it from the state of Maryland.

KING GEORGE'S ISLANDS, two islands in the South Pacific Ocean, discovered by Com. Byron in 1763. Lon. 149. 15. W. Lat. 14. 41. N.

KING GEORGE THE THIRD'S ISLAND, the name given by Capt. Cook to Otaheite.

KINGHORN, a royal borough of Scotland in Fifeshire, on the Frith of Forth, directly opposite to Leith.

KINGS, BOOKS OF THE, two canonical books of the Old Testament, containing the history of the kings of Israel and Judah from the beginning of the reign of Solomon down to the Babylonish captivity, for the space of near 600 years. It is generally supposed, and seems very probable, that these books were composed by Ezra, who extracted them out of the public records.

KING'S COUNTY, a county of Ireland, in the province of Leinster, so named from King Philip of Spain, husband to Queen Mary II. It is bounded on the N. by West Meath, and on the E. by Kildare. The chief town is Philipstown.

KING'S COUNTY, a fertile and well cultivated county of New York, on the W. end of Long Island.

KING'S COUNTY, a county of Nova Scotia, comprehending the lands on the S. W. and S. sides of the Basin of Minas.

KING'S EVIL. See MEDICINE.

KING'S FERRY, in Kent, the common way from the main land into the isle of Sheppey; where a cable of about 140 fathoms in length, fastened at each end across the water, serves to get the boat over by hand.

KINGSTON, a town of Jamaica, seated on the N. side of the bay of Port Royal. It was founded in 1693, when the repeated desolations by earthquakes and fires had driven the inhabitants from Port Royal. Lon. 76. 32. W. Lat. 17. 40. N.

KINGSTON, or **ESOPUS**, a town of New York, in Ulster county, on the W. bank of Hudson's river, 6 miles W. of Rhinebeck.

KINGSTON-UPON-HULL, a town in the East Riding of Yorkshire, 173 miles from London, more commonly called Hull. It is situated at the conflux of the Hull and the Humber, near the place where the latter opens into the German Ocean. This town has not only the most considerable inland traffic of any port in the North of England, but a foreign trade superior to any in the kingdom, excepting the ports of London, Bristol, Liverpool, and Yarmouth. By means of the many large rivers that fall into the Humber, it trades to almost every part of Yorkshire, as well as to Lincolnshire, Nottinghamshire, Staffordshire, Derbyshire, and Cheshire.

KINGSTON-UPON-THAMES, a corporate town of Surrey, 12 miles S. W. of London. Lon. 0. 12. W. Lat. 51. 27. N.

KING TE TCHING, a famous village belonging to the district of Jao-teheou, a city of China in the province of Kiang-si. This village, in which are collected the best workmen in porcelain, is as populous as the largest cities of China. It is reckoned to contain a million of inhabitants, who consume every day more than ten thousand loads of rice.

KINO, in the materia medica, a gum resin. This drug was first recommended to the attention of medical practitioners by Dr. Fothergill, as being a very useful vegetable astringent; and in the hands of other practitioners it has been so far found to answer the character he gave of it, that it is now in very common use.

KINROSS, a populous town of Scotland, capital of the county of Kinross, 24 miles N. of Edinburgh, and 15 S. of Perth.

KINROSS-SHIRE, a small county of Scotland, bounded on the N. E. E. and S. by that of Fife; and on the W. and N. by Perthshire. It is almost circular, and about 30 miles in circumference.

KINSALE, a town of Ireland, in the county of Cork, situated at the mouth of the Bandon, 136 miles from Dublin.

KINTORE, a royal borough in Aberdeenshire, seated on the Don. Lon. 2. 5. W. Lat. 57. 38. N.

KINTYRE, or **CANTYRE**, [from *Cantiërre*, i. e. a headland,] the S. division of Argyllshire. It is a peninsula, stretching 37 miles from N. to S. and 7 in breadth. It is mostly plain, arable, and populous.

KIN-YANG, a city of China of the first rank, in the province of Chen-si, strongly fortified, as a barrier against the Tartars: 450 miles S. W. of Peking.

KIOF, or **KLOW**, a government of the Russian empire, being part of the Ukraine, or Little Russia. It lies on the E. side of the Dnieper, although Kiof, the capital, is on the W. side. This government contains eleven districts; and its principal rivers are the Dnieper, Desna, Oster, Udai, Sula, Psol, and Trubesh.

Kior, or **Kiow**, a considerable town of Russia. Lon. 31. 51. E. Lat. 50. 12. N.

KIPPIS, **ANDREW**, D. D. F. R. S. and F. S. A. an English biographer and divine, born at Nottingham, and educated under Dr. Doddridge at Northampton. He first settled as a minister at Bolton, Lincolnshire, in 1746; thence removed to Dorking, Surrey, in 1750; and in 1753, to a congregation in Prince's Street, Westminster. He afterwards wrote in the *Monthly Review*, and in another periodical work called *The Library*, in 1761. In 1763 he was chosen philological tutor to the Academy for educating dissenting ministers. In 1773, he published "A Vindication of the Protestant Dissenting Ministers with regard to their late application to Parliament, which occasioned an amicable controversy with dean Tucker. In 1777 he became editor of a new edition of the *Biographia Britannica*." Five volumes were published during his life, and the greater part of the sixth prepared before he died. In 1788 he published the "Life of Capt. Cook," in one volume quarto, and a "Life of Dr. Lardner," prefixed to his works. He also wrote the "History of Knowledge, Learning, and Taste, in Great Britain," contained in the *New Annual Register*; with various other tracts, sermons, &c. The university of Edinburgh presented him with the degree of D. D. His style is pure. He died at Westminster in 1795.

KIRCHBERG, a town of France, in the department of the Rhine and Moselle, and late county of Sponheim, 41 miles W. of Mentz.

KIRCHEIM, or **KIRCHEIM POLAND**, a town of France, in the department of Mont Tonnere, and late principality of Weikburg, 16 miles W. of Worms.

KIRCHER, **ATHANASIVS**, a famous philosopher and mathematician, born at Fulde in 1601. In 1618 he entered into the society of the Jesuits, and taught philosophy, mathematics, the Hebrew and Syriac languages, in the university of Wirtzburg, with great applause, till 1631. He went to France on account of the ravages committed by the Swedes in Franconia, and lived some time at Avignon. He was afterwards called to Rome, where he taught mathematics in the Roman college, collected a rich cabinet of machines and antiquities, and died in 1680. The quantity of his works is immense, amounting to twenty-two volumes folio, eleven in quarto, and three in octavo; enough to employ a man for a great part of his life even to transcribe them. Most of them are rather curious than useful; but they display uncommon genius and deep erudition. The principal are, 1. *Praelusiones Magneticae*. 2. *Primitivae Gnomonicae Catoptricae*. 3. *Ars Magna Lucis et Umbrae*. 4. *Musurgia Universalis*. 5. *Obeliscus Pamphilus*. 6. *Oedipus Aegyptiacus*, four volumes folio. 7. *Itinerarium Extaticum*. 8. *Obeliscus Aegyptiacus*, in four volumes, folio. 9. *Mundus Subterraneus*. 10. *China Illustrata*.

KIRKALDY, a royal burgh of Scotland, in Fifeshire. Lon. 3. 0. W. Lat. 56. 8. N.

KIRKBY LONSDALE, a town of Westmoreland, 253 miles from London.

KIRKCUDBRIGHT, a county of Scotland, which makes a considerable part of Galloway, of which the earls of Nithsdale were hereditary stewards.

KIRKCUDBRIGHT, a royal burgh in the above county, 101 miles S. W. from Edinburgh.

KIRKINTILLOCH, a town of Scotland, in Dumbartonshire, 7 miles N. N. E. of Glasgow.

KIRKOSWALD, a town of England, in Cumberland, seated on a hill near the Eden; 292 miles N. W. of London.

KIRKWALL, a borough capital of Parnona, 30 miles N. E. of Thurso.

KISSING,

KISSING, by way of salutation, or as a token of respect, has been practised in all nations. The Roman emperors saluted their chief officers by a kiss. Kissing the mouth or the eyes was the usual compliment upon any promotion or happy event. Soldiers kissed the general's hand when he quitted his office. Among the Romans, near relations were allowed to kiss their female kindred on the mouth: but this was done to discover if they smelt of wine; because the Roman ladies sometimes made too free with the juice of the grape. Slaves kissed their master's hand, who used to hold it out to them for that purpose. Kissing was a customary mode of salutation amongst the Jews, as we may collect from Judas approaching his Master with a kiss. Relations used to kiss their kindred when dying, and when dead; when dying, out of a strange opinion that they should imbibe the departing soul; and when dead, by way of valedictory ceremony. They even kissed the corpse after it was conveyed to the pile, when it had been seven or eight days dead.

KISSINGEN, a town of Franconia, in the bishopric of Wurzburg, near some medicinal springs, 9 miles N. W. of Schweinfurt.

KISTI, an Asiatic nation, whose territories extend from the highest ridge of Caucasus, along the Sundsia rivulets. According to Major Rennel, they are bounded on the W. by the little Cabarda, on the E. by the Tartars and Lesguis, and on the S. by the Lesguis and Georgians.

KISTNA, or **KISTNAGH**, a river of Hindostan, which rises in the mountain of Visapour, on the E. side of the Gauts, 20 miles from Sattara; and crossing almost the whole of Hindostan, from W. to E. forms the boundary of the Deccan, and falls into the Bay of Bengal.

KISTNAGHERI, a town and fort of Hindostan, in the Mysore, 54 miles S. E. of Bangalore.

KIT, in music, a small violin of such form and dimension as to be capable of being carried in a case or sheath in the pocket.

KITCHEN, [*kegin*, Welsh; *keg*, Flemish; *kyshen*, Erse,] the room in a house where the provisions are cooked.

KITCHEN, ARMY, is a space of about sixteen or eighteen feet diameter, with a ditch surrounding it three feet wide; the opposite bank of which serves as a seat for the men who dress the victuals. The kitchens of the flank-companies are contiguous to the outline of the camp; and the intermediate space is generally distributed equally for the remaining kitchens. As each tent forms a mess, each kitchen must have as many fire-places as there are tents in the company.

KITCHEN-GARDEN. See **GARDENING**.

KITE, in ornithology. See **FALCO**.

KITS, ST. or ST. CHRISTOPHER'S, one of the Caribbee islands, in America, lying N. W. of Nevis, and about 60 miles W. of Antigua. The produce is chiefly sugar, cotton, ginger, indigo, and the tropical fruits. Lon. 62. 32. W. Lat. 17. 30. N.

KLEINHOVIA, in botany, a genus of the decandria order, and gynandria class of plants; natural order, Columniferae. Calyx pentaphyllous; petals five; nectarium campanulate, pedunculate, containing the stamina; capsule inflated, five-seeded. It has but one species, a native of Java.

KLUSSBORECK, or **CREUTZBERG**, a fortified town of Silesia, in Brieg, with a castle, 26 miles N. E. of Grottgaw, and 28 of Brieg.

KNAPSACK, [from *knappen*, to eat,] the bag which a soldier carries on his back; a bag of provisions. Knapsacks are most convenient square, and should be made with a division to hold the shoes, black-ball, and brushes, separate from the linen. White goat-skins are the best.

KNAPWEED. See **CENTAUREA**.

KNARESBOROUGH, a town of Yorkshire, in the West Riding, 18 miles W. by N. of York. Lon. 1. 26. W. Lat. 54. 5. N.

KNAUTIA, in botany, a genus of the monogynia order, and tetrandria class of plants; natural order, Aggregate. Common calyx oblong, simple, quinqueflorous; proper one, simple, superior; the florets irregular; receptacle naked. It has four species, chiefly natives of the Levant.

KNEE, in anatomy, the articulation of the thigh and leg-bones. See **ANATOMY**.

KNEE, in ship-building, is a crooked piece of timber, having two branches or arms used to connect the beams of a ship with her sides. The branches of the knees form an angle of greater or

smaller extent, according to the mutual situation of the pieces which they are designed to unite. One branch is securely bolted to one of the deck-beams, whilst the other is in the same manner attached to a corresponding timber in the ship's side. Besides the great utility of knees in connecting the beams into one compact frame, they contribute greatly to the strength and solidity of the ship, in the different parts of her frame to which they are bolted; and thereby enable her with greater firmness to resist the effects of a turbulent sea.

KNEES, **CARLING**, in a ship, those timbers which extend from the ship to the hatch-way, and bear up the deck on both sides.

KNEE-PAN. See **ANATOMY**.

KNIGHT, [*equus*, Lat.] among the ancient Romans, was a person of the second degree of nobility, following immediately that of the senators. See **EQUESTRIAN ORDER**, and **EQUITES**.

KNIGHT, in feudal history, was originally a title given by the ancient Germans to their youth after being admitted to the privilege of bearing arms. The passion for arms among the Germanic states, says Dr. Stuart, (in his View of Society in Europe,) was carried to extremity. It was amidst scenes of death and peril that the youth were educated: it was by feats of prowess that the ambitious signalized their manhood. But, among these nations, when the individual felt the call of valour, and wished to try his strength against an enemy, he could not of his own authority take the lance and the javelin. A form was invented by which they were advanced to that honour. If the candidate was deemed worthy of being admitted to the privileges of a soldier, by the council of the district to which he belonged, a chieftain, his father, or one of his kindred, adorned him with a shield and lance. To this ceremony, so simple and so interesting, the institution of knighthood is indebted for its rise. See **KNIGHTHOOD**.

KNIGHT-MARSHAL, an officer in the king's household, who has jurisdiction and cognizance of any transgression within the king's household and verge; as also the contracts made there, whereof one of the house is party.

KNIGHTS OF THE SHIRE, or **KNIGHTS OF PARLIAMENT**, are two gentlemen of worth, chosen on the king's writ in pleno comitatu, by such of the freeholders of every county as can expend 40s. per annum, to represent such county in parliament. These, when every man who held a knights fee in capite of the crown was customarily constrained to be a knight, were of necessity to be milites gladio cincti, for so the writ runs to this day; but now custom admits esquires to be chosen to this office. They must have at least 500l. per annum; and their expences are to be defrayed by the county, though this be seldom now required.

KNIGHTS OF WINDSOR, or **KNIGHTS OF THE CHAPEL**, were instituted by Henry VIII. in his testament. Their number was at first thirteen, but has been since augmented to twenty-eight. They assist in the funeral-services of the kings of England; they are subject to the office of the canons of Windsor, and live on pensions assigned them by the order of the garter. They bear a blue or red cloak, with the arms of St. George on the left shoulder.

KNIGHTS, in a ship, two short thick pieces of wood, commonly carved like a man's head, having four shivers in each, three for the halyards, and one for the top to run in; one of them stands fast bolted on the beams abaft the foremast, and is therefore called the fore-knights: and the other, standing abaft the main-mast, is called the main-knight.

KNIGHT-ERRANDRY. During the prevalence of chivalry, the ardour of redressing wrongs seized many knights so powerfully, that, attended by esquires, they wandered about in search of objects, whose misfortunes and misery required their assistance and succour. And as ladies engaged more particularly their attention, the relief of unfortunate damsels was the achievement they most courted. This was the rise of knights-errant, whose adventures produced romance. These were originally told as they happened. But the love of the marvellous interfered; fancy was indulged in her wildest exaggerations; and poetry gave her charms to the most monstrous fictions.

KNIGHTHOOD, a military order of honour; a mark or degree of ancient nobility, or the reward of personal virtue and merit. There are four kinds of knighthood; military, regular, honorary, and social.

1. **KNIGHTHOOD, HONORARY**, is that which princes confer on other princes, and even on their own great ministers and favourites;

ites; such are knights of the Garter, Bath, St. Patrick, Nova Scotia, Thistle, &c. See these articles.

2. **KNIGHTHOOD, MILITARY**, is that of the ancient knights, who acquired it by high feats of arms. They are called milites, in ancient charters and titles, by which they were distinguished from mere bachelors, &c. These knights were girt with a sword, and a pair of gilt spurs; whence they were called equites aurati. Knighthood is not hereditary, but acquired. It does not come into the world with a man like nobility; nor can it be revoked. The sons of kings, and kings themselves, with all other sovereigns, heretofore had knighthood conferred on them as a mark of honour. They were usually knighted at their baptism or marriage, at their coronation, before or after a battle, &c.

3. **KNIGHTHOOD, REGULAR**, is applied to all military orders which profess to wear some particular habit, to bear arms against the infidels, to succour and assist pilgrims in their passage to the Holy Land, and to serve in hospitals where they should be received; such were the knights templars, and such still are the knights of Malta, &c.

4. **KNIGHTHOOD, SOCIAL**, is that which is not fixed nor confirmed by any formal institution, nor regulated by any lasting statutes; of which kind there have been many orders erected on occasion of factions, or tilts and tournaments, masquerades, and the like. Knighthood as a system, known under the denomination of Chivalry, is to be dated only from the 11th century. All Europe being reduced to a state of anarchy on the decline of the Charlemagne, every proprietor of a manor became a petty sovereign; the mansion-house was fortified by a moat, defended by a guard, and called a castle. The professor had a party of 700 or 800 men at his command; and with these he used frequently to make excursions, which commonly ended in a battle with the lord of some petty state of the same kind, whose castle was then pillaged, and the women and treasures carried off by the conqueror. During this state of universal hostility, there was no friendly communication between the provinces, nor any high roads from one part of the kingdom to another: the wealthy traders, who then travelled from place to place with their merchandise and their families, were in perpetual danger; the lord of almost every castle extorted something from them on the road; and at last, some one, more rapacious than the rest, seized upon the whole cargo, and carried off the women for his own use. Thus castles became the warehouses of all kinds of rich merchandise, and the prisons of the distressed females whose fathers or lovers had been plundered or slain, and who being therefore seldom disposed to take the robber or murderer into favour, were in continual danger of a rape. At length many lords associated to repress these sallies of violence and rapine, to secure property, and protect the ladies. Among these were many proprietors of great fiefs; and the association was at length strengthened by a solemn vow, and received the sanction of a religious ceremony. As the first knights were men of the highest rank, and the largest possessions, admission into the order was deemed the highest honour; many extraordinary qualifications were required in a candidate, and many new ceremonies were added at his creation. After having fasted from sun-rise, confessed himself, and received the sacrament, he was dressed in a white tunic, and placed by himself at a side-table, where he was neither to speak, to smile, nor to eat; while the knights and ladies, who were to perform the principal parts of the ceremony, were eating, drinking, and making merry at the great table. At night his armour was conveyed to the church where the ceremony was performed; and here having watched it till the morning, he advanced with his sword hanging about his neck, and received the benediction of the priest. He then kneeled down before the lady who was to put on his armour, who being assisted by persons of the first rank, buckled on his spurs, put an helmet on his head, and accoutred him with a coat of mail, a cuirass, bracelets, cuisses, and gauntlets. Being thus armed cap-a-pee, the knight who dubbed him struck him three times over the shoulder with the flat side of his sword, in the name of God, St. Michael, and St. George. He was then obliged to watch all night in all his armour, with his sword girded, and his lance in his hand. From this time the knight devoted himself to the redress of those wrongs which "patient merit of the unworthy takes;" to secure merchants from the rapacious cruelty of banditti, and women from

ravishers, to whose power they were, by the particular confusion of the times, continually exposed. The principal lords who entered into the confraternity of knights, used to send their sons to each other at seven years of age, to be educated, far from their parents, in the mystery of chivalry. These youths, at fourteen were made squires, and at twenty-one were qualified to receive the order of Knighthood. Thus highly honourable was the origin of an institution, commonly considered as the result of caprice, and the source of extravagance; but which, on the contrary, rose naturally from the state of society in those times, and had a very serious effect in refining the manners of the European nations. Valour, humanity, courtesy, justice, honour, were its characteristics: and to these were added religion; which, by infusing a large portion of enthusiastic zeal, carried them all to a romantic excess, wonderfully suited to the genius of the age, and productive of the greatest and most permanent effects both upon policy and manners. It gave variety, elegance, and pleasure, to the intercourse of life, by making woman a more essential part of society; and is therefore entitled to our gratitude; though the point of honour, and the refinements in gallantry, its more doubtful effects, should be excluded from the improvement of modern manners. Chivalry flourished most during the time of the croisades. These gave rise to new orders of knighthood; hence the knights of the Holy Sepulchre, the Hospitaliers, Templars, and an extravagant number of religious orders. Various other orders were at length instituted by sovereign princes: the Garter, by Edward III. of England; the Golden Fleece, by Philip the Good, duke of Burgundy; and St. Michael, by Lewis XI. of France. From this time ancient chivalry declined to an empty name; when sovereign princes established regular companies in their armies knights bannerets were no more, though it was still thought an honour to be dubbed by a great prince or victorious hero; and all who professed arms without knighthood assumed the title of esquire. There is scarcely a prince in Europe who has not instituted an order of knighthood: and the simple title of knight, which the kings of Britain confer on private subjects, is a derivation from ancient chivalry, although very remote from its source. Justiniani, at the beginning of his "History of Knighthood," gives a complete catalogue of the several orders; according to his computation, they are in number 92. Favin, Menenius, Mendo, Belot, Geliot, Menestrier, Micheli, and also Miraus, have wrote on the subject. But Justinian's "Historie Chronologique dell' Origine degl Ordine Militari," is esteemed the most complete work. The best edition is that of Venice, 1692, in two vols. folio.

KNIGHTON, a town of South Wales, in Radnorshire. Lon. 2. 46. W. Lat. 52. 13. N.

KNIGHT-SERVICE, [*servitium militare*, and in old French law, *chivalry*,] a species of tenure, for the origin and nature of which see FEODAL SYSTEM.

KNOT, a part of a tree from which shoot out the branches, roots, &c. The use of the knots, is to strengthen the stem; they serve also as sences, to filtrate, purify, and refine, the juices raised up for the nourishment of the plant.

KNOT, in ornithology. See TRINGA.

KNOTS OF A ROPE, among seamen, are distinguished into three kinds, viz. whole knot, that made so with the lays of a rope that it cannot slip, serving for sheets, tacks, and stoppers: bow-line knot, that so firmly made and fastened to the cringles of the sails, that they must break or the sail split before it slips: and the sheep-shank knot, that made by shortening a rope without cutting it, which may be presently loosened, and the rope not the worse for it.

KNOTS OF THE LOG-LINE, at sea, are the divisions of it. See LOG.

KNOT-GRASS. See POLYGONUM.

KNOTTESFORD, a town of Cheshire, near the Mersey, 184 miles from London.

KNOTTINGLEY, a town in the West Riding of Yorkshire, near Ferrybridge, noted for lime.

KNOUT, a punishment inflicted in Russia, with a kind of whip called knout, and made of a long strap of leather prepared for this purpose. With this whip the executioners dexterously carry off a slip of skin from the neck or the bottom of the back laid bare to the waist, and repeating their blows, in a little while rend away all the skin off the back in parallel strips. In the common

knout

knout the criminal receives the lashes suspended on the back of one of the executioners; but in the great knout, which is generally used on the same occasions as racking on the wheel was in France, the criminal is raised into the air by means of a pulley fixed to the gallows, and a cord fastened to the two wrists tied together; a piece of wood is placed between his two legs also tied together; and another of a crucial form under his breast.

KNOWLEDGE, is defined by Mr. Locke to be "the perception of the connection and agreement or disagreement and repugnancy of our ideas." See **METAPHYSICS**, and **LOGIC**.

KNOX, JOHN, the hero of the reformation in Scotland, was born in 1505, at Gifford, near Haddington. He was educated at the university of St. Andrew's, where he took the degree of A. M. and commenced teacher very early in life. At this time the new religion of Martin Luther was but little known in Scotland; Mr. Knox therefore at first was a zealous Roman Catholic; but attending the sermons of a black friar, named Guillian, he began to waver in his opinions; and afterwards conversing with the famous Wishart, who in 1544 came to Scotland with the commissioners sent by Henry VIII. he renounced the Romish religion, and became a zealous reformer. Being appointed tutor to the sons of the lairds of Ormiston and Lang Niddery, he began to instruct them in the principles of the Protestant religion; and on that account was so violently persecuted by the bishop of St. Andrew's, that with his two pupils he was obliged, in 1547, to take shelter in the castle of that place. But the castle was besieged and taken by twenty-one French galleys. He continued a prisoner on board a galley two years, till the end of 1549; when being set at liberty, he landed in England, and having obtained a licence, was appointed preacher, first at Berwick, and afterwards at Newcastle. Strype conjectures that in 1552 he was appointed chaplain to Edward VI. He certainly obtained an annual pension of 40l. and was offered the living of All-hallows in London; which he refused, not choosing to conform to the liturgy. Soon after the accession of Queen Mary I. he retired to Geneva; whence he removed to Frankfort, where he preached to the exiles; but a difference arising, on account of his refusing to read the English liturgy, he went back to Geneva; and thence in 1555 returned to Scotland, where the reformation had made considerable progress during his absence. He now travelled from place to place, preaching and exhorting the people with unremitting zeal and resolution. About this time he wrote a letter to the queen regent, earnestly intreating her to hear the Protestant doctrine, which she treated with contempt. In 1556, he was invited by the English Calvinists at Geneva to reside among them. He accepted their invitation. Immediately after his departure from Scotland, the bishop summoned him, and he not appearing, condemned him to death for heresy, and burnt his effigy at the cross of Edinburgh. He continued abroad till 1559, during which time he published his "First Blast against the monstrous Regiment of Women." Being now returned to Scotland, he resumed the great work of reformation with his usual ardour, and was appointed minister at Edinburgh. In 1561 Queen Mary arrived from France, and being bigotted to the religion in which she had been educated, was exposed to continual insults from her reformed subjects. Mr. Knox himself frequently insulted her from the pulpit; and when admitted to her presence, regardless of her sex, and her high rank, behaved to her with the most unjustifiable freedom. In 1571, he was obliged to leave Edinburgh, on account of the confusion and danger from the opposition to the earl of Lenox, then regent; but he returned in 1572, and resumed his pastoral functions. He died at Edinburgh in November 1572, and was buried in the church-yard of St. Giles's in that city. His "History of the Reformation" was printed with his other works at Edinburgh in 1584, 1586, 1644, 1732. He published many other pieces; and several more are preserved in Calderwood's "History of the Church of Scotland." He left also a considerable number of MSS. which in 1732, were in the possession of Mr. Woodrow, minister of Eastwood.

KNOXIA, in botany, a genus of the monogynia order, and tetrandria class of plants; natural order, Stellatae. Corolla monopetalous, funnel-shaped; seeds two, furrowed; calyx has one leaf larger than the rest. It has but one species, a native of Ceylon.

KNOXVILLE, a city of Tennessee, in Knox county, the metropolis of the state, 200 miles S. E. by S. of Frankfort in Kentucky, and 728 S. W. of Philadelphia. Lon. 83. 44. W. Lat. 35. 48. N.

KNUTSFORD, a town of Cheshire, 15 miles S. W. of Manchester.

KOEI-TCHEOU, a province of China, and one of the smallest in the kingdom, bounded on the S. by Quang-si, E. by Hou-quang, N. by Setchuen, and W. by Yun-nan. The whole country is almost a desert, and covered with inaccessible mountains; it may justly be called the Siberia of China.

KÖEBREUTERIA, a genus of the monœcia order, and polygamia class of plants; natural order, Trihilatae. Calyx five-leaved; petals four; nectary double, four scalelets, three glands; capsule three-celled. It has but one species, a tree of China.

KOENIGIA, in botany, a genus of the trigynia order, and triandria class of plants. Calyx triphyllous; corolla none; seed one, ovate, naked. It has but one species.

KOENIGSHOFEN, a town of Franconia, 38 miles N. E. of Wurzburg.

KOKHONOR, or **KOKONOR**, a kingdom of Asia, W. of China, and N. E. of Thibet, inhabited by Tartars, descended from the Eluths, and governed by princes descended from a Chinese monarch. Lon. between 16° and 17° W. of Peking. Lat. from 36. 49. to 37. 10. N.

KOLDING, or **COLDINGUEN**, a town of Denmark, in North Jutland. Lon. 9. 25. E. Lat. 55. 35. N.

KOLYVAN, a town of Russia, the capital of Kolyvanskoi, on the Oby.

KOLYVANSKOI, a government of the Russian empire, in West Siberia, famous for its silver-mines. It is 720 miles long, and from 240 to 360 broad.

KOM, a town of Persia, in Irak, 156 miles N. of Ispahan.

KOMMANI, **COMMANI**, or **COMMENDO**, a populous kingdom of Africa, on the Gold Coast, about 20 miles square, formerly part of the kingdom of Zabui. The natives are warlike, and the king can raise an army of 20,000 men.

KOMMANI, GRAND, the capital of the above kingdom. Lon. 0. 34. E. Lat. 4. 54. N.

KONGSBERG, a town of Norway, celebrated for its silver-mines, 45 miles S. W. of Christiana.

KONIGSBERG, or **KONIGSBURG**, six towns of Germany: viz. 1. in Brandenburg, 47 miles E. of Stetin; 2. in Franconia; 3. in Upper Hesse, 5 miles N. of Wetzlar; 4. in Upper Saxony, 20 miles S. S. W. of Coburg; 5. in Silesia, 13 miles S. E. of Troppau; 6. in Stiria, 6 miles N. E. of Rein.

KONIGSTEIN, a late county of Germany, which belonged partly to the elector of Mentz, and partly to the house of Stolberg.

KONIGSTEIN, the capital of the above county, with a fort, 11 miles N. W. of Frankfort, on the Maine, and 30 N. E. of Mentz.

KONINGSBERG, a town of Poland, and capital of Regal Prussia, with a magnificent palace, in which is a hall 274 feet long and 59 broad, without any pillars to support it. It has a handsome library. Lon. 21. 35. E. Lat. 54. 43. N.

KORAN. See **ALCORAN**.

KORIACS, a people inhabiting the northern part of Kamtschatka, and all the coast of the Eastern Ocean from thence to the Anadir. They are divided into the Rein-deer or Wandering Koriacs, and the Fixed Koriacs. The former lead an erratic life, in the tract bounded by the Penschinka sea to the S. E. the river Kowyma to the W. and the Anadir to the N. They wander from place to place with their rein-deer, in search of the moss, the food of those animals, which are their only wealth. They are squalid, cruel, and warlike; the terror of the Fixed Koriacs as much as the Tschutski are of them. They never frequent the sea nor live on fish. Their habitations are jouts, or places half sunk in the earth. They are in their persons lean, and very short; have small heads and black hair, which they shave frequently; their faces are oval; their nose is short; their eyes are small; their mouth is large; and their beards black and pointed, but often eradicated. The Fixed Koriacs are likewise short; but rather taller than the others, and strongly made: the Anadir is their boundary to the N. the ocean to the E. and the Kamtschatkans to the S.

KOS,

KOS, in Jewish antiquity, a measure of capacity, containing about four cubic inches: this was the cup of blessing out of which they drank when they gave thanks after solemn meals, like that of the passover.

KOUANIN, in the Chinese theology, the tutelary deity of women. The Chinese make great numbers of the figures of this deity in white porcelain, and send them to all parts of the world, as well as keep them in their own houses. The figure represents a woman with a child in her arms.

KOU-CHU, a Chinese shrub, which bears a great resemblance to the fig-tree both in form of its branches and leaves. This tree yields a kind of milky juice, which the Chinese use for laying on gold-leaf in gilding.

KOULI-KHAN, **THAMAS**, or **NADIR SHAH**, was born in the province of Khorasan, and his father was chief of a branch of the Afghans, which rank descended to Nadir when he was a minor, but his uncle usurped the government. On this Nadir entered into the service of the Beglerbeg, governor of Muschada, in Khorasan, who appointed him to command an army sent against the Tartars. Nadir gained a complete victory with an inferior force, and took the Tartar general prisoner. The Beglerbeg at first treated Nadir with great distinction, but being jealous of his aspiring spirit, he refused him the rank of lieutenant-general which he had promised him; and when Nadir complained of his breach of faith, he caused him to be bastinadoed. Exasperated at this ungrateful and dishonourable treatment, he joined a banditti of robbers. With this troop, consisting of five hundred well-mounted men, he committed great ravages. The Afghans having made themselves masters of Ispahan, and the Turks and Muscovites ravaging other parts of Persia, Shah Thamas applied to Nadir for his assistance. He accordingly entered into the service of the Shah, but one of his first actions was to murder his uncle who had usurped his title. He distinguished himself against the Turks, whom he defeated in several actions, for which he was made a general, and the Shah conferred upon him the title of Thamas Kouli, or the slave of Thamas; he was also ennobled with the title of Khan. Notwithstanding these distinctions, he deposed Thamas, and placed a son of that prince on the throne, to whom he became regent. In 1735 he gained the battle of Erivan, in which the Turks lost above 50,000 men. After this he assumed the royal title, and was acknowledged by the grandees of the empire. The year following he took Candahar, and in 1739 conquered the Mogul empire, making himself master of Delhi, where he acquired immense riches. He then assumed the title of emperor of the Indies; but disgraced himself by ordering a massacre of the inhabitants of Delhi, in revenge for an insult offered to some of his troops. The cruelties and tyranny of Kouli-Khan at length excited general hatred, and a conspiracy being formed by some Persian officers, he was assassinated in 1747.—Watkins.

KRAMERIA, in botany, a genus of the tetrandria monogynia class and order. Calyx none; corolla four-petaled; nectary upper three-parted, lower two-leaved; berry dry, echinated, one-seeded. There is but one species, viz. *K. ixina*, a shrub with lanceolate leaves, found in South America.

KREMS, or **CREMS**, a town of Austria, 32 miles W. N. W. of Vienna.

KROUTE, **CROUTE**, or **SOUR CROUTE**, [*Sauer Kraut*, Germ. *i. e.* sour herb,] a preparation of cabbage which has been found of sovereign efficacy as a preservative in long voyages from the sea-scurvy. See **CROUTE**.

KUARA, a province of Abyssinia, S. of Dembea, bordering on that of the Shangalla, the Macrobii of the ancients.

KUIINIA, in botany, a genus of the syngenesia polygamia aequalis class and order; natural order, Compositæ Discoidææ.

Flowers floscular; calyx imbricate, oblong, cylindrical; down plumose; receptacle naked; style deeply bifid; stigmas club-shaped; anthers distinct. It has but one species, viz. *K. eupatoroides*, a native of Pennsylvania.

KUNCKEL, **JOHN**, a celebrated Saxon chemist, born in Sleswick, in 1630. He became chemist to the elector of Saxony, the elector of Brandenburg, and Charles XI. king of Sweden, who gave him the title of counsellor of metals, and letters of nobility, with the surname of Louwensteing. He employed fifty years in chemistry; in which, by the help of the furnace of a glass-house which he had under his care, he made several excellent discoveries, particularly of the phosphorus of urine. He died in Sweden in 1702; and left several works, some in German, and others in Latin: among which, that entitled "*Observationes Chemicæ*," and the "*Art of making Glass*," printed at Paris in 1752, are the most esteemed.

KURIL, **KURILE**, or **KURISKII**, **ISLES**, a series of islands, extending from N. Lat. 45° to 51° and which possibly once lengthened the peninsula of Kamtschatka before they were convulsed from it. They run S. from the low promontory Lopatka, between which and Soonska the most northerly is only the distance of one league.

KURTUS, in natural history, a genus of fishes, order jugulares. Body carinated above and below, and broad; back highly elevated; gill membrane, with two rays. There is only one species, which inhabits the seas of India. Its length is about ten inches, and its breadth four. Its colour, on the whole body, is that of silver-foil, and its back is tinged with gold, and marked on its ridge with several black spots.

KUSTRIN, or **CUSTRIN**, a strong town of Brandenburg, 48 miles E. of Berlin.

KUYNDER, a town, fort, and river of Batavia, in the department of the Eems, and late province of Friesland, 23 miles S. of Leewarden.

KYANITE, or **CYANITE**, in mineralogy, a species of the talc genus: colour blue, sometimes white and grey: lustre externally and internally shining, splendid, and completely pearly. It occurs in wedge-shaped concretions, which are often very promiscuous, and then pass into large and coarse-grained distinct concretions. It feels greasy; is easily frangible, and the specific gravity is from 3.5 to 3.6. It is found in many parts of Europe. It is reckoned the link which connects talc with actynolite and tremolite.

KYLLINGIA, in botany, a genus of the triandria monogynia class and order; natural order, Gramina. Ament ovate or oblong, imbricate; flowers with a bivalve calyx and corolla. There are seven species, natives of the East and West Indies.

KYPHONISM, **KYPHONISMUS**, or **CYPHONISMUS**, an ancient punishment frequently undergone by the primitive martyrs; wherein the body of the person was anointed with honey, and so exposed to the sun, that the flies and wasps might be tempted to torment him. This was performed in three ways; sometimes they tied the patient to a stake; sometimes they hoisted him up in the air, and suspended him in a basket; and sometimes they stretched him out on the ground with his hands tied behind him. The word comes from *κυφωω*, which signifies either the stake to which the patient was tied, the collar fitted to his neck, or an instrument wherewith they tormented him. The scholiast on Aristophanes says, it was a wooden lock or cage, and that it was so called from *κυφειν*, to crook or bend, because it kept the tortured in a crooked, bending posture; others take it for a log of wood laid over the criminal's head, to prevent his standing upright. Hesychius describes the *κυφωω* as a piece of wood whereon criminals were stretched and tormented.

L.

the eleventh letter of the alphabet, and the eighth consonant. It was derived from the old Hebrew Lamed, λ , or Greek Lambda, λ . It is sounded by intercepting the breath between the top of the tongue and fore-part of the palate, with the mouth open; and makes a sweet sound, with something of an aspiration; and therefore the Britons and Spaniards usually doubled it, or added *h* to it, in the beginning of words, as in *lian*, or *than*, a temple, sounding nearly like *h*, &c. It is placed after most of the consonants in the beginning of words and syllables, as black, glare, addle, eagle, &c. but before none. Its sound is clear in Abel, but obscure in able, &c. As a numeral, L denotes 50; and with a dash over it, thus, $\overline{L}$, 5000. As an abbreviation, L stands for Lucius; LL. D. for doctor of laws; L. S. at copies of deeds, charters, &c. for locus sigilli, the place of the seal; and L. S. for a sesterce. See *SESTERCE*.

LA, in music, the syllable by which Guido denotes the last sound of each hexachord; if it begins in C, it answers to our A; if in G, to E, &c.

LAAB, a town of Austria, on the Taya, 26 miles N. of Vienna.

LAALAND, or LALAND, a fertile island of Denmark, at the entrance into the Baltic from the Greater Belt; 30 miles long, and 12 broad. All kinds of grain are cultivated with great success; and a peculiar species of red fruit, called manna, resembling sweet almonds in taste, grows naturally in it. Naskow is the capital. Lon. from 11. 2. to 11. 48. E. Lat. 54. 43. to 55. 2. N.

LABADIA, or BADIA, a district of Italy, in the late Venetian province of Rovigo.

LABADIA, or the BADIA, a town in the above district, 20 miles N. W. of Ferrara.

LABARUM, the banner or standard carried before the Roman emperors in the wars. It consisted of a long lance, with a staff at top; crossing it at right angles; from which hung a rich streamer, of a purple colour, adorned with precious stones. Till the time of Constantine it had an eagle painted on it; but that emperor, in lieu thereof, added a cross with a cypher expressing the name of Jesus. This standard the Romans took from the Germans, Dacæ, Sarmatæ, Pannonians, &c. whom they had overcome. The name labarum was not known before the time of Constantine; but the standard itself, in the form we have described it, abating the symbols of Christianity, was used by all the preceding emperors. Some derive the word from *labor*, as if this finished their labours; some from *λαβειν*, reverence, piety; others from *λαβεραν*, to take; and others from *λαφυρα*, spoils.

LABATIA, in botany, a genus of the tetrandria monogynia class and order. Calyx four-leaved, inferior; corolla subcampanulate, four-cleft, with two minute segments in the division of the corolla; capsule four-celled; seeds solitary. There are two species.

LABDANUM, a resin, of a strong not unpleasant smell, and an aromatic, but not agreeable taste. This substance exudes from *cistus creticus*, a shrub found in Syria and the Grecian islands. It is said to have been formerly collected from the beards of goats who browsed the leaves of the *cistus*: at present, a kind of rake, with several straps or thongs of skins fixed to it, is drawn lightly over the shrub, so as to take up the unctuous juice, which is afterwards scraped off with knives. It is rarely met with pure, even in the places which produce it; the best (which is very rare) is in dark coloured masses, almost black, of the consistence of a soft plaster, which grows still softer upon being handled; of a very agreeable smell, and of a light pungent bitterish taste. Rectified spirit of wine almost intirely dissolves pure labdanum, leaving only a small portion of gummy matter which has no taste or smell: and hence this resin may be thus excellently purified for

internal purposes. It is an useful ingredient in the stomachic plaster, now styled *emplastrum labdani*.

LABEL, in law, a narrow slip of parchment hanging from a deed, writ, or other writing, in order to hold the appending seal.

LABEL is also used for a long, thin, brass rule, with a small sight at one end, and a centre-hole at the other; commonly used with a tangent line on the edge of a circumferentor to take altitudes, &c.

LABEL, in heraldry, is a fillet usually placed in the middle along the chief of the coat, without touching its extremities. Its breadth ought to be a 9th part of the chief. It is adorned with pendants; and when there are above three of these, the number must be specified in blazoning. It is used on the arms of eldest sons while the father is alive, to distinguish them from the younger; and is esteemed the most honourable of all differences. See *HERALDRY*.

LABIAL LETTERS, those pronounced chiefly by means of the lips; viz. B, M, and P.

LABIATED FLOWERS, monopetalous flowers, consisting of a narrow tube with a wide mouth, divided into two or more segments.

LABIAU, a town of Ducal Prussia. Lon. 19 56. E. Lat. 55. 17. N.

LABORATORY, or ELABORATORY, the place where chemists perform their operations, where the furnaces are built, vessels kept, &c. In general it is applied to any place where physical experiments in pharmacy, chemistry, pyrotechny, &c. are performed. As laboratories must be of very different kinds, according to the nature of the operations to be performed in them, it is impossible to give any directions which will answer for every one. Where the purposes are merely experimental, a single furnace or two of the portable kind will be sufficient. Shelves are necessary for holding vessels with the products of the different operations; and it is absolutely necessary to avoid confusion and disorder, lest the products of the operations should be lost or mistaken for one another. Mortars, filters, levigating stones, &c. must also be procured: but from a knowledge of the methods of performing the different chemical operations will easily be derived the knowledge of a proper place to perform them in; for which see *CHEMISTRY*.

LABORATORY, in military affairs, signifies the place where fireworks are prepared, both for actual service and for pleasure, viz. quick matches, fuzes, port-fires, grape-shot, case-shot, carcasses, hand-grenades, cartridges, shells filled, and fuzes fixed, wads, &c. &c.

LABOUR. See *MIDWIFERY*.

LABOUR, in sea-language. A ship is said to be in labour when she rolls and tumbles very much, either a hull, under sail, or at anchor.

LABRADOR, the same with New Britain, or the country round Hudson's Bay. The climate, though only in Lat. 57° N. is excessively cold during winter. Wine freezes in a solid mass; brandy coagulates; and the very breath falls on the blankets of a bed, in the form of a hoar-frost. The ice begins to disappear in May; and about the middle of June commences hot weather, which, at times, is so violent, as to scorch the faces of the hunters. Mock suns and halos are frequent, very bright, and richly tinged with all the colours of the rainbow. The sun rises and sets with a large cone of yellowish light; and the night is enlivened by the aurora borealis, which spreads many different lights and colours over the whole sky. The animals are moosedecers, stags, reindeers, bears, tigers, buffaloes, wolves, foxes, beavers, otters, martens, squirrels, ermines, wild cats, and hares. The feathered kinds are geese, bustards, ducks, partridges, and all kinds of wild fowls. The

fish are whales, morses, seals, codfish, and a white fish preferable to herrings; and in their rivers and fresh waters are pike, perch, carp, and trouts. In summer, there is the usual variety in the colour of the several animals; but when that season is over, which lasts only for three months, they all assume the livery of winter; and every sort of beasts, and most of the fowls, are of the colour of the snow; every thing animate and inanimate is white. But one of the most striking things, that draws the most inattentive to an admiration of the wisdom and goodness of Providence, is, that the dogs and cats from Great Britain, that have been carried to Hudson's Bay, on the approach of winter have changed their appearance, and acquired a much longer, softer, and thicker coat of hair than they originally had.

LABRADOR, a large lake of Cape Breton, which, by its numerous branches, forms a communication with the greater part of the island. Some geographers call it St. Peter's lake.

LABRADOR STONE, a curious species of felt-spar, or Rhombic Quartz, which exhibits all the colours of a peacock's tail. It was discovered some years ago by the Moravians, in Labrador. It is found of a light or deep grey colour, but for the most part of a blackish grey. When held in the light in various positions, it discovers a variety of colours, such as the blue of lapis lazuli, grass-green, apple-green, pea-green, and sometimes, but more seldom, a citron-yellow. Sometimes it has a colour between that of red copper and tombuck-grey; at other times the colours are between grey and violet. For the most part these colours are in spots, but sometimes in stripes on the same piece. The stones occur in pretty large angular pieces, appear foliated when broken, and the fragments are of a rhomboidal figure. Their specific gravity is about 2.755, and in other respects they agree with the felt-spar.

LABRUM, in antiquity, a great tub which stood at the entrance of the temples, containing water for the priests to wash themselves in, previous to their sacrifices. It was also the name of a bathing tub used in the baths of the ancients.

LABRUS, in ichthyology, a genus of fishes of the order thoracici. Generic character: teeth strong and sharp; the grinders sometimes convex and crowded; lips thick and doubled; rays of the dorsal fin in several species prolonged into soft processes; gill-covers unarmed and scaly. There are ninety-eight species. The *L. formosus* is represented in Plate LV.

LABURNUM, in botany. See **CYTISUS**.

LABYRINTH, [*labyrinthus*, Latin,] among the ancients, was a large intricate edifice cut out into various aisles and meanders running into each other, so as to render it difficult to get out of it. Mention is made of several of those edifices among the ancients; but the most celebrated are the Egyptian and the Cretan labyrinths. The word literally signifies a circumscribed space, intersected by a number of passages, some of which cross each other in every direction like those in quarries and mines, and others make larger or smaller circuits round the place from which they depart like the spiral lines on certain shells. In a figurative sense, it was applied to obscure and captious questions, to indirect and ambiguous answers, and to those discussions which, after long digressions, bring us back to the point from which we set out.

LABYRINTH OF CRETE is the most famed in history or fable; having been rendered particularly remarkable by the story of the Minotaur, and of Theseus who found his way through all its windings by Ariadne's clue. Diodorus Siculus relates as a conjecture, and Pliny as a certain fact, that Dædalus constructed this labyrinth on the model of that of Egypt, though on a smaller scale. They add, that it was formed by the command of Minos, who kept the Minotaur shut up in it; and that in their time it no longer existed. Diodorus and Pliny, therefore, considered this labyrinth as a large edifice; while other writers represent it simply as a cavern hollowed in the rock, and full of winding passages. But if this labyrinth had been constructed by Dædalus under Minos, it is surprising that we find no mention of it, neither in Homer, who more than once speaks of Minos and Crete; nor in Herodotus, who describes that of Egypt, after having said that the monuments of the Egyptians are much superior to those of the Greeks; nor in the more ancient geographers; nor in any of the writers of the ages when Greece flourished. Diodorus and Pliny suppose, that in their time no traces of the labyrinth existed in Crete, and that even the date of its destruction had been forgotten. Yet it is said to have been visited by the disciples of Apollonius of Tyana, who

was contemporary with those two authors. The Cretans, therefore, then believed that they possessed the labyrinth. "I would request the reader (says Abbé Barthélemi,) to attend to the following passage in Strabo. At Napulia, near the ancient Argos (continues that judicious writer), are still to be seen vast caverns, in which are constructed labyrinths that are believed to be the work of the Cyclops: the meaning of which is, that the labours of men had opened in the rock passages which crossed and returned upon themselves, as is done in quarries. Such is the idea we ought to form of the labyrinth of Crete.

LABYRINTH OF EGYPT, according to Pliny, was the oldest of all the known labyrinths, and was subsisting in his time after having stood 3600 years. He says it was built by king Petesucus, or Thithoes, but Herodotus makes it the work of several kings. It stood on the banks of the lake Mæris, and consisted of 12 large contiguous palaces, containing 3000 chambers, 1500 of which were under ground. Strabo, Diodorus Siculus, Pliny, and Mela, speak of this monument with the same admiration as Herodotus: but not one of them says it was constructed to bewilder those who went into it; though it is manifest that, without a guide, they would be in danger of losing their way. It was this danger no doubt, which introduced a new term into the Greek language.

LABYRINTH, in anatomy, the internal cavity of the ear, so called from sinuosities and windings. See **ANATOMY**.

LABYRINTH, in gardening, a winding mazy walk between hedges, through a wood or wilderness. The chief aim is to make the walks so perplexed and intricate, that a person may lose himself in them, and meet with as great a number of disappointments as possible. They are rarely to be met with, except in great and noble gardens, as Versailles, Hampton-court, &c.

LACCA, **LAC**, or **GUM LAC**, is a kind of wax, of which a species of insects form cells upon trees, like honeycombs. See **COCCUS**. In these cells remain some of the dead insects, which give a red colour to the whole substance of the lac. That called stick lac is the wax adhering to some of the small branches of the tree, and which is unprepared. This lac, when separated from the adhering sticks, grossly powdered, and deprived of its colour by digestion with menstrua, for the sake of the dyes and other purposes, is called seed-lac; when the stick-lac is freed from impurities by melting it over a gentle fire, and formed into cakes, it is called lump lac; and lastly, that called shell lac is the cells liquified, strained, and formed into thin transparent laminae. The value of shell lac is according to its transparency. The lac insect is one of the most useful of that tribe yet discovered, particularly to the natives of the countries where it is found. They consume a great quantity of shell lac in making ornamental rings, painted and gilded in various tastes, to decorate the arms of the ladies: and it is formed into beads, spiral and linked chains for necklaces, and other female ornaments.

LACCADIVE ISLANDS, a group of small islands in the Indian Ocean. The nearest is about 120 miles from the coast of Malabar. Lon. from 71° 15' to 73° 30' E. Lat. from 10° to 11° 40' N.

LACCIC ACID, in chemistry, a white or yellowish production of insects, called white-lac. Dr. Pearson found that this substance bore a considerable analogy to bees-wax. A full account of Dr. Pearson's experiments may be seen in the eighty-fourth volume of Philos. Trans. Carbon, hydrogen, and oxygen, are thought to be its component parts.

LACE, in commerce, is composed of many threads of gold, silver, silk, interwoven the one with the other, and worked upon a pillow with spindles according to the pattern designed. The open work is formed with pins, which are placed and displaced as the spindles are moved. The importation of gold and silver lace is prohibited.

LACE, **BONE**, a lace made of fine linen thread or silk, much in the same manner as that of gold and silver. The pattern of the lace is fixed upon a large round pillow, and pins being stuck into the holes or openings in the patterns, the threads are interwoven by means of a number of bobbins made of bone or ivory, each of which contains a small quantity of fine thread, in such a manner as to make the lace exactly resemble the pattern. Several towns in England, particularly in Buckinghamshire, carry on this manufacture; but vast quantities of the finest lace have been imported from Flanders.

LACEDÆMON, in fabulous history, a son of Jupiter and Taygete, the daughter of Atlas. He married Sparta the daughter of Europa, by whom he had Amyclas and Eurydice the wife of Acrisius.

LACEDÆMON, in ancient geography, a noble city of Peloponnesus, called also Sparta; these names differing in this, that the latter is the proper and ancient name of the city, the former of the country, which afterwards came to be applied to the city. (Strabo, Stephanus.) Homer also makes this distinction; who calls the country holy, because encompassed with mountains. It has also been severally known by the name of Lelegia, from the Leleges, the first inhabitants of the country, or from Lelex one of their kings; and Oebalia, from Oebalus the sixth king from Eurotas. It was also called Hecatompolis, from 100 cities which the whole province once contained. This city was the capital of Laconia, and is now called Misitra. Lon. 23. 0. E. Lat. 36. 55. N.

LACERNA, a coarse thick garment worn by the Romans over their gowns like a cloak. It was first used in the camp, but afterwards admitted into the city.

LACERTA, the **LIZARD**, in astronomy, a constellation of the Northern Hemisphere. See **ASTRONOMY**.

LACERTA, the **LIZARD**, in zoology, a genus of amphibia of the order reptilia, the characters of which are these: body naked, with four feet, and a tail; legs equal. There are about 80 species; of which

L. AGILIS has a pretty long verticillated tail, with sharp scales, and a scaly collar. This is the common green lizard, and is a native both of Europe and India. This species is extremely nimble: in hot weather it basks on the sides of dry banks or old trees: but, on being observed, immediately retreats to its hole. The food of this species, as well as of all the other British lizards, is insects; and they themselves are devoured by birds of prey. They are all perfectly harmless; yet their form strikes one with disgust, and has occasioned great obscurity in their history.

L. ALLIGATOR, the **ALLIGATOR**, or **AMERICAN CROCODILE**, has a vast mouth, furnished with sharp teeth; from the back to the end of the tail, serrated; skin tough and brown, and covered on the sides with tubercles. This dreadful species, which grows to the length of 17 or 18 feet, is found in the warmer parts of North America; and most numerous, fierce, and ravenous, towards the South. Yet in Carolina it never devours the human species, but on the contrary shuns mankind; it however kills dogs as they swim the rivers, and hogs which feed in the swamps. It is often seen floating like a log of wood on the surface of the water, and is mistaken for such by dogs and other animals, which it seizes, draws under water, and devours. Like the wolf, when pressed by long hunger, it will swallow mud, and even stones and pieces of wood. They often get into the wears in pursuit of fish, and do much mischief by breaking them to pieces. They are torpid during winter in Carolina; and retire into their dens, which they form by burrowing far under ground. They make the entrance under water, and work upwards. In spring they quit their retreats, and resort to the rivers; and chiefly seek their prey near the mouth, where the water is brackish. They roar and make a dreadful noise at first leaving their dens, and against bad weather. The female lays a vast number of eggs in the sand, near the banks of lakes and rivers, and leaves them to be hatched by the sun: multitudes are destroyed as soon as hatched either by their own species or by fish of prey. In South America the carrion vulture is the instrument of Providence to destroy multitudes; and thus prevent the country from being rendered uninhabitable. See Plate LXVII.

L. BASILISCUS, or, the **BASILISK**, is particularly distinguished by a broad wing-like process, elevated along the whole length of its back, somewhat similar to the fins of fishes, and which is capable, at the pleasure of the animal, of being extended or contracted. It lives almost solely in trees, feeding upon insects, and though somewhat terrific in appearance, is as harmless as any of the lizard tribe. It is found most frequently in South America, generally about a foot and a half long, swims with great ease, and moving among the branches of the trees with extreme agility. The basilisk of antiquity, whose bite was supposed to produce instant death, and whose look carried destruction with it, is to be ranked with the fabulous monsters, which through the ignorance of those times, were amply supplied by a poetic imagination. See Plate LXVII.

L. CHAMELEON, the **CHAMELEON**, has a crooked cylindrica tail. The head of a large chameleon is almost two inches long and from thence to the beginning of the tail, it is four and an half. The tail is five inches long, and the feet two and an half. The thickness of the body is different at different seasons; for sometimes from the back to the belly it is two inches, and sometimes but one; for he can blow up and contract himself at pleasure. This swelling and contraction is not only of the back and belly, but also the legs and tail. These different motions do not, like those of other animals, proceed from a dilatation of the breast in breathing, which rises and falls successively; but they are very irregular, as in tortoises and frogs. The chameleon will continue blown up for two hours together, and then grow less and less insensibly; for the dilatation is always more quick and visible than the contraction. In this last state he appears extremely lean; the spine of the back is sharp, and all his ribs might be told; the tendons of the arms and legs might also be seen distinctly. The skin is very cold to the touch; and notwithstanding he seems so lean, there is no feeling the beating of the heart. The surface of the skin is unequal, and has a grain not unlike shagreen, but very soft, because each eminence is as smooth as if it were polished. The head is like that of a fish, being joined to the breast by a very short neck, covered on each side with cartilaginous membranes resembling gills. There is a crest directly on the top of the head, and two others on each side above the eyes, and between these there are two cavities near the top of the head. The muzzle is blunt, like that of a frog: at the end there is a hole on each side for the nostrils; but there are no ears, nor any sign of any. The jaws are furnished with teeth, or rather with a bone in the form of teeth, which he makes little or no use of, because he lives by swallowing flies and other insects without chewing them; and hence arose the vulgar notion of his living upon air, because he was never seen to eat. The tongue, which Linnaeus says resembles an earthworm, is of considerable length, and is enlarged and somewhat flattened at the end. From this member there continually oozes out a very glutinous liquor, by means of which it catches such insects as come within its reach, and it is surprising to see with what quickness it retracts its tongue the instant it has arrested any prey. The form, structure, and motion, of the eyes, have something very particular; for they are very large, being almost half an inch in diameter. They are of a globous figure; which may be easily seen, because they stand out of the head. They have a single eye-lid like a cap, with a small hole in the middle, through which the sight of the eye appears, no bigger than a pin's head, and a shining brown, encircled by a little ring of a gold-colour. This eye-lid has a grain like shagreen, as well as the other parts of the skin; and when the rest of the body changes colour, and assumes spots of different shape, those on the lid always keep the same form, though they are tinged with the same colour as the skin. But the most extraordinary thing relating to the eyes is, that this animal often moves one when the other is entirely at rest; nay, sometimes one eye will seem to look directly forward, and the other backward, and one will look up to the sky, when the other regards the earth. The four feet are all of equal length; but those before are turned backwards, and those behind forwards. There are five toes on each paw, which have a greater resemblance to hands than feet. They are all divided into two, which gives the appearance of two hands to each arm, and two feet to each leg; and though one of these parts have three toes, and the other but two, yet they seem to be all of the same size. His walk is slower than that of a tortoise, and he seems to move along with an affectation of gravity. He seems to seek for a proper place to set his feet upon; and when he climbs up trees, he does not trust to his feet like a squirrel, but endeavours to find out clefts in the bark, that he may get a surer hold. His tail is like that of a viper when it is puffed up and round; at other times the bones may be seen in the same manner as on the back. He always wraps his tail round the branches of trees, and it serves him instead of a fifth hand. He is a native of Africa and Asia. See Plate LXVII.

L. CROCODILUS, or **CROCODILE**. The crocodile, so remarkable for its size and powers of destruction, has in all ages been regarded as one of the most formidable animals of the warmer regions. It is a native of Asia and Africa, but seems to be most common in the latter; inhabiting large rivers, as the Nile, the Niger, &c. and preying principally on fish, but occasionally seiz-

ing on almost every animal which happens to be exposed to its rapacity. The size to which the crocodile sometimes arrives is prodigious; specimens being frequently seen of twenty feet in length, and instances are commemorated of some which have exceeded the length of thirty feet. The armour with which the upper part of the body is covered may be numbered among the most elaborate pieces of Nature's mechanism. In the full-grown animal it is so strong and thick as easily to repel a musket-ball; on the lower parts it is much thinner, and of a more pliable nature: the whole animal appears as if covered with the most regular and curious carved work: the colour of a full-grown crocodile is blackish-brown above, and yellowish-white beneath; the upper parts of the legs and the sides varied with deep yellow, and in some parts tinged with green. In the younger animals the colour on the upper parts is a mixture of brown and pale yellow, the under parts being nearly white: the eyes are provided with a nictitating membrane, or transparent moveable pellicle, as in birds: the mouth is of vast width, the rictus or gape having a somewhat flexuous outline, and both jaws being furnished with very numerous sharp-pointed teeth, of which those about the middle part of each jaw considerably exceed the rest in size, and seem analogous to the canine teeth in the viviparous quadrupeds or mammalia: the number of teeth in each jaw is thirty, or more; and they are so disposed as to alternate with each other when the mouth is closed: on taking out the teeth and examining the alveoli, it has been found that small teeth were forming beneath, in order to supply the loss of the others when shed: the legs are short, but strong and muscular: the fore-feet have five toes, and are unwebbed: the hind-feet have only four toes, which are united towards their base by a strong web: the two interior toes on each of the fore-feet, and the interior one of the hind-feet, are destitute of claws: on the other toes are strong, short, and curved, claws: the tail is very long, of a laterally compressed form, and furnished above with an upright process, formed by the gradual approximation of two elevated crests proceeding from the lower part of the back. The crocodile in a young state is by no means to be dreaded, its small size and weakness preventing it from being able to injure any of the larger animals: it therefore contents itself with fish and other small prey; and such as have occasionally been brought to Europe are so far from being formidable or ferocious, that they may be generally handled with impunity, and either from weakness, or the effect of a cold climate, seem much inclined to torpidity; but in the glowing regions of Africa, where it arrives at its full strength and power, it is justly regarded as the most formidable inhabitant of the rivers. It lies in wait near the banks, and snatches dogs and other animals, swallowing them instantly, and then plunging into the flood, and seeking some retired part, where it may lie concealed, till hunger again invites it to its prey. In its manner of attack it is exactly imitated by the common *lacerta palustris*, or water-newt, which, though not more than four or five inches long, will with the greatest ease swallow an insect of more than an inch in length; and that at one single effort, and with a motion so quick, that the eye can scarcely follow it. It poises itself in the water, and having gained a convenient distance, springs with the utmost celerity on the insect, and swallows it. If, therefore, a small lizard of four or five inches only in length, can thus instantaneously swallow an animal of a fourth part of its own length, we need not wonder that a crocodile of eighteen, twenty, or twenty five, feet long, should suddenly ingorge a dog or other quadruped. Crocodiles, like the rest of the *lacerta*, are oviparous: they deposit their eggs in the sand or mud near or on the banks of the rivers they frequent, and the young, when hatched, immediately proceed to the water; but the major part are said to be commonly devoured by other animals, as ichneumons, birds, &c. The egg of the common nilotic crocodile is not much larger than that of a goose, and in external appearance bears a most perfect resemblance to that of a bird; being covered with a calcareous shell, under which is a membrane. When the young are first excluded, the head bears a much larger proportion to the body than when full grown. The eggs, as well as the flesh, of the crocodile itself, are numbered among the delicacies of some of the African nations, and are said to form one of their favourite repasts. See Plate LXVII.

L. GANGETICA, the OPEN-BELLIED CROCODILE OF THE GANGES, is furnished with a false belly like the opossum, where the young creep out and in, as their dangers or necessities require.

This species thus furnished, cannot be said to be an enemy to her own young; since she thus gives them more than parental protection. It is probable also that this open bellied crocodile is viviparous, and fosters her young that are prematurely excluded in this second womb until they come to proper maturity. This species was not described by Linnæus; but has been inserted in the *Systema Naturæ* since his death. Mr. Edwards tells us, that three of them were sent from Bengal about 1747, to the celebrated Dr. Mead. Two of them he preserved in his collection, and presented the third to the late ingenious Mrs. Kennon. Since the decease of these worthy persons, they became the property of Mr. James Lemon of London, who gave Mr. Edwards one of them to present to the Royal Society. The narrowness of the beak is the most extraordinary circumstance in this crocodile, which appears like the bill of the goosander. It has small sharp teeth. In other respects it has all the marks common to alligators or crocodiles. The beak was finely creased transversely. The animal appeared in the spirits all over of a yellowish olive colour, the under side lighter than the upper, the latter having some dusky marks and spots. See Plate LXVII.

L. GECKO, has a cylindrical tail, concave ears, and a warty body. It is the INDIAN SALAMANDER of Bontius. "This animal is very frequent in Cairo (says Hasselquist) both in the houses and without them. Its poison is very singular, as it exhales from the lobuli of the toes. The animal seeks all places and things impregnated with sea-salt, and, passing over them several times, leaves this very noxious poison behind. In July 1750, I saw two women and a girl in Cairo at the point of death, from eating cheese new salted, bought in the market, and on which this animal had dropped its poison. Once at Cairo, I had an opportunity of observing how acrid the exhalations of the toes of this animal are, as it ran over the hand of a man who endeavoured to catch it; there immediately rose little pustules over all those parts the animal had touched; these were red, inflamed, and smarted a little, greatly resembling those occasioned by the stinging of nettles. It emits an odd sound, especially in the night, from its throat, not unlike that of a frog."

L. IGUANA, or GUANA, has the top of the back and tail, and the gullet, strongly serrated, and is sometimes found five feet long. It has small teeth, and bites hard. It inhabits the rocks of the Bahama islands, and lurks in cliffs or hollow trees. It feeds entirely on vegetables; and the fat of the abdomen assumes the colour of that which it has last eaten. It is slow of motion, and has a most disgusting look; yet it is esteemed a most delicate and wholesome food, noxious only to venereal patients, according to Linnæus. It is not amphibious, yet on necessity will continue long under water; it swims by means of the tail, keeping its legs close to the body. Guanans are the support of the natives of the Bahama islands, who go in their sloops from rock to rock in search of them. They are taken with dogs trained for the purpose; and as soon as caught, their mouths are sewed up, to prevent them from biting. Some are carried alive for sale to Carolina; others salted and barrelled for home consumption. See Plate LXVII.

L. PALUSTRIS, has a lanceolated tail, and four toes on the fore-feet; and inhabits the stagnant waters of Europe. It has a slow and crawling pace. Mr. Pennant more than once found, under stones and old logs, some very minute lizards that had much the appearance of this kind: they were perfectly formed, and had not the least vestiges of fins; which circumstance, joined to their being found in a dry place remote from water, seems to indicate that they had never been inhabitants of that element, as many of our lizards are in their first state. At that period they have a fin above and below their tail; that on the upper part extends along the back as far as the head; but both drop off as soon as the animal takes to the land, being then no longer of any use. Mr. Ellis has remarked certain pennated fins at the gills of one very common in most of our stagnating waters, and which is frequently observed to take a bait like a fish.

L. SALAMANDRA, or the SALAMANDER, is of a deep brilliant black colour, varied with irregular patches of bright yellow. It is found in various parts of France, Germany, and Italy, abounding particularly in moist and woody situations, and making its appearance chiefly during rain. In winter it secludes itself in clefts, or hollow trees. It is about seven inches long, lives principally upon insects and snails, can subsist by water as well as land, is slow in its

its movements, and lethargic in its habits. The idea of its being capable of enduring fire without injury, can be accounted for, merely from its possessing a power of exuding in any state of irritation a white and glutinous substance, which must of course tend to render the application of fire less immediately destructive to it than to some other animals, and considering what trilling causes have led, in innumerable cases to important inferences, this fact may probably have given rise to the notion of the salamander being insusceptible of destruction, and even of injury, in the midst of flames. The idea of its poisoning any large animal by its bite is equally exploded. The common lizard, however, is stated to have been poisoned in consequence of the bite of the salamander, from some particular fluid contained in the skin of the latter. The salamander produces its young living, hatched from internal eggs, and frequently upwards of thirty in number.

LACHENALIA, in botany, a genus of the hexandria monogynia class and order: natural order, Coronaria. Corolla six-parted; the three outer petals difform; capsule three-winged; cells many-seeded; seeds globular, affixed to the receptacle. There are twelve species, all bulbous-rooted plants, of the Cape of Good Hope.

LACHES, [from *lascher*, Fr. i. e. to slacken; or *lasche*, idle,] in the English law, signifies slackness or negligence, as it appears, in Littleton, where laches of entry is a neglect of the heir to enter.

LACHESIS, [from *λαχυν*, to measure out by lot,] in mythology, one of the Fates. She presided over futurity, and was represented as spinning the thread of life; or, according to others, holding the spindle.

LACHNEA, in botany, a genus of the monogynia order, and octandria class of plants: natural order, Veprecula. Calyx none; corolla four-cleft; with the limb unequal; seed one; resembling a berry. It has two species, natives of the Cape of Good Hope.

LACHRYMAL, or **LACHRYMALIS**, in anatomy, an appellation given to several parts of the eye. See **ANATOMY**.

LACHRYMATORY, in antiquity, a vessel wherein the tears of a deceased person's friends were preserved along with the ashes and urn. They were small glass or earthen bottles, chiefly in the form of phials. At the Roman funerals, the friends of the deceased, or the prætor, women hired for that purpose, used to fill them with their tears, and deposit them very carefully with the ashes in testimony of their sorrow, imagining the manes of the deceased were thereby greatly comforted. Many specimens of them are preserved in the cabinets of the curious, particularly in the British Museum.

LACHISA, or **HADSIAR**, a province of Arabia Felix, bounded on the N. by Arabia Deserta, E. by the Persian Gulf, S. by Oman, and W. by Nedjed. Its camels and asses are much valued, and some thousands annually sold into Syria. It has also a pearl-fishery and some foreign trade. It is chiefly inhabited by the Bedouins.

LACINIUM, in ancient geography, a promontory of the Bruttii in Italy, the S. boundary of the Sinus Tarentinus and the Adriatic.

LACIS, a genus of the class and order polyandria digynia. Calyx and corolla none; filaments winged on both sides below; receptacle girt with twelve spines; capsules ovate. There is one species, an aquatic of Guiana.

LACISTIMA, a genus of the monandria digynia class and order. Calyx is the scale of the ament; corolla four-parted; filaments bifid; berry pedicelled, one-seeded. It has one species, a shrub of Jamaica.

LACIZE, or **LAZISE**, a town and fort of Maritime Austria, on the E. side of Lake Garda. Also a hilly district extending W. from Verona to Lake Garda.

LACK OF RUPEES, is 100,000 rupees; which, supposing them siccas, or standard, at 2s. 6d. each, amount to 12,500l. Sterling.

LACQUERS, are varnishes applied upon tin, brass, and other metals, to preserve them from tarnishing, and to improve their colour. The basis of lacquers is a solution of the resinous substance called seed-lac in spirit of wine. The spirit ought to be very much concentrated, in order to dissolve much of the lac. For this purpose, some authors direct dry potass to be thrown into the spirit. This alkali attracts the water, with which it forms a liquid that subsides distinctly from the spirit at the bottom of the

essel. From this liquid the spirit may be separated by decantation. By this method the spirit is much concentrated; but, at the same time, it becomes impregnated with part of the alkali, which depraves its colour, and communicates a property to the lacquer of imbibing moisture from the air. These inconveniences may be prevented by distilling the spirit; or, if the artist has not an opportunity of performing that process, he may cleanse the spirit, in a great measure, from the alkali by adding to it some calcined alum; the acid of which uniting with the alkali remaining in the spirit, forms with it a vitriolated tartar, which, not being soluble in spirit of wine, falls to the bottom together with the earth of the decomposed alum. To a pint of the purified spirit, about three ounces of powdered shell-lac are to be added; and the mixture to be digested during the same day with a moderate heat. The liquor ought to be poured off, strained, and cleared, by settling. This clear liquor is now fit to receive the required colour from certain resinous colouring substances, the principal of which are gamboge and anotto; the former of which gives a yellow, and the latter an orange, colour. In order to give a golden colour, two parts of gamboge are added to one of anotto; but these colouring substances may be separately dissolved in the tincture of lac, and the colour required may be adjusted by mixing the two solutions in different proportions. When silver-leaf or tin is to be lacquered, a large quantity of the colouring materials is requisite than when the lacquer is intended to be laid on brass.

LACONIA, or **LACONICA**, a country in the south of Peloponnesus. The capital was called Sparta, or Lacedæmon. See **LACEDÆMON**. The brevity with which the Laconians always expressed themselves became proverbial. See **LACONIC**.

LACONICISM. See **LACONISM**. Laconicism is certainly preferable, both in respect of sound and sense, as well as regularity of derivation.

LACONIC, [*laconicus*, Lat.] short; brief; from *Lacones*, the Spartans, who used few words.

LACONICUM, a short pithy sententious speech, such as the Lacedæmonians were remarkable for. See **LACONIA**.

LACONISM, [*laconismus*, Lat.] a concise style, called by Pope laconicism.

LACTATES, the compounds of lactic acid and alkalies. See **LACTIC ACID**.

LACTATIO, or **LACTATION**, among medical writers, denotes nursing, or giving suck. The mother's breast, if possible, should be allowed the child, at least during the first month; for thus the child is more peculiarly benefited by what it sucks, and the mother is preserved from more real inconveniences than the falsely delicate imagine they would suffer by compliance therewith; but if by infirm constitution, or other causes, the mother cannot suckle her child, let dry-nursing under the mother's eye be pursued. When women lose their appetite by giving suck, both the children and themselves are thereby injured; wet nurses are to be preferred, who, during the time they give the breast, have rather an increased appetite, and digest more quickly; the former are apt to waste away, and sometimes die consumptive. Those nurses with whom lactation may for a time agree, should wean the child as soon as their appetite lessens, their strength seems to fail, or a tendency to hysteric symptoms are manifest. When the new-born child is to be brought up by the mother's breast, apply it thereto in ten or twelve hours after delivery; thus the milk is sooner and more easily supplied, and there is less hazard of a fever than when the child is put to it before the milk begins to flow of itself. If the mother does not suckle her child, her breasts should be kept so warm with flannels, or a bare-skin, that a constant perspiration may be supported, which will prevent much inconvenience from the milk. The child, notwithstanding all care in dry-nursing, sometimes pines if a breast is not allowed. In this case a wet-nurse should be provided, if possible, one that has not been long delivered of a child. She should be young, of a healthy habit, an active disposition, a mild temper, and whose breasts are well filled with milk. If the milk be good, it is sweetish to the taste, and totally free from saltness; to the eye it appears thin, and of a bluish cast.

LACTEALS. See **ANATOMY**.

LACTIC ACID, an acid contained in milk. It was first examined by Scheele, and found by him to have peculiar properties. In the whey of milk this acid is mixed with a little curd, some phosphate

Phosphate of lime, sugar of milk, and mucilage. All these must be separated before the acid can be examined. Scheele accomplished this by the following process: Evaporate sour whey to one-eighth of its bulk, and then filter it to separate the coagulated cheesy matter; then add lime-water to precipitate the phosphate of lime, and dilute the liquid with pure water. Next precipitate the excess of lime by means of the oxalic acid, and evaporate the solution to the consistence of honey, and pour on a quantity of alcohol which separates the portion of sugar, of milk, and other extraneous matter, and dissolves the lactic acid; then distil the clear filtered liquor till the whole of the alcohol employed be driven off; what remains is the lactic acid.

LACTOMETER, a kind of hydrometer. See **MILK-GAUGE**, and Plate CII. fig. 10.

LACTUCA, in botany, a genus of the polygamia æqualis order and syngenesia class of plants; natural order Compositæ. calyx imbricate, cylindrical, with a membranaceous margin; receptacle naked; seeds even, with a simple stipitate down. It has eleven species, of which *L. sativa*, the common lettuce, has many varieties which are well known.

LACUNA, [Latin,] in old records, a ditch; a furrow for a drain; a blank in writing.

LACUNAR, in architecture, an arched roof or ceiling, more especially the planking or flooring above porticos or piazzas.

LACYDAS, or **LACYDES**, a Greek philosopher, born at Cyrene, who was the disciple of Arcesilaus, and his successor in the academy. He taught in a garden given him by Attalus, king of Pergamus; but that prince sending for him to court, he replied, "That the pictures of kings should be viewed at a distance." He imitated his master in doing good without caring to have it known. He had a goose which followed him every where by night as well as by day; and when she died he made a magnificent funeral for her! He taught the same doctrine as Arcesilaus; and, like some moderns, said, that we ought to determine nothing, but always to suspend our opinion. He died B. C. 212.

LADDERS, **SCALING**, in the military art, are used in scaling, when a place is to be taken by surprise. They are made several ways: here we make them of flat staves, so that they may move about their pins, and shut like a parallel ruler, for conveniently carrying them: the French make them of several pieces, so as to be joined together, and to be made of any necessary length: sometimes they are made with single ropes, knotted at proper distances, with iron-hooks at each end; one to fasten them upon the wall above, and the other in the ground; and sometimes they are made with two ropes, and staves between them, to keep the ropes at a proper distance to tread upon. When they are used in scaling walls, they ought to be rather too long than too short, and to be given in charge only to the stoutest in the detachment. The soldiers should carry them with the left arm passed through the second step, taking care to hold them upright close to their sides, and very short below, to prevent any accident in leaping into the ditch. The first rank of each division, provided with ladders, should set out with the rest at the signal, marching resolutely with their firelocks slung, to jump into the ditch; when they arrive they should apply their ladders against the parapet, observing to place them towards the salient angles rather than the middle of the curtain, because the enemy have less force there. The ladders must be placed within a foot of each other, without too much or too little slope, that they may not be overturned or broke by the weight of the soldiers mounting upon them. The ladders being applied, those who have carried them, and those who follow, should mount up, and rush upon the enemy sword in hand: if he who goes first happens to be overturned, the next should take care not to be thrown down by his comrade; but immediately mount himself, so as not to give the enemy time to load his piece. As the soldiers who mount first may be easily tumbled over, and their fall may cause the attack to fail, their breasts should be protected by the fore-parts of cuirasses; for if they can penetrate, the rest may easily follow. The success of an escalade is infallible, if they mount the four sides at once, and shower a number of grenades amongst the enemy, especially when supported by some grenadiers and picquets, who share the enemy's fire.

LADEN, in the sea-language, the state of a ship when she is charged with a weight or quantity of any sort of merchandises, or other materials, equal to her tonnage or burden. If the cargo

with which she is laden be extremely heavy, her burden is determined by the weight of the goods; and if light, she carries as much as she can stow, to be fit for the purposes of navigation. As a ton in measure is generally estimated at 2000 pounds in weight, a vessel of 200 tons ought accordingly to carry a weight equal to 400,000 pounds, when the matter of which the cargo is composed is specifically heavier than the water in which she floats; or, in other words, when the cargo is so heavy that she cannot float high enough with so great a quantity of it as the hold will contain.

LADEN IN BULK, the state of being freighted with a cargo which is neither in casks, boxes, bales, or cases, but lies loose in the hold; being defended from the moisture or wet of the hold by a number of mats and a quantity of dunage. Such are usually the cargoes of corn, salt, or such materials.

LADENBURG, a town in the late Palatinate of the Rhine, 40 miles S. E. of Mentz.

LADOGA, a great lake of the Russian empire, in Finland, which has a communication with the gulf of Finland, by the Nieva, and abounds in fish, particularly salmon. It is a hundred and twenty miles long, and from fifty to sixty broad.

LADOGA, a town of Russia, seated on the above lake.

LADON, in ancient geography, a river of Arcadia falling into the Alpheus.

LADON, in modern geography, a town of France, in the department of Loiret, 9 miles E.N.E. of Orleans.

LADRONE, or **MARIAN ISLANDS**, a cluster of twelve islands in the Pacific Ocean, in about 145° Lon. E. and between 11° and 21° Lat. N. They were first discovered by Magellan, who sailed round the world through the straits which bear his name. He gave them the name of Ladrone Islands, or the Islands of Thieves, from the thievish disposition of the inhabitants. When these islands were discovered, the natives were totally unacquainted with any other country besides their own; and having no accounts of their own origin, supposed that the author of their race was formed of a piece of the rock of Funa, one of their smallest islands. Many things, looked upon by us as absolutely necessary to our existence, were utterly unknown to them. They had no animals, but one species of birds, resembling turtle-doves, which they never killed, but only tamed them, and taught them to speak. They were much astonished on seeing a horse which a Spanish captain left among them in 1673. But what is most incredible is, that they were utterly unacquainted with fire till Magellan, provoked by their repeated thefts, burned one of their villages. When they saw their wooden houses blazing, they thought that the fire was a beast which fed upon the wood; and some of them who came too near, being burnt, the rest stood at a distance, lest they should be devoured or poisoned by the breathings of that terrible animal. The inhabitants are olive-coloured, but not of such a deep dye as those of the Philippines: their stature is good, and their limbs well proportioned. Though their food chiefly consists entirely of fish, fruits, and roots, yet they are so fat, that to strangers they appear swelled, but this does not render them less nimble and active. They often live to a hundred years or more, yet retain the health and vigour of men of fifty. The men go stark naked, but the women are covered. They are not ill-looking, and take great care of their beauty, though their ideas on that subject are very different from ours. They admire black teeth and white hair. Hence one of their principal occupations is to keep their teeth black by the help of certain herbs, and to whiten their hair by sprinkling upon it a certain water. Their language much resembles that of the Tagales in the Philippine islands. It is agreeable to the ear, having a soft and easy pronunciation. One of its chief graces consists in the facility of transposing words, and even all the syllables of one word; and thus furnishing a variety of double meanings, with which these people are greatly delighted.

LADY, [*hlafdiſ*, loaf-day, Sax.] The original application of this expression was to the mistress of the manor, who once a-week, or oftener, distributed to her poor neighbours, with her own hands, a certain quantity of bread; and perhaps it is from that hospitable custom, that to this day the ladies of this kingdom alone serve the meat at their own tables.

LADY-DAY, in law, the 25th of March, being the annunciation of the holy virgin. See **ANNUNCIATION**.

LADY-MANTLE. See **ALCHEMILLA**.

LADY'S BOWER. See CLEMATIS.

LADY'S COMB. See SCANDIX.

LADY'S CUSHION. See SAXIFRAGA.

LADY'S FINGER. See ANTHYLLIS.

LADY'S SMOCK. See CARDAMINE.

LADY'S TRESSES. See OPHRYS.

LENA, in antiquity, a gown worn by the Roman augurs, and peculiar to their office. In this gown they covered their heads when they made their observations on birds, &c. See AUGUR.

LAERTES, in fabulous history, king of Ithica, the son of Arcesius and Chalcomedusa, and father of Ulysses.

LÆSTRYGONES, in fabulous history, the most ancient inhabitants of Sicily. Some suppose them to be the same as the people of Leontium, and to have been neighbours to the Cyclops. They fed on human flesh: and when Ulysses came on their coasts they sunk his ships and devoured his companions.

LAETIA, in botany, a species of the monogynia order, and polyandria class of plants. Calyx five-leaved; corolla five-petaled, or none; fruit one-celled, three-cornered; seeds with a pulpy aril. It has four species, natives of America.

LAGAN, or LAGON, [from *legan*, Sax. to lie,] in sea-laws, shipwrecked goods left on the sand, or ashore; or goods cast overboard by seamen in danger of shipwreck.

LAGEMAN, [*lagamannus*, Lat] *homo habens le gem*, or *homo legalis seu legitimus*, such as we call now "good men of the jury." The word is often used in Domesday Book, and in the laws of Edward the Confessor, cap. 38.

LAGEN, or LAGENA, in antiquity, a measure of wine, containing six sextarii; whence some derive the word flagon. The lieutenant of the tower has the privilege to take unam lagenam vini ante malum & retro, of all wine-ships that come upon the Thames; and Sir Peter Leicester, in his Antiquities of Cheshire interprets *lagenam vini*, "a bottle of wine."

LAGERSTROEMIA, in botany, a genus of the monogynia order, and polyandria class of plants. Calyx six-cleft, bell-shaped; petals six, curled; stamina very many, the six outer thicker than the rest, and longer than the petals. There are four species, natives of the East Indies.

LAGNY, a town of France, in the department of Seine, Marne, and late province of the isle of France, 15 miles E. of Paris.

LAGOECAI, BASTARD or WILD CUMIN; in botany, a genus of the monogynia order, and pentandria class of plants. Involucre universal and partial; petals bifid; seeds solitary, inferior. It has but one species, found in the Levant.

LAGOON ISLAND, an island of the South Sea, of an oval form, with a lake in the middle, which occupies the greatest part of it. It abounds with trees. Lon. 138. 54. W. Lat. 18. 47. S. Also, another island in the South Sea. Lat. 21. 38. S. Lon. 147. 37. W.

LAGOS, a sea-port town of Portugal, in the province of Algar. Lon. 8. 5. W. Lat. 34. 45. N.

LAGULLAS, CAPE, the most southerly point of Africa, east of the Cape of Good Hope.

LAGUNA, or SAN CHRISTOVAL DE LAGUNA, a considerable town in the island of Teneriffe. Lon. 16. 27. W. Lat. 28. 29. N.

LAGUNEA, in botany, a genus of the monadelphia polyandria class and order. Natural order, Columniferae. Calyx simple, five-cusped; style simple; stigma peltated; capsule five-celled, five-valved. There are three species, of which *L. aculeata*, prickly lagunea, has a round tomentose stem, armed with small upright prickles, a little branched, and is about a foot and a half in height.

LAGURUS, in botany, a genus of the digynia order, and triandria class of plants: natural order, Gramina. Calyx bivalved, with a villous awn; exterior petal of the corolla terminated by two awns, with a third on its back retorted. It has but one species.

LAHOLM, a sea-port town of Sweden, in the province of Gothland, near the Baltic. Lon. 13. 13. E. Lat. 56. 35. N.

LAHORE, a large town of Hindoostan, and capital of a province of the same name, one of the most considerable in the Mogul's dominions. Lon. 75. 55. E. Lat. 32. 40. N.

LAIKY, [λαϊκοί,] the people, as distinguished from the clergy. See CLERGY. The lay-part of his majesty's subjects is divided into three distinct states; the civil, the military, and the maritime. See CIVIL, MILITARY, and MARITIME.

LAIZE, a river of France, in the department of Calvados, which falls into the Orne, 2 miles S.W. of St Martin.

LAKE, [*lacus*, Lat.] a collection of waters contained in some cavity in an inland place, of a large extent, surrounded with land, and having no communication with the ocean. Lakes may be divided into four kinds. 1. Such as neither receive nor send forth rivers. 2. Such as emit rivers without receiving any. 3. Such as receive rivers without emitting any. And, 4. Such as both receive and send forth rivers. Of the first kind, some are temporary and others perennial. Most of those that are temporary owe their origin to the rain, and the cavity or depression of the place in which they are lodged: thus in India there are several such lakes made by the industry of the natives, of which some are a mile, and some two, in circuit; these are surrounded with a stone-wall, and being filled in the rainy months, supply the inhabitants in dry seasons, who live at a great distance from springs or rivers. There are also several of this kind formed by the inundations of the Nile and Niger; and in Moscovy, Finland, and Lapland, many lakes are formed, partly by the rains, and partly by the melting of the ice and snow: but the perennial lakes, which neither receive nor emit rivers, are supposed to arise from subterraneous springs, by which they are constantly supplied. The second kind of lakes, which emit without receiving rivers, is very numerous. Many rivers flow from these as out of cisterns; where their springs being situated low within a hollow place, first fill the cavity and make it a lake, which not being capacious enough to hold all the water, it overflows and forms a river. Of this kind are the lake Wolga, at the head of the river Wolga; lake Odium, at the head of the Tanais; lake Adae, whence a head-water of the Tigris flows; and lake Ozero, or white lake, in Muscovy, the source of the Shaksna; and the great lake Chaamay, whence flow four very large rivers, which water the countries of Siam, Pegu, &c. viz. the Menan, the Asa, the Ciapoumo, and the Laquia, &c. The third species of lakes, which receive rivers but emit none, apparently owe their origin to those rivers, which, in their progress from their source, falling into some extensive cavity, are collected together, and form a lake of such dimensions as may lose as much by exhalation as it continually receives from these sources: of this kind is that great lake improperly called the Caspian Sea; the lake Asphaltites, also called the Dead Sea; the lake of Geneva, and several others. Of the fourth species, which both receive and emit rivers, are reckoned three kinds, as the quantity they emit is greater, equal, or less, than they receive. If it be greater, they must be supplied by springs, at the bottom; if less, the surplus of the water is probably spent in exhalations; and if equal, their springs just supply as much water as runs off, and is evaporated by the sun. Lakes are also divided into fresh-water and salt-water lakes. Dr. Halley is of opinion that all great perennial lakes are saline, either in a greater or less degree; and that this saltiness increases with time. Large lakes answer the most valuable purposes in the northern regions, the warm vapours that arise from them moderating the extreme cold, and in warmer climates, at a great distance from the sea, the exhalations raised from them by the sun cause the countries that border upon them to be refreshed with frequent showers, and consequently prevent their becoming barren deserts.

LAKE, or LAQUE, a preparation of different substances into a kind of magistery for the use of painters: one of the finest and first invented of which was that of gum-lacca, or laque, from which all the rest, as made by the same process, are called by the common name lacquet. See LACCA. The method of preparing these is much the same with that of the curcuma-root, or turmeric root; the process is this: take a pound of turmeric-root in fine powder, three pints of water, and an ounce of salt of tartar; put all into a glazed earthen vessel, and let them boil together over a clear gentle fire, till the water appears highly impregnated with the root, and will stain a paper to a beautiful yellow. Filter this liquor, and gradually add to it a strong solution of rock-alum in water, till the yellow matter is curdled together and precipitated; after this pour the whole into a filtre of paper, and the water will run off and leave the yellow matter behind. It is to be washed many times with fresh water, till the water comes off insipid, and then is obtained the beautiful yellow called lacque of turmeric, used in painting. In this manner may a lake be made of any of the tinging substances that are of a strong texture, as madder, logwood, &c. but it will not succeed in tender species, as the flowers of roses, violets, &c. as it destroys the nice arrangement of parts

in those subjects on which the colour depends. A fine lake is thus prepared: first, let a pound of pearl-ash, be dissolved in two quarts of water, and the solution be filtered through paper. A pound of clean scarlet shreds, and two quarts of water, are next to be added to the liquor, and the whole boiled till the rags are perfectly divested of their tinge; when they are to be taken out and pressed. Three additional pounds of shreds are now to be boiled in the same solution; and, during this process, a pound and a half of the bone of cuttle-fish are to be dissolved in one pound of aquafortis. This liquid is next to be combined with the former solution; and the whole, on being suffered to subside, will deposit a sediment, which forms what is called lake. The liquor is then to be strained, and the sediment mixed four or five times, successively, in two gallons of spring-water, till all saline particles are extracted; lastly, it is to be drained, and dropped through a funnel on clean boards, when the lake will assume the form of cones or pyramids, in which it must be suffered to dry, and the preparation will be fit for use.

LALAND. See **LALAND.**

LAMA, the sovereign pontiff, or rather god, of the Asiatic Tartars, inhabiting the country of Barantola. The lama is not only adored by the inhabitants of the country, but also by the kings of Tartary, who send him rich presents, and go in pilgrimage to pay him adoration, calling him lama congiu, *i. e.* "god, the everlasting father of heaven." He is never to be seen but in a secret place of his palace, amidst a great number of lamps, sitting cross-legged upon a cushion, and adorned all over with gold and precious stones; where, at a distance, they prostrate themselves before him, it not being lawful for any to kiss even his feet. He is called the great lama, or lama of lamas; that is, "priest of priests." The orthodox opinion is, that when the grand lama seems to die either of old age or infirmity, his soul, in fact, only quits a crazy habitation to look for another younger or better; and it is discovered again in the body of some child, by certain tokens known only to the lamas or priests, in which order he always appears. A particular account of the pompous ceremonies attending the inauguration of the infant Lama in Thibet, is given in the first volume of the Asiatic Researches. The Emperor of China appears, on such occasions, to act a very conspicuous part, in giving testimony of his respect and zeal for the great religious father of his faith. The twenty-eighth day of the seventh moon, corresponding nearly, as their year commences with the vernal equinox, to the middle of October, is reckoned the most auspicious for the ceremony of inauguration. The procession, on these occasions, from Terpalang to Teeshoo Loomboo, is conducted with such slow and majestic solemnity, that though the distance is only twenty miles, it takes up three days. The crowd of spectators is immense. The three next days are spent in the ceremonies of inauguration, in delivering the presents sent by the emperor to the lama, and in the public festivals on the occasion; during which all who are at the capital are entertained at the public expence, and alms are distributed liberally to the poor. Universal rejoicings prevail throughout Thibet; banners are unfurled on all their fortresses; the peasantry fill up the day with music and festivity, and the night is cheered by general illuminations. A long period is afterwards employed, in making presents and public entertainments to the newly inducted lama, who, at the time of his accession to the musnud, or pontificate of Teeshoo Loomboo, is often not three years of age. The whole ceremony, from its commencement to its consummation, lasts forty days.

LAMB, in zoology. See **Ovis**. A male lamb of the first year is called a wedder hog, and the female a ewe hog; in the second year it is called a wedder, and the female a sheave.

LAMBALLE, a town of France, in the department of the North Coasts; thirty-seven miles N. W. of Rennes. Lon. 2. 21. W. Lat. 48. 27. N.

LAMBAY, an island on the W. coast of Ireland, twelve miles from Dublin.

LAMBAYEQUE, a town of Peru, 12 miles from Moroppe.

LAMBESC, a town of France, in the department of the Months of the Rhone; twelve miles N. W. of Aix. Lon. 5. 31. E. Lat. 43. 40. N.

LAMBETH, a flourishing village of Surry, on the Thames, opposite Westminster; now joined to the metropolis by the vast increase of buildings; famous for the ancient palace of the Archbishops of Canterbury.

LAMBORN, a town of Berkshire, seven miles N. by W. of Hungerford, and sixty-eight W. of London. Lon. 1. 26. W. Lat. 51. 30. N.

LAMECH, [מֶלֶךְ, Heb. *i. e.* poor or humbled,] the fifth in direct descent from Cain, the son of Methusael, and father of Jubal, Jubal, and Tubal-cain, the earliest inventors of the arts on record. He is the first polygamist we have any authentic account of, (Gen. iv. 18, 24.) There is a tradition among the Hebrews, that Lamech growing blind, ignorantly killed Cain, believing him to be some wild beast; and that afterwards he slew his own son Tubal-cain, who had been the cause of this murder, because he had directed him to shoot at a place in the thickets, where he had seen something stir. See **CAIN**. Commentators widely differ respecting the meaning and intention of Lamech's speech to his two wives.

LAMEGO, a city of Portugal, in Beira, on the Duero; thirty-six miles E. of Porto, and seventy-two N. N. E. of Coimbra.

LAMELLÆ, in natural history, very thin plates, such as the scales of fishes are composed of.

LAMENTATIONS, a canonical book of the Old Testament, written by the prophet Jeremiah, according to Archbishop Ussher, and some other learned men, who follow the opinion of Josephus and St. Jerom, on occasion of Josiah's death. But as this opinion does not agree with the subject of the book, the Lamentation composed by Jeremiah on that occasion is probably lost. The fifty-second chapter of the book of Jeremiah was probably added by Ezra, as a preface or introduction to the Lamentations: the two first chapters are employed in describing the calamities of the siege of Jerusalem: in the third the author deplores the persecutions he himself had suffered: the fourth treats of the desolation of the city and temple, and the misfortune of Zedekiah: the fifth is a prayer for the Jews in their dispersion and captivity: and at the close of all he speaks of the cruelty of the Edomites, who had insulted Jerusalem in her misery. All the chapters in this book, except the last, are in verse, and digested in the order of the alphabet; with this difference, that in the first, second, and fourth, chapters, the first letter of every verse follows the order of the alphabet; but in the third the same initial letter is continued for three verses together. This order was probably adopted, that the book might be more easily learned and retained. The subject is extremely moving: and the style lively, pathetic, and affecting. In this kind of writing the prophet Jeremiah was a great master, according to the character which Grotius gives of him, *Mirus in affectibus concitandis*.

LAMER MOOR, or **LAMMER-MOOR HILLS**, [from *La Mer*, Fr. the sea, and *moor*,] a ridge of moorish hills, in the S. of Scotland, which begin at Coldingham in the Merse, and Dunglass in E. Lothian, (both of which places stand close upon the sea,) and extend W. with a broad surface from thirty to forty miles, till they terminate at Soutra hill, which is the highest of them. They are intersected by various openings, in different directions, and by rivulets running down on each side.

LAMIE, in pagan mythology, a sort of demons, who were supposed to devour children. Their form was human, resembling beautiful women. Horace mentions them in his Art of Poetry. They are also called Larvæ and Lemures.

LAMINÆ, in physiology, thin plates of which several substances consist.

LAMINATED, [from *lamina*, Lat.] plated; used of such bodies whose texture discovers such a disposition as that of plates lying over one another.

LAMIUM, **DEAD-NETTLE**: in botany, a genus of the gymnospermia order, and didynamia class of plants; natural order, Verticillata. Corolla upper lip, entire, arched, the under lip bilobous; throat with a dent or tooth on each side. There are thirteen species.

L. ALBUM, **WHITE ARCHANGEL**, or **DEAD-NETTLE**, grows frequently under hedges and in waste places. The flowers, which appear in April and May, have been particularly celebrated in uterine fluors, and other female weaknesses; also in disorders of the lungs; but they appear to be of very weak virtue; and have now no place in our pharmacopœia.

LAMLASH, a town of Scotland, on the E. coast of the Isle of Arran.

LAMMAS-DAY, a festival celebrated on the first of August by the Romish church, in memory of St. Peter's imprisonment. Lammas

laminas is by some derived from a Saxon word, signifying loaf-mass, because on that day the Anglo-Saxons made an offering of bread made with new wheat.

LAMO, an island and kingdom of Africa, on the coast of Melinda, in Zanguebar. It lies between the Isle of Pate, and Cape Ormosa.

LAMP, [*λαμπάς*], a vessel containing oil, with a wick for the purpose of affording light. Lamps were in general use amongst the Jews, Greeks, and Romans. The candlestick with seven branches, placed in the sanctuary by Moses, and those which Solomon afterwards prepared for the temple, were crystal lamps filled with oil, and fixed upon the branches. The lamps or candlesticks used by the Jews in their houses were generally put into a very high stand on the ground. The lamps used at marriage-festivals, alluded to in the parable of the ten virgins, (Matth. xxv. 1,) were of a different kind. According to antiquaries, they were sort of torches, made of iron or potter's earth, wrapped about with old linen, and moistened from time to time with oil. The lamps of Gideon's soldiers were of the same kind. The use of wax was not known to the Romans, but they generally used lamps; hence the proverb *Tempus et oleum perdidit*, I have lost my labour. Lamps were sometimes burnt in honour of the dead, both by Greeks and Romans. The utility of lamps in domestic life is universally acknowledged; we shall, therefore, notice such inventions or improvements relative to this branch of manufacture, as are most approved. The first we shall notice is, that of M. Argand, who obtained a patent in 1784: the superiority of his lamp depends on the admission of a larger volume of air to the flame, than is practicable on the common plan. This object is effected by employing a circular wick, so that a strong current of air rushes into the cylinder round which the wick is placed, and thus, together with the atmosphere, excites the flame to such a degree, that the smoke is entirely consumed. The light and heat are by this method remarkably increased, while the expence of the oil is considerably reduced; because those particles, which, in the usual lamps, are dissipated in smoke, will, by M. Argand's invention, be converted into a brilliant flame. A patent was obtained in 1787, by Mr. Peter Keir, for a contrivance of raising the supply of oil in lamps. The whole effect is produced by the application of another fluid, the specific gravity of which is greater than that of oil; and which communicates with the latter, by means of certain receivers, tubes, or conductors. These are so arranged, that the heavier liquid may press a column of oil upwards to any requisite height, for the purpose of supplying the lamp. Farther, by prolonging the conductor of the heavier fluid beneath the lower surface of the column of oil, the weight of the former will hydrostatically act upon such surface, and raise the column. Thus, the lamp will not only be furnished with the purest particles of oil from the upper part, but the flame will also be considerably elevated above the body of the vessel; and, being supplied from a contracted surface of oil, it will consequently afford a more diffused light, with a considerable diminution of shade. For a more minute account of this ingenious contrivance, we refer the inquisitive reader to the eighth volume of the Repository of Arts and Manufactures. Messrs. White and Smethurst greatly improved Argand's lamp, for which they obtained a patent in 1800. The whole is modestly called an improvement on the burner of the common Argand lamp; the object of which is, to afford a more free and plentiful supply of oil to the ignited part of the wick; so that it will burn better, require less frequent snuffing, and answer well, even with oil of an inferior quality. These advantages are obtained simply, by leaving a larger than the usual space between the two tubes, within which the wick is placed. Yet it is necessary to contract such space towards the top, in order that the burnt crust or cinder may be more conveniently removed; an object which may be effected by applying a ring or piece of metal, conically or otherwise formed, so as to reduce the space in the upper part of the lamp to the usual dimensions. The advantages of Messrs. White and Smethurst's improvement, are: 1. That the inconvenience hitherto complained of, respecting the mode of cleaning and dressing the lamps, is thus removed; as, upon their plan, the capillary tubes of the cotton-wick are prevented from being at any time obstructed by the viscid nature of the oil, while its ascent is promoted by such capillary attraction. 2. The quantity of oil consumed by these improved

lamps is, by the patentees, stated to be less, in the proportion of at least four to five. 3. One of the most important advantages thence derived is, that of the wick being rendered fit to burn common whale, or seal-oils, which are sold at about half the price of the best spermaceti oil, the only inflammable fluid hitherto used in Argand's lamps; while the former produce an equal degree of light. Lamps, in many respects, are far preferable to candles, especially for sedentary and studious persons; but as the light emitted by them is frequently too vivid for weak, or irritable eyes, we would recommend the use of a small screen, which should be proportionate to the disk of the flame, and be placed at one side of the light, in order to shade it from the reader's eye, without excluding its effect from others, or darkening the room. Such a contrivance is equally simple and useful; it may consist either of paper, or taffety, slightly gummed; and, being easily folded and carried in the pocket, is far superior to the common screens. From experiments made some years since, with the express view of ascertaining the expence of burning chamber-oil, it appears that a common taper-lamp, with eight cotton-threads in the wick, consumed in one hour $\frac{2}{3}$ parts, or about one-third of an ounce of spermaceti oil, which at that time cost 2s. 6d. per gallon; so that the expence of burning for twelve hours, amounted to 4s. 57 farthings, or about 1½ of a penny. The light emitted by such lamp, was as clear and bright as that yielded by candles, which run from eight to ten in the pound. Subsequent trials were made with M. Argand's lamp; the result of which was, that the latter will continue to burn three hours for the value of one penny. And though a candle, when newly snuffed, may appear to be preferable, yet the lamp is ultimately superior, both for steadiness and durability of light. Nay, one good lamp proved equal in its effect to half a dozen tallow-candles, consisting of six in the pound, the expence of which was eight-pence, while that of the lamp amounted only to two-pence halfpenny, in the space of seven hours.

LAMP, PERPETUAL. The testimonies of Pliny, St. Austin, and others, have led many to believe that the ancients had invented perpetual lamps; and some moderns have attempted to find out the secret, but in vain. Indeed it seems no easy matter to find out either a perpetual wick, or a perpetual oil. The curious may read Dr. Plot's conjectures on the subject in the Philosophical Transactions, No. 166; or in Lowthorp's Abridgement, vol. iii. p. 636. But few, we believe, will give themselves the trouble of searching for the secret, when they consider the credulity of Pliny and St. Austin. Their testimony is not a sufficient inducement to us to believe, that a lamp was ever formed to burn 1000 or 1500 years; much less is it credible that the ancients had the secret of making one burn for ever.

LAMP, ROLLING. See Plate XCVII. fig. 4. A machine AB, with two moveable circles, DE, FG, within it; whose common centre of motion and gravity is at K, where their axes of motion cross one another. If the lamp KC, made pretty heavy and moveable about its axis HI, and whose centre of gravity below K, be fitted within the inner circle, the common centre of gravity of the whole machine will fall below K; and by reason of the pivots A, B, D, E, H, I, will be always at liberty to descend; hence, though the whole machine be rolled along the ground, or moved in any manner, the flame will always be uppermost, and the oil cannot spill. In this manner they hang the compass at sea; and thus should all the moon-lanterns be made, that are carried before coaches, chaises, and the like.

LAMP-BLACK, one of the black colouring matters. See COLOUR. When lamp-black is combined with oil, so as to form a black varnish, it appears from various experiments, that bodies painted with this compound resist the effects of electricity in a most surprizing degree; and that they have, in a variety of cases, even repelled lightning.

LAMP-FURNACE. See CHEMISTRY.

LAMPAS, in farriery, denotes an excrescence in the roof of a horse's mouth, which is sometimes so luxuriant that it grows above the teeth, and thus prevents his feeding. See FARRIERY.

LAMPEDOSA, a pleasant and fertile island, though not inhabited, in the Mediterranean, near the coast of Tunis, about twelve miles in circumference, 63 miles W. of Malta. Lon. 11. 0. E. Lat. 35. 40. N.

LAMPREY. See PETROMYZON.

LAMPSCIUS, an epithet for any thing belonging to Lampscus.

sacus. It was also used for lascivious, on account of the character of the people.

LAMPSACUM, or **LAMPSACUS**, in ancient geography, a considerable city of Mysia; called Pilyea, by Homer, because abounding in pine-trees. It is now called Lampsaki. Lon. 28. 0. E. Lat. 40. 12. N.

LAMPYRIS, the **FIRE-FLY**; a genus of insects of the coleoptera order; the characters are: antennæ filiform; elytra flexible; thorax flat, of a semi-orbicular form, surrounding and concealing the head. The segments of the abdomen terminate in papillæ, which are turned up towards the elytra, and partly fold one over the other. The females, in general, are apterous. There are about sixty species; of which the most remarkable is the

L. NOCTICULA, or **COMMON GLOW-WORM**, which is a highly curious and interesting animal. It is seen during the summer-months as late as the close of August, if the season be mild, on dry banks, about woods, pastures, and hedgeways, exhibiting, as soon as the dusk of the evening commences, the most vivid and beautiful phosphoric splendor, in form of a round spot of considerable size. The animal itself, which is the female insect, measures about three quarters of an inch in length, and is of a dull, earthy, brown, colour, on the upper parts, and beneath, more or less tinged with rose-colour, with the two or three last joints of the body of a pale or whitish sulphur-colour. It is from these parts that the phosphoric light above-mentioned proceeds, which is of a yellow colour, with a very slight cast of green: the body, exclusive of the thorax, consists of ten joints or divisions. The larva, pupa, and complete female insect, scarcely differ perceptibly from each other in general appearance, but the phosphoric light is strongest in the complete animal. The glow-worm is a slow-moving insect, and in its manner of walking frequently seems to drag itself on by starts, or slight efforts. The male is smaller than the female, and is provided both with wings and wing-sheaths; and it is but rarely seen. It is certain, that in some species of this genus, the male, as well as the female, is luminous; as in the *lampyrus italica*, which seems to be a native of our own island also, though less common here than in the warmer parts of Europe. Aldrovandus describes the winged glow-worm as having its wing-shells of a dusky colour, and at the end of the body two brilliant fiery spots like the flame of sulphur. See Plate LXXVI.

LANA, **WOOL**; in botany, a species of pubescence, down, or velvet, which serves to screen the leaves, covered with it, from the heat: this appearance is very conspicuous in the horehound, woolly thistle, &c. See **BOTANY**.

LANARIA, a genus of the hexandria monogynia class and order. Corolla superior, woolly; capsules three-celled. There is but one species, a herb of the Cape.

LANARK, or **LANERKSHIRE**, a county of Scotland, called also Clydesdale, from the Clyde, by which it is watered; though this name belongs properly only to the southern district of Lanerkschire. It is bounded on the N. by Dumbartonshire; E. by Stirling, Edinburgh, and Peebles-shires; on the S. by Dumfries; and on the W. by Ayr and Renfrew shires. Its extent from N. to S. is about forty miles, and from E. to W. thirty-six.

LANARK, the capital of the above county, twenty-four miles E. of Glasgow, and thirty W. of Edinburgh.

LANCASHIRE, a county of England, bounded on the W. by the Irish sea, on the N. by Cumberland, Westmoreland, and Yorkshire, on the E. by Yorkshire, and on the S. by Cheshire; extending 74 miles in length, and from 15 to 44 in breadth. The air of Lancashire is pure, and agreeable, except among the fens and on the sea-shore, where the atmosphere is loaded with putrid exhalations, producing malignant and intermitting fevers, scurvy, rheumatism, dropsy, and consumption. The soil is various; poor and rocky on the hills, fat and fertile in the valleys, and champaign country. The colour of the peat also varies; white, grey, and black. There is a bituminous earth about Ormskirk, that smells like the oil of amber, and indeed yields an oil of the same nature, both in its scent and medicinal effects; as it reduces raw flesh to the consistence of mummy. It also burns like a torch, and is used as such by the country people. This county abounds with lead, iron, copper, antimony, black lead, lapis calaminaris, spar, green vitriol, alum, sulphur, pyrites, freestone, and pit and canal coal. The level country produces plenty of wheat and barley, and the skirts of the hills yield good harvests of excel-

lent oats: very good hemp is also raised, and the pasture in the valley is so peculiarly rich, that the cattle fed upon it are much larger and fatter than those in any other part of England.

LANCASTER, the capital of Lancashire, 235 miles N. N. W. of London. Lon. 2. 56. W. Lat. 54. 4. N.

LANCASTER, a county of S. Carolina, in Camden district.

LANCASTER, a town in the above county, 36 miles from Camden, and 47 from Charlotte.

LANCASTER, a town of Massachusetts, 35 miles W. N. W. of Boston.

LANCASTER, a populous and wealthy county of Pennsylvania.

LANCASTER, the capital of the above county, 58 miles W. by N. of Philadelphia.

LANCE, [*lancea*, Lat.] a weapon used by the ancient cavaliers, in form of a half-pike. It consisted of three parts, the shaft or handle, the wings, and the dart. Pliny attributes the invention of lances to the Etolians. But Varro and Aulus Gellius say it is Spanish; whence others conclude the use of this weapon was borrowed by the people of Italy from the Spaniards. Diodorus Siculus derives it from the Gaulish, and Festus from the Greek *λῆξα*, which signifies the same.

LANCE, in ichthyology. See **AMMODYTES**.

LANCEOLATED LEAF, one resembling a spear's point. See **BOTANY**.

LANCEROTA, one of the Canary islands, 32 miles long and 22 broad.

LANCEROTA, a city in the above island. Lon. 13. 5. W. Lat. 28. 40. N.

LANCE, a sharp-pointed and two-edged instrument chiefly used for opening veins in the operation of bleeding; also for laying open abscesses, tumours, &c. The late Dr. John Brown often said in his lectures, when declaiming against phlebotomy, that "this little mischievous instrument has murdered more of the human race, than all the swords, spears, javelins, battering-rams, guns, cannons, and other instruments of war, that ever were invented." Without giving full credit to this hyperbolic assertion, it must be allowed, that copious bleeding has been by far too frequently prescribed in many diseases.

LANCH, a peculiar sort of long boat, used by the French, Spaniards, and Italians, and in general by other European nations, when voyaging in the Mediterranean sea. It is proportionably longer, lower, and more flat-bottomed than the long-boat; of consequence less fit for sailing, but better calculated for rowing along a flat shore.

LANCH, or **LAUNCH**, is also the movement by which a ship or boat descends from the shore, either when she is at first built, or at any time afterwards. To facilitate the operation of lanching, and prevent any interruption therein, the ship is supported by two strong platforms, laid with a gradual inclination to the water, on the opposite sides of her keel, to which they are parallel. Upon the surface of this declivity are placed two corresponding ranges of planks, which compose the base of a frame called the cradle, whose upper part envelopes the ship's bottom, whereto it is securely attached. Thus the lower surface of the cradle, conforming exactly to that of the frame below, lies flat upon it lengthwise, under the opposite sides of the ship's bottom; and as the former is intended to slide downwards upon the latter, carrying the ship along with it, the planes or faces of both are well daubed with soap and tallow. The necessary preparations being made for the launch, all the blocks and wedges, by which the ship was formerly supported, are driven out from under her keel, till her whole weight gradually subsides upon the platforms above described, which are accordingly called the ways. The shores and stanchions, by which she is retained upon the stocks till the period approaches for lanching, are at length cut away, and the screws applied to move her if necessary. The motion usually begins on the instant when the shores are cut, and the ship slides downward along the ways, which are generally prolonged under the surface of the water, to a sufficient depth to float her as soon as she arrives at the farthest end thereof. When a ship is to be lanch'd, the ensign, jack, and pendant, are always hoisted, the last being displayed from a staff erected in the middle of the ship. Ships of the first rate are commonly constructed in dry docks, and afterwards floated out, by throwing open the flood-gates, and suffering the tide to enter as soon as they are finished.

LANCIANO, a considerable town of Naples, in Abruzzo Citra. Lon. 15. 5. E. Lat. 42. 12. N.

LAND, in a general sense, denotes terra firma, as distinguished from sea.

LAND, in a limited sense, denotes arable ground. See HUSBANDRY.

LAND, SHUT IN, in sea-language, is used to signify that another point of land hinders the sight of that from which the ship came.

LAND, TO LAY THE, or LAND LAID, in sea-language, is just to lose sight of it.

LAND, TO SET THE, is, to see by the compass how it bears.

LANDA, a kingdom in the isle of Borneo.

LANDAFF, a town of S. Wales, in Glamorganshire. Lon. 3 20. W. Lat. 51. 33. N.

LANDAU, a town of France, in the department of the Lower Rhine, 270 miles E. of Paris. Lon. 8. 12. E. Lat. 49. 13. N.

LANDAU, a town of Bavaria, on the Isar; 32 miles W. of Passau.

LANDAU, a town of Germany in the late circle of the Lower Rhine, 12 miles N. of Waldeck.

LANDEN, JOHN, F. R. S. an eminent mathematician, born at Peakirk, near Peterborough in Northamptonshire, in Jan. 1719. He became very early a proficient in the mathematics, for we find him a very respectable contributor to the Ladies Diary in 1744. In the Philos. Trans. for 1754, vol. 48, he gave "An investigation of some theorems which suggest several very remarkable properties of the circle, and are at the same time of considerable use in resolving fractions, the denominators of which are certain multinomials, into more simple ones, and by that means facilitate the computation of fluents." In 1755, he published a volume of about 160 pages, entitled *Mathematical Lucubrations*. This title was adopted, to inform the world, that the study of the mathematics was rather the pursuit of his leisure-hours than his principal employment; and indeed it continued to be so the greatest part of his life, for about 1762 he was appointed agent to Earl Fitzwilliam, an employment which he retained till within two years of his death. About the end of 1759, he published proposals for printing by subscription "The Residual Analysis, a new Branch of the Algebraic art;" and in 1758 he published a small tract in 4to. entitled "A Discourse on the Residual Analysis," in which he resolved a variety of problems by a mode of reasoning entirely new. In the 51st vol. of the Philos. Trans. for 1760, he gave "A new Method of computing the Sums of a great number of infinite Series." In 1764, he published the first book of "The Residual Analysis," in a 4to. vol. of 218 pages, with several copperplates. In this treatise, besides explaining the principles on which this new analysis was founded, he applied it to drawing tangents and finding the properties of curve lines, &c. On the 16th Jan. 1766, he was elected F. R. S. In the 58th volume of the Philos. Trans. for 1768, he gave a "Specimen of a new method of comparing curvilinear areas; by means of which many areas did not appear to be comparable by any other method;" a circumstance of no small importance in that part of natural philosophy which relates to the doctrine of motion. In the 60th volume for 1770, he gave "Some new theorems for computing the whole areas of curvilinear figures where the ordinates are expressed by fractions of a certain form," in a more concise and elegant manner than had been done by Cotes, De Moivre, and others, who had considered the subject before him. In the 61st volume for 1771, he has investigated several new and useful theorems for computing certain fluents, which are assignable by arcs of the conic sections. In 1771, he also published, "Animadversions on Dr. Stewart's Computation of the Sun's Distance from the Earth." In the 65th volume of the Philos. Trans. for 1775, he gave the investigation of a general theorem, for finding the length of any arc of a conic hyperbola by means of two elliptic arcs; and observes, that by the theorems there investigated, both the elastic curve, and the curve of equable recess from a given point, may be constructed in those cases where Mr. Maclaurin's elegant method fails. In the 67th volume for 1777, he gave "A new theory of the motion of bodies revolving about an axis in free space, when that motion is disturbed by some extraneous force, either percussive or accelerative." Finding afterwards that the subject had been previously handled by M. D'Alembert, and ano-

ther mathematician, Mr. Landen took up the subject again; and though he did not then give a solution to the general problem, viz. "To determine the motions of a body of any form whatever, revolving without restraint about an axis passing through its centre of gravity," he fully removed every doubt of the kind which had been started by the person alluded to by M. D'Alembert, and pointed out several bodies, which, under certain dimensions, have that remarkable property. This paper is given, among many others equally curious, in a volume of *Memoirs*, which he published in 1780; with a valuable and extensive appendix, containing "Theorems for the calculation of fluents." The tables which contain these theorems are more complete than any to be found in any other author, and are chiefly of his own investigating; being such as had occurred to him in the course of a long and close application to mathematical studies in almost every branch of those sciences. In 1781, 1782, and 1783, he published three tracts on the summation of converging series, in which he explained and shewed the extent of some theorems given for that purpose by M. de Moivre, Mr. Sterling, and his old friend Simpson, in answer to those things which he thought had been written to the disparagement of those excellent mathematicians. In 1782, he had made such improvements in his theory of rotatory motion, as enabled him, to give a solution of the general problem specified above; but, finding the result of it to differ very materially from those which had been given by M. D'Alembert, and M. Euler, the agreement of two writers of such established reputation made him long dubious of the truth of his own solution, and induced him to revise the process again and again with the utmost circumspection. But being every time more convinced that his own solution was right and theirs wrong, he at length gave it to the public in the 75th vol. of the Philos. Trans. for 1785. He had for several years been severely afflicted with the stone, to such a degree as to be confined to his bed for a month at a time; yet even this dreadful disorder did not abate his ardour for mathematical studies; for the second volume of his *Memoirs*, was written and revised during the intervals of his disorder. This volume, besides a solution of the general problem concerning rotatory motion, contains the resolution of the problem concerning the motion of a top; an investigation of the motion of the equinoxes, in which Mr. Landen was the first who pointed out the cause of Sir Isaac Newton's mistake in his solution of this celebrated problem; and some other papers of considerable importance. He just lived to see this work finished, and received a copy of it the day before his death, which happened on the 15th of January, 1790, at Milton, near Peterborough, in the 71st year of his age.

LANDEN, a town of France in the department of the Dyle, and late province of Austrian Brabant, 17 miles W. S. W. of Leige, and 18 N. E. of Namur.

LANDERNAU, a town of France, in the department of Finisterre, and late province of Bretagne, 20 miles N. E. of Brest.

LANDES, a department of France, comprehending the late territory of Marsan, bounded on the N. by the department of Gironde; E. by those of Lot and Garonne, and Gers: S. by that of Lower Pyrenees; and W. by the Sea. It is in general sandy and barren, but fertile on the S. E. Mont de Marsan is the capital.

LANDGRAVE, [from *land*, German, earth, and *graff* or *grace*, a judge or count.] was a title given to those who executed justice in behalf of the emperors, with regard to the internal policy of the country. It does not seem to have been used before the 11th century. Those judges were first appointed within a certain district of Germany: in time the title became hereditary, and the judges assumed the sovereignty of the several districts over which they presided. Landgrave was applied, by way of eminence, to those sovereign princes of the late Germanic empire, who possessed by inheritance certain estates called landgraves, and of which they received the investiture from the emperor. There were four princes who had this title, viz. those of Thuringia, Hesse, Alsace, and Leuchtenberg. There were also other landgraves, who were not princes but counts of the empire. See COUNT.

LAND-LOCKED is when land lies all round the ship, so that no point of the compass is open to the sea. If she be at anchor in such a place, she is said to ride land-locked, and is therefore concluded to ride safe from the violence of the winds and tides.

LAND-MARK, any thing set up to preserve the boundaries of lands.

lands. Also any mountain, rock, steeple, tree, &c. that may serve to make the land known at sea.

LANDRECY, a town of France, in the department of the North, and late province of Hainault, 100 miles N. by E. of Paris.

LANDSBERG, a town of Bavaria, 18 miles S. of Augsburg.

LANDSCAPE, in painting, the view or prospect of a country, extended as far as the eye will reach. See **PAINTING**.

LANDSCRON, a fort of France, in the department of the Upper Rhine; 5 miles S. W. of Basle.

LANDSCRON, **LANDSCRONA**, or **LANDSCROON**, a sea-port town of Sweden, in the province of S. Gothland, and territory of Schonen, 22 miles N. of Copenhagen. Lon. 14. 20. E. Lat. 55. 42. N.

LAND'S END, a remarkable promontory of Cornwall, the most westerly point of Great Britain. Lon. 5. 45. W. Lat. 50. 7. N.

LANDSIHUT, a town of Bavaria, 32 miles N. E. of Munich.

LAND-TAX, an ancient branch of the public revenue, the origin of which may be traced to the fines or communications for military service, levied, during the feudal system, under the name of scutages. These are supposed to have been at first mere arbitrary compositions, as the king and the persons liable could agree; but the practice having been much abused, it was declared by Magna Charta, and afterwards repeatedly confirmed by acts of parliament, that no scutage should be imposed without the consent of the great men and commons, in parliament assembled. This tax was sometimes exacted under the name of hydage, or carrucage; but taxes on land came afterwards to be generally denominated subsidies, or assessments. During the Commonwealth, taxes on land were levied by monthly assessments; and commissioners were appointed in each county for rating the individuals. These assessments varied according to the exigencies of the times, from 35,000*l.* to 120,000*l.* a month; the assessments in Scotland were commonly 6000*l.* but sometimes 1000*l.* a month. In Ireland 9000*l.* a month. This mode of raising money was so productive, that, with little variations, under the denomination of land-tax it has ever since formed an important branch of the revenue. The land-tax, till lately, differed from all the other branches of the public revenue (except part of the duties on malt), in being imposed annually; whereas other taxes have been granted either for a term of years, or, more commonly of late years, for ever; but though granted for only one year at a time, it has been regularly continued from year to year since the Revolution, having never been wholly taken off; but it has varied with respect to the rate at which it has been imposed, having been usually reduced during peace, and increased again in time of war, to answer in part, the increased expenditure. In 1693 it was first raised to four shillings in the pound, upon a valuation given in in the preceding year, and according to which it has continued to be raised to the present time, at the following rates:

In 1693 and 1699,	at 3 <i>s.</i>
1700,	at 2 <i>s.</i>
1701,	at 3 <i>s.</i>
1702 to 1712,	at 4 <i>s.</i>
1713 to 1715,	at 2 <i>s.</i>
1716,	at 4 <i>s.</i>
1717 to 1721,	at 3 <i>s.</i>
1722 to 1726,	at 2 <i>s.</i>
1727,	at 4 <i>s.</i>
1728 and 1729,	at 3 <i>s.</i>
1730 and 1731,	at 2 <i>s.</i>
1732 and 1733,	at 1 <i>s.</i>
1734 to 1739,	at 2 <i>s.</i>
1740 to 1749,	at 4 <i>s.</i>
1750 to 1752,	at 3 <i>s.</i>
1753 to 1755,	at 2 <i>s.</i>
1756 to 1766,	at 4 <i>s.</i>
1767 to 1770,	at 3 <i>s.</i>
1771,	at 4 <i>s.</i>
1772 to 1775,	at 3 <i>s.</i>
1776 to 1798,	at 4 <i>s.</i>

The sums to be raised at 4*s.* in the pound were stated, in the an-

nual act, at 1,989,673*l.* 7*s.* 10½*d.* for England, and 47,934*l.* 1*s.* 2*d.* for Scotland, making together 2,037,627*l.* 9*s.* 0½*d.*; and upon credit of this assessment 2,000,000*l.* was annually borrowed of the Bank in anticipation of the tax, for which sum exchequer-bills were given them, which were to be discharged out of the produce of the tax as it came in; but the full amount of the assessment was seldom, if ever, collected, so that the nett payments into the exchequer always fell short of the sum borrowed on the credit thereof, exclusive of interest on the bills; and the deficiency was made good out of the supplies for the next year. In 1798 the current value of the public funds having been unusually depressed for some time past, and apprehensions being entertained that the further increase of the funded debt would be attended with peculiar inconvenience, unless some mode was discovered of counteracting its effects, a project was adopted of offering the land-tax for redemption or sale. With this view an act was passed, making the land-tax a perpetual tax, from 25th March, 1799; and being thus converted into a permanent annuity, it was offered for sale to the proprietors of the lands upon which it was charged; or if they declined it, to any other person who chose to become a purchaser. In the first case it was considered as a redemption of the tax, the estate becoming in future wholly freed from it; in the latter case the purchaser became entitled to receive the land-tax regularly from the receiver general, half-yearly, on the 16th of March and 20th of September in every year. The consideration to be given in either case was not to be in money, but stock, either in the three per cent. consols., or three per cent. reduced, to be transferred to the commissioners for the reduction of the national debt. The quantity of stock to be transferred for redemption of the tax by persons interested in the land on which it was charged, was so much capital as yielded an annuity or dividend exceeding the amount of the tax to be redeemed by one-tenth part thereof; and the stock to be transferred for purchase of the tax by persons not interested in the land, was so much capital as yielded an annuity or dividend exceeding the tax to be purchased by one-fifth part thereof. Thus the amount of three per cent. stock to be transferred for 10*l.* per annum tax was 366*l.* 13*s.* 4*d.* for redemption, or 400*l.* for purchase. This scheme was adopted with the view of facilitating the raising of money on loan, by absorbing a large quantity of floating stock, and thus raising the current price; while at the same time it would be attended with an increase of revenue. This at least was the avowed object of the measure, which it was estimated would be the means of redeeming or taking out of the market about 80,000,000*l.* of stock; the advantages offered by it were however, by no means such as to induce a general approval of it, many persons subject to the tax declined redeeming it, and but few were inclined to become purchasers. The period first limited was several times extended, but the plan succeeded very imperfectly, and on the 1st February, 1803, the total amount of 3 per cent stock, which had been transferred for the redemption of land-tax, was only 21,794,307*l.* 17*s.* 3*d.*

LAND-TO, or the ship lies land-to, means she is so far from shore, that it can only just be discerned.

LAND-TURN, is a wind that in almost all hot countries blows at certain times from the shore in the night.

LAND-WAITER, an officer of the customs, who is to watch what goods are landed. His duty is, upon landing any merchandise, to examine, taste, weigh, measure them, &c. and to take an account thereof. In some ports they also execute the office of a coast-waiter. They are likewise occasionally styled searchers, and are to attend and join with the patent searcher in the execution of all cockets for the shipping of goods to be exported to foreign parts; and in cases where drawbacks on bounties are to be paid to the merchant on the exportation of any goods, they, as well as the patent searchers, are to certify the shipping thereof on the debentures.

LANESBOROUGH, a borough of Ireland, in the county of Longford, on the Shannon, 62 miles from Dublin.

LANGANICO, or **SUNRI**, a town of European Turkey, in the Morea, anciently called Olympia, seated on the Carbon, the ancient Alpheus; famous for its temple and image of Jupiter Olympius, and still more for giving name to the celebrated Olympic Games performed near it. It is 60 miles S. W. of Corinth.

LANGÉAC, a town of France, in the department of Cantal, and

and late province of Auvergne; 17 miles E. of St. Flour, and 18¹/₂ W. of Puy.

LANGÉAIS, an ancient town of France, in the department of Indre and Loire, and late province of Touraine, 12 miles W. of Tours.

LANGELAND, an island of Denmark in the Baltic sea, in the strait called the Great Belt, and between Zealand, Saland, and Fyonia. It produces plenty of corn, and the principal town is Ruteoping. Lon. 11. 10. E. Lat. 55. 0. N.

LANGENTHAL, a town of the Helvetic republic, in Berne, 10 miles E. of Soleure, and 18 N. E. of Berne.

LANGIONA, a town of Asia, capital of the kingdom of Laos, with a magnificent palace. Lon. 96. 45. E. Lat. 22. 38. N.

LANGON, a town of France, in the department of Gironde, famous for its wine, 15 miles N. of Bazas. Lon. 0. 10. W. Lat. 44. 33. N.

LANGPORT, a well frequented town of Somersetshire, 132 miles from London, on the Parrot, between Bridgewater and Crewkern.

LANGREL SHOT, used at sea, consists of two bars of iron joined by a chain or shackle, and having a ball of iron fixed on each end; by means of which apparatus it does great execution among the enemy's rigging. See CHAIN-SHOT.

LANGRES, a town of France, in the department of Upper Marne, a late province of Champagne, 35 miles N. E. of Dijon. Lon. 5. 20. E. Lat. 47. 52. N.

LANGUAGE.

LANGUAGE, [*lingua*, Lat.] the expression of our ideas and their various relations by certain articulate sounds, which are used as the signs of those ideas and relations. By articulate sounds are meant those modulations of simple voice, or of sound emitted from the thorax, which are formed by means of the mouth and its several organs,—the teeth, the tongue, the lips, and the palate. Language also frequently signifies any signs made use of for the expressing of our ideas, and their relations. In a more general sense, the word language is sometimes used to denote all sounds, by which animals of any kind express their particular feelings and impulses, in a manner that is intelligible to their own species. The divine author of nature has endowed every animal with powers sufficient to make known all those of its sensations and desires, with which it is necessary, for the preservation of the individual or the continuance of the kind, that others of the same species should be acquainted. For this purpose, the organs of all vocal animals are so formed, as, upon any particular impulse, to utter sounds, of which those of the same species instinctively know the meaning. The summons of the hen is instantly obeyed by the whole brood of chickens; and in many others of the irrational tribes a similar mode of communication may be observed between the parents and the offspring, and between one animal and its customary associate. But it is not among animals of the same species only that these instinctive sounds are mutually understood. It is as necessary for animals to know the voices of their enemies as the voices of their friends; and the roaring of the lion is a sound, of which, previous to all experience, every beast of the forest is naturally afraid. Between these animal voices and the language of men there is, however, very little analogy. Human language is capable of expressing ideas and notions, which there is every reason to believe that the brutal mind cannot conceive. "Speech," says Aristotle, "is made to indicate what is expedient and what inexpedient, and in consequence of this what is just and unjust. It is therefore given to men; because it is peculiar to them, that of good and evil, just and unjust, they only (with respect to other animals) possess a sense of feeling." The voices of brutes seem intended by nature to express, not distinct ideas or moral modes, but only such feelings as it is for the good of the species that they should have the power of making known; and in this, as in all other respects, these voices are analogous; not to our speaking, but to our weeping, laughing, singing, groaning, screaming, and other natural and audible expressions of appetite and passion. Another difference between the language of men and the voices of brutes consists in articulation, by which the former may be resolved into distinct elementary sounds or syllables; whereas the latter, being for the most part unarticulated, is not capable of such a resolution. Hence Homer and Hesiod characterize man by the epithet *μυῖα*, or voice dividing, as denoting a power peculiar to the human species: for though there are a few birds which utter sounds that may be divided into syllables, yet each of these birds utters but one such sound, which seems to be employed rather as notes of natural music than for the purpose of giving information to others; for when the bird is agitated, it utters cries which are very different, and have no articulation. A third difference between the language of

men and the significant cries of brute animals, is, that the former is from art and the latter from nature. Every human language is learned by imitation, and is intelligible only to those who either inhabit the country where it is vernacular, or have been taught it by a master or by books: but the voices in question are not learned by imitation; and being wholly instinctive, they are intelligible to all the animals of that species by which they are uttered, though brought together from the most distant countries on earth. That a dog, which had never heard another bark, would notwithstanding bark himself, and that the barkings or yelps of a Lapland dog would be instinctively understood by the dogs of Spain, Calabria, or any other country, are facts which admit not of doubt: but there is no reason to imagine, that a man, who had never heard any language spoken, would himself speak; and it is well known, that the language spoken in one country is unintelligible to the natives of another country where a different language is spoken. In the woods of different countries solitary savages have at different times been found, who, though they apparently possessed all the sagacity natural to man, and though their organs both of hearing and of speech were perfect, never used articulate sounds as signs of sensations or ideas. They uttered indeed the inarticulate cries which are instinctively expressive of pleasure and pain, of joy and sorrow, more distinctly and forcibly than men civilized; but with respect to the very rudiments of language, they were what Horace represents all mankind to have been originally,—*mutum et turpe pecus*. Indeed it is obvious, that were there any instinctive language, the first words uttered by all children would be the same; and that every child, whether born in the desert or in society, would understand the language of every other child, however educated, or however neglected. Nay we may even venture to affirm, that such a language, though its general use might, in society, be superseded by the prevailing dialect of art, could never be wholly lost; and that no man of one country would find it difficult, far less impossible, to communicate the knowledge of his natural and most pressing wants to the men of any other country, whether barbarous or civilized. The exercise of cultivated reason, and the arts of civil life, have indeed eradicated many of our original instincts, but they have not eradicated them all. There are external indications of the internal feelings and desires, which appear in the most polished society, and which are confessedly instinctive. The passions, emotions, sensations, and appetites, are naturally expressed in the countenance, by characters which the savage and the courtier can read with equal readiness. The look serene, the smoothed brow, the dimpled smile, and the glistening eye, denote equanimity and good will in terms which no man mistakes. The contracted brow, the glaring eye, the sullen gloom, and the threatening air, denote rage, indignation, and defiance, as plainly and forcibly as revilings or imprecations. To teach men to disguise these instinctive indications of their temper, and

"To carry smiles and sunshine in their face,
"When discontent sits heavy at their heart,"

constitutes a great part of modern and refined education. Yet in spite of every effort of the utmost skill, and every motive resulting from

from interest, the most consummate hypocrite, or the most hackneyed politician, is not always able to prevent his real disposition from becoming apparent in his countenance. He may indeed, by long practice, have acquired a very great command both over his temper and over the instinctive signs of it: but at times nature will predominate over art, and a sudden and violent passion will flash in his face, so as to be visible to the eye of every beholder. If these observations be just, and we think nobody will call them in question, it follows, that, if mankind were prompted by instinct to use articulate sounds as indications of their passions, affections, sensations, and ideas, the language of nature could never be wholly forgotten, and that it would sometimes predominate over the language of art. Groans, sighs, and some inarticulate lively sounds, are naturally expressive of pain and pleasure, and equally intelligible to all mankind. The occasional use of these no art can wholly banish; and if there were articulate sounds naturally expressive of the same feelings, it is not conceivable, that art or education could banish the use of them, merely because by the organs of the mouth they are broken into parts, and resolvable into syllables. As it is thus evident, that there is no instinctive articulated language, it has become an enquiry of some importance, how mankind were first induced to fabricate articulate sounds, and to employ them for the purpose of communicating their thoughts. Children learn to speak by insensible imitation; and when advanced some years in life, they study foreign languages under proper instructors: but the first men had no speakers to imitate, and no formed language to study; by what means then did they learn to speak? On this question only two opinions can be formed. Language must either have been originally revealed from heaven, or the fruit of human invention. The greater part of Jews and Christians, and even some of the wisest pagans, have embraced the former opinion; which seems to be supported by the authority of Moses, who represents the Supreme Being as teaching our first parents the names of animals. The latter opinion is held by Diodorus Siculus, Lucretius, Horace, and many other Greek and Roman writers, who consider language as one of the arts invented by man. This opinion sprung from the atonic cosmogony framed by Mochus the Phœnician, and afterwards improved by Democritus and Epicurus; and though it is part of a system, in which the first men are represented as having grown out of the earth, like trees and other vegetables, it has been adopted by several modern writers of note; particularly Father Simon, Voltaire, the abbé Condilliac, Dr. Adam Smith, and the late Lord Monboddo. These Authors acknowledge that language is of very difficult invention, and far beyond the reach of the grossest savages, and their account of its origin appears very imperfect. Mrs. Warburton, Delaney, Johnson, Beattie, Blair, and Stanhope Smith of New Jersey, who think that language was originally revealed from heaven, consider the account of its human invention as a series of mere suppositions, hanging loosely together, and the whole suspended from no fixed principle. The opinions of Diodorus, Vitruvius, Horace, Lucretius, and Cicero, which are frequently quoted in its support, are in their estimation of no greater authority than the opinions of other men; for as language was formed and brought to a great degree of perfection long before the era of any historian with whom we are acquainted, the antiquity of the Greek and Roman writers, who are comparatively of yesterday, gives them no advantage in this inquiry over the philosophers of France and England. Aristotle has defined man to be *ζῷον μίμητικόν*: and the definition is certainly so far just, that man is much more remarkable for imitation than invention; and therefore, say the reasoners on this side of the question, had the human race been originally mutum et turpe pecus, they would have continued so to the end of time, unless they had been taught to speak by some superior intelligence. That the first men sprung from the earth like vegetables, no modern philosopher has ventured to assert; nor does there any where appear sufficient evidence, that men were originally in the state of savages. The oldest book extant contains the only rational cosmogony known to the ancient nations; and that book represents the first human inhabitants of this earth, not only as reasoning and speaking animals, but also as in a state of high perfection and happiness, of which they were deprived for disobedience to their Creator. Moses, setting aside his claim to inspiration, deserves, from the consistence of his narrative, at least as much credit as Mochus, or Democritus, or Epicurus; and from his prior antiquity, if anti-

quity could on this subject have any weight, he would deserve more, as having lived nearer to the period of which they all write. But the question respecting the origin of language may be decided without resting on authority of any kind, merely by considering the nature of speech, and the mental and corporeal powers of man. Those who maintain it to be of human invention, suppose men at first to have been solitary animals; afterwards to have herded together without government or subordination: then to have formed political societies, and by their own exertions to have advanced from the grossest ignorance to the refinements of science. But this is a supposition contrary to all history and all experience. There is not upon record a single instance well authenticated of a people emerging by their own efforts from barbarism to civilization. There have indeed been many nations raised from the state of savages; but it is known that they were polished, not by their own repeated exertions, but by the influence of individuals or colonies from nations more enlightened than themselves. The original savages of Greece were trained by the Pelasgi, a foreign tribe; and were afterwards further polished by Orpheus, Cecrops, Cadmus, &c. who derived their knowledge from Egypt and the East. The ancient Romans, a ferocious and motley crew, received the blessings of law and religion from a succession of foreign kings; and the conquests of Rome at a later period contributed to civilize the rest of Europe. In America the only two nations which, at the invasion of the Spaniards, could be said to have advanced a single step from barbarism, were indebted for their superiority over the other tribes, not to the gradual and unassisted progress of the human mind, but to the wise institutions of foreign legislators. It is not necessary here to trace the progress of man from the savage state to that of political society; but experience teaches us, that in every art it is much easier to improve than to invent. The human mind, when put into the proper track, is indeed capable of making great advances in arts and sciences; but it has not, in a people sunk in ignorance and barbarity, sufficient vigour to discover that track, or to conceive a state different from the present. If the rudest inhabitants of America and other countries have continued, (as there is every reason to believe they have,) for ages in the same unvaried state of barbarism, how is it imaginable that people so much ruder than they, as to be ignorant of all language, should think of inventing an art so difficult as that of speech, or even to form a conception of it? In building, fishing, hunting, navigating, &c. they might imitate the instinctive arts of other animals; but there is no other animal that expresses its sensations and affections by arbitrary articulate sounds. It is said, that before language could be invented, mankind must have existed for ages in large political societies, and have carried on in concert some common work: but if inarticulate cries, and the natural visible signs of the passions and affections, were modes of communication sufficiently accurate to keep a large society together for ages, and to direct its members in the execution of some common work, what could be their inducement to the invention of an art so useless and difficult as that of language. Let us however suppose, that different nations of savages set about inventing an art of communicating their thoughts, which experience had taught them was not absolutely necessary; how came they all, without exception, to think of the one art of articulating the voice for this purpose? Inarticulate cries, out of which language is fabricated, have indeed an instinctive connexion with our passions and affections: but there are gestures and expressions of countenance with which our passions and affections are in the same manner connected. If the natural cries of passion could be so modified and enlarged as to be capable of communicating to the hearer every idea in the mind of the speaker, it is certain that the natural gestures could be so modified as to answer the very same purpose (see PANTOMIME,) and it is strange that among the several nations who invented languages, not one should have stumbled upon fabricating visible signs of their ideas, but that all should have agreed to denote them by articulated sounds. Every nation whose language is narrow and rude supplies its defects by violent gesticulations; and therefore, as much less genius is exerted in the improvement of any art, than was requisite for its first invention, it is natural to suppose, that, had men been left to devise for themselves a method of communicating their thoughts, they would not have attempted any other, than that by which they now improve the language transmitted by their fathers. It is vain to urge that articulate

articulate sounds are fitter for the purpose of communicating thought than visible gesticulation: for though this may be true, it is a truth which could hardly occur to savages, who had never experienced the fitness of either; and if, to counterbalance the superior fitness of articulation, its extreme difficulty be taken into view, it must appear little less than miraculous that every savage tribe should think of it, rather than the easier method of artificial gesticulation. Savages, it is well known, are remarkable for their indolence, and for always preferring ease to utility; but their modes of life give such a pliancy to their bodies, that they could with very little trouble bend their limbs and members into any position agreed upon as the signs of ideas. This is so far from being the case with respect to the organs of articulation, that it is with extreme difficulty, if at all, that a man advanced in life can be taught to articulate any sound which he has not been accustomed to. No foreigner, who comes to England after the age of 30, ever pronounces the language tolerably well; an Englishman of that age can hardly be taught to utter the guttural sound which a Scotchman gives to the Greek χ , or even the French sound of the vowel u ; and of the solitary savages who have been caught in different forests, we know not an instance of one who, after the age of manhood, learned to articulate any language so as to make himself readily understood. The present age has indeed furnished many instances of deaf persons being taught to speak intelligibly, by skilful masters moulding the organs of the mouth into the positions proper for articulating the voice; but who was to perform this task among the inventors of language, when all mankind were equally ignorant of the means by which articulation is effected? In a word, daily experience informs us, that men who have not learned to articulate in their childhood, never afterwards acquire the faculty of speech but by such helps as savages cannot obtain; and therefore, if speech was invented at all, it must have been either by children who were incapable of invention, or by men who were incapable of speech. A thousand, nay a million, of children could not think of inventing a language. While the organs are pliable, there is not understanding enough to frame the conception of a language; and by the time that there is understanding, the organs are become too stiff for the task. And therefore, say the advocates for the divine origin of language, reason as well as history intimates, that mankind in all ages must have been speaking animals; the young having constantly acquired this art by imitating those who were elder; and we may warrantably conclude, that our first parents received it by immediate inspiration. To this account of the origin of language an objection readily occurs: If the first language was communicated by inspiration, it must have been perfect, and held in reverence by those who spoke it, *i. e.* by all mankind. But a vast variety of languages have prevailed in the world; and some of those which remain are known to be very imperfect, whilst there is reason to believe that many others are lost. If different languages were originally invented by different nations, all this would naturally follow from the mixture of these nations; but what could induce men possessed of one perfect language of divine original, to forsake it for barbarous jargons of their own invention, and in every respect inferior to that with which their forefathers or themselves had been inspired? To this objection, it is replied, that nothing was given by inspiration but the faculty of speech and the elements of language; for when once men had language, it is easy to conceive how they might have modified it by their natural powers, as thousands can improve what they could not invent. The first language, if given by inspiration, must in its principles have had all the perfection of which language is susceptible; but from the nature of things it could not be very copious. The words of language are either proper names, or the signs of ideas and relations; but it cannot be supposed that the All-wise Instructor would load the memories of men with words to denote things then unknown, or with the signs of ideas which they had not then acquired. It was sufficient that a foundation was laid, of such a nature as would support the largest superstructure which they might ever after have occasion to raise upon it, and that they were taught the method of building by composition and derivation. This would long preserve the language radically the same, though it could not prevent the introduction of different dialects in the different countries over which men spread themselves. In whatever region we suppose the human race to have been originally placed, the increase of their numbers would

in process of time either disperse them into different nations, or extend the one nation to a vast distance on all sides from what we may call the seat of government. In either case they would everywhere meet with new objects, which would occasion the invention of new names; and as the difference of climate and other natural causes would compel those who removed eastward or northward, to adopt modes of life in many respects different from the modes of those who travelled towards the west or the south, a vast number of words would in one country be fabricated to denote complex conceptions, which must necessarily be unintelligible to the body of the people inhabiting countries where those conceptions had never been formed. Thus would various dialects be unavoidably introduced into the original language, even whilst all mankind remained in one society and under one government. But after separate and independent societies were formed, these variations would become more numerous, and the several dialects would deviate farther and farther from each other, as well as from the idiom and genius of the parent tongue, in proportion to the distance of the tribes by whom they were spoken. If we suppose a few people either to have been banished together from the society of their brethren, or to have voluntarily wandered to a distance, from which through trackless forests they could not return, (and such emigrations have often taken place,) it is easy to see how the most copious language must in their mouths have soon become narrow, and how the oilspring of inspiration must in time have become so deformed, as hardly to retain a feature of the ancestor whence it originally sprung. Men do not long retain a practical skill in those arts which they never exercise; and there are abundance of facts to prove, that a single man cast upon a desert island, and having to provide the necessities of life by his own ingenuity, would soon lose the art of speaking with fluency his mother-tongue. A small number of men cast away together, would indeed retain that art somewhat longer; but in a space of time not very long, it would in a great measure be lost by them or their posterity. In this state of banishment, as their time would be almost wholly occupied in hunting, fishing, and other means within their reach to support a wretched existence, they would have very little leisure, and perhaps less desire, to preserve by conversation the remembrance of that ease, and those comforts, of which they now found themselves for ever deprived; and they would of course soon forget all the words, which in their native language had been used to denote the accommodations and elegancies of polished life. This at least is certain, that they would not attempt to teach their children a part of language, which in their circumstances could be of no use to them, and of which it would be impossible to make them comprehend the meaning; for where there are no ideas, the signs of ideas cannot be made intelligible. From such colonies as this dispersed over the earth, it is probable that all those nations of savages have arisen, which have induced so many philosophers to imagine, that the state of the savage was the original state of man; and if so, we see, that from the language of inspiration must have unavoidably sprung a number of different dialects, all extremely rude and narrow, and retaining nothing of the parent tongue, except perhaps the names of the most conspicuous objects of nature, and of those wants and enjoyments which are inseparable from humanity. The savage state has no artificial wants, and furnishes few ideas that require terms to express them. The habits of solitude and silence incline a savage rarely to speak; and when he speaks, he uses the same terms to denote different ideas. Speech therefore, in this rude condition of men, must be extremely narrow, and extremely various. Every new region, and every new climate, suggests different ideas, and creates different wants which must be expressed either by terms entirely new, or by old terms used with a new signification. Hence must originate great diversity, even in the first elements of speech, among all savage nations, the words retained of the original language being used in various senses, and pronounced, as we may believe, with various accents. When any of those savage tribes emerged from their barbarism, whether by their own efforts or by the aid of people more enlightened than themselves, it is obvious, that the improvement and copiousness of their language would keep pace with their own progress in knowledge, and in the arts of civil life; but in the infinite multitude of words which civilization and refinement added to language, it would be little less than miraculous, were any two nations to agree upon

upon the same sounds to represent the same ideas. Superior refinement, indeed, may induce imitation; conquests may impose a language, and extension of empires may melt down different nations and different dialects into one mass; but independent tribes naturally give rise to diversity of tongues, nor does it seem possible, that they should retain more of the original language, than the words expressive of those objects with which all men are at all times equally concerned. The variety of languages, therefore, the copiousness of some, and the narrowness of others, furnish no good objection to the divine origin of language in general; for whether language was at first revealed from heaven, or in a course of ages invented by men, a multitude of dialects would inevitably arise, as soon as the human race was separated into a number of distinct and independent nations. But whether we consider language as immediately inspired by the Creator, or invented by human ingenuity, it is certain, that this admirable and valuable endowment is derived from him whose offspring we are; for since he has given all the apparatus for this purpose in perfection, we are assured that he designed us the favour, and therefore bestowed either by direct communication, or by leading, in some other way, our first parents to the acquisition of language. As the knowledge of languages constitutes a great part of erudition, and their beauty and deformities furnish employment to taste, and as these depend much upon the idioms of the different tongues, we shall offer a few remarks upon this subject. Since the words *IDIOM* and *GENIUS* of a language are often confounded, it is necessary to define them. By *idiom* we mean that general mode of arranging words into sentences which prevails in any particular language; and by *genius* we mean to express the particular set of ideas which the words of any language, either from their formation or multiplicity, are most naturally apt to excite in the mind of any one who hears it properly uttered. Thus, although the English, French, Italian, and Spanish languages nearly agree in the same general idiom, yet the particular genius of each is remarkably different: the English is naturally bold, nervous, and strongly articulated; the French is weaker, and more flowing; the Italian more soothing and harmonious; and the Spanish more grave, sonorous, and stately. When we examine the several languages which have been most esteemed in Europe, we find that there are only two idioms among them which are essentially distinguished from one another: and all those languages are divided between these two idioms, following sometimes the one and sometimes the other, either wholly or in part. The languages which may be said to adhere to the first idiom, are those which in their construction follow the order of nature; that is, express their ideas in the natural order in which they occur to the mind; the subject which occasions the action appearing first; then the action, accompanied with its several modifications; and, last of all, the object to which it has reference. These may properly be called analogous languages; and of this kind are the English, French, and most of the modern languages in Europe. The languages which may be referred to the other idiom, are those which follow no other order in their construction, than what the taste or fancy of the composer may suggest; sometimes making the object, sometimes the action, and sometimes the modification of the action, to precede or follow the other parts. The confusion which this might occasion, is avoided by the particular manner of inflecting their words, by which they are made to refer to the others with which they ought to be connected, in whatever part of the sentence they occur, the mind being left at liberty to connect the several parts with one another after the whole sentence is concluded. And as the words may be here transposed at pleasure, those languages may be called transpositive languages. To this class we must, in an especial manner, refer the Latin and Greek languages. Each of these idioms has several advantages and defects peculiar to itself, and hence becomes one source of several excellencies or imperfections in the language where it is used. The partiality which our forefathers, at the revival of letters in Europe, naturally entertained for the Greek and Roman languages, made them look upon every distinguishing peculiarity belonging to them as one of the many causes of the amazing superiority, which those languages evidently enjoyed above every other then spoken in Europe. This blind deference still continues to be paid to them, as our minds are early prepossessed with these ideas, and as we are taught in our earliest years, to believe, that to entertain the least idea of our own lan-

guage being equal to the Greek or Latin, in any particular whatever, would be a certain mark of ignorance or want of taste. But if we look around us, and observe the many excellent productions in almost every language of Europe, we must be satisfied, that even these are now possessed of some powers which might afford at least a presumption, that, if they were cultivated with a proper degree of attention, they might in some respects, be made to rival, if not to excel, those beautiful and justly admired remains of antiquity. The learned reader knows, that the several changes, which take place in the arrangement of the words in every transpositive language, could not be admitted without occasioning great confusion, unless certain classes of words were endowed with particular variations, by means of which they are made to refer to the other words, with which they ought naturally to be connected. From this cause proceeds the necessity of several variations of verbs, nouns, and adjectives; which are not in the least essential or necessary in the analogous languages. From this it is evident that the terminations of a great multitude of words will be the same, in a transpositive language, and will therefore frequently render the sound disagreeable; thus the numerous tenses of the Latin verbs ending in *am, bam, ram*, sound peculiarly barbarous, when conjoined in the same sentence with other words ending also in *am*: thus what can be more uncouth than this?—"Causam quam nesciebam diligentissime investigabam;—Or even than Cicero's famous poetical line, though none of these verbs occur in it, O fortunatam, natam, me consule, Roman! Were it necessary to pursue this subject farther, we might observe, that the perfect tense in all the conjugations ends universally in *I*, the pluperfect in *eram*, and the future in *am* or *bo*; in the subjunctive mood, the imperfect universally in *rem*, the perfect in *erem*, the pluperfect in *issem*, and the future in *ero*: and as a still greater sameness is observable in the different variations for the persons in these tenses, seeing the first person plural in all tenses ends in *mus*, and the second person in *tis*, with little variation in the other persons; it is evident that, in respect of diversity of sounds, this method of conjugating verbs by inflection, is greatly inferior to the more natural method, of expressing the various connections and relations of the verbal attribute by different words, usually called auxiliaries, for in this case the tenses of the different verbs employed do not follow this uniformity of sound in their terminations. The analogous language also admits of a much greater variety in uttering the same sentiment. Thus the present of the indicative mood in Latin can at most be expressed only in two ways, viz. *scribo*, and *ego scribo*; whereas, in English, we can vary it in four different ways, viz. 1st, I write; 2dly, I do write; 3dly, Write I do; 4thly, Write do I. And if we consider the further variation which these receive in power as well as in sound, by having the emphasis placed on the different words; instead of four we have eleven different variations; thus, 1st, I write, with emphasis upon the *I*;—2dly, I write, with the emphasis upon the word *write*. Let any one pronounce these with the different emphasis necessary, and he will be immediately satisfied, that they are not only distinct from each other with respect to meaning but also with regard to sound; and the same must be understood of all the other parts of this example: thus,

- | | |
|----------------|-----------------|
| 3. I do write, | 8. Write I do, |
| 4. I do write, | 9. Write do I, |
| 5. I do write, | 10. Write do I, |
| 6. Write I do, | 11. Write do I, |
| 7. Write I do, | |

None of the Latin tenses admit of more variations than the two above mentioned; nor do almost any of the English admit of fewer than in the above example; and several of these phrases, which must be considered as exact translations of some of the tenses of the Latin verb, admit of many more. Besides this, a little consideration will shew that a language which varies its verbs by means of auxiliaries is much superior to that which varies them by inflection with respect to precision, distinctness, and accuracy, in expressing any idea. Thus the Latin verb *Amo*, may be Englished either by the words, I love, or I do love, and the emphasis placed upon any of the words that the circumstances may require; by means of which, the meaning is pointed out with a force and energy which it is altogether impossible to produce by the use of any single word. And in like manner we might shew that the same superiority is to be found in each respective tense. Thus,

the perfect tense of the Latins, instead of the simple *amavi*, we say, *I have loved*; and by the liberty we have of putting the emphasis upon any of the words which compose this phrase, we are in the most accurate manner fix the precise idea which we mean to excite: for if we say, *I have loved*, with the emphasis upon the word *I*, it at once points out the person as the principal object in that phrase, and makes us naturally look for a contrast in some person, and the other parts of the phrase becomes subordinate to it;—*he has loved thee much*, but *I have loved thee infinitely more*." The Latins too, as they were not prohibited from joining the pronoun with their verb, were also acquainted with this excellence, which Virgil has beautifully used in this case:

— Nos patriam fugimus ;

Tu, Tityre, lentus in umbrâ, &c.

but we are not only enabled thus to distinguish the person in as powerful a manner as the Latins, but can also with the same facility point out any of the other circumstances as principals; for if we say, with the emphasis upon the word *have*, "*I have loved*," it as naturally points out the time as the principal object, and makes us look for a contrast in that peculiarity, *I have*; "*I have loved indeed*;—my imagination *has* been led astray—my reason *has* been perverted: but, *now* that time has opened my eyes, I can smile at those imaginary distresses which once perplexed me." In the same manner we can put the emphasis upon the other word of the phrase, *loved*,—"I have loved." Here the passion is exhibited as the principal circumstance; and as this can never be excited without some object, we naturally wish to know the object of that passion—"Whom? what have you loved?" are the natural questions we would put in this case. "*I have loved—Eliza*." In this manner we are, on all occasions, enabled to express, with the utmost precision, that particular idea which we would wish to excite, so as to give an energy and perspicuity to the language, which can never be attained by those languages whose verbs are conjugated by inflection: and besides, all inflected languages are subject to much inconvenience by having too small a number of tenses, so that they are compelled to make one word on many occasions supply the place of two, three, or even four. Thus, in Latin, the same word *Amabo* stands for shall or will love, so that the reader is left to guess from the context which of the two meanings it was most likely the writer had in view. In the same manner, may or can love are expressed by the same word *amem*; as are also might, could, would, or should love, by the single word *amarem*; so that the reader is left to guess which of these four meanings the writer intended to express: which occasions a perplexity very different from that clear precision which our language allows of, by not only pointing out the different words, but also by allowing us to put the emphasis upon any one of them we please, which superadds energy and force to the precision it would have had without that assistance. It therefore appears that the method of conjugating verbs by inflection is inferior to that which is performed by the help of auxiliaries;—because it does not afford such a diversity of sounds,—nor allow such variety in the arrangement of expression for the same thought,—nor give so great distinction and precision in the meaning. It is, however, attended with one considerable advantage above the other method; for as the words of which it is formed are necessarily of greater length, and more sonorous, than in the analogous languages, it admits of a more flowing harmony of expression; for the number of monosyllables in this last greatly checks that pompous dignity which naturally results from longer words. And the multiplicity of short words, which occur in the English language, is perhaps one of its greatest defects, of which it is said to have more than that of any other nation in Europe, while it decidedly possesses a superior degree of excellence. Bold and energetic, it is admirably calculated alike for history and the drama: at the same time, from its smoothness and copiousness, it is peculiarly adapted for the different branches of poetry. But, with all these advantages, it labours under an infinity of monosyllables, which will ever prevent it from attaining that swelling fulness of sound, which so essentially contributes to produce both harmonious dignity and graceful cadences in literary composition. To this imperfection must be added the letter *s*, which, by its very frequent and inevitable recurrence, communicates to the whole such a general hiss, as cannot fail to be unpleasant to every impartial per-

son, who has the least conception of musical harmony. Instead of improving our language in this respect, the public taste has rendered it more conspicuous by greatly multiplying the use of this letter. The plurals of almost all our nouns were originally formed by adding the harmonious syllable *en* to the singular, which has given place to the letter *s*; and instead of *housen*, as formerly, we now say *houses*; instead of *kine*, *cows*, &c. *Oxen* is almost the only plural with this harmonious termination now retained. In like manner, many of the variations of our verbs were formed by the syllable *eth*, for which we have likewise adopted the same disagreeable letter; so that, instead of *loveth*, *moveth*, *writeth*, *walketh*, &c. we have changed them into the more modish form of *loves*, *moves*, *writes*, *walks*, &c. Our very auxiliary verbs have suffered the same change; and instead of *hath* and *doth*, we now make use of *has* and *does*. From these causes, notwithstanding the great improvements which have been made in our language, within these few centuries, in other respects; yet, with regard to the pleasingness of sound alone, it was perhaps much more perfect in the days of Chaucer than at present. If the syllable *en*, which was formerly appended to the plural number, were restored to its ancient place, we presume that many of the difficulties would be removed; and that, trilling as this alteration may appear, the language would thus be greatly improved. We shall further add that the beauties of language, with respect to significance, may not improperly be distinguished into two kinds: 1. Those that arise from a right choice of words or materials for constructing the period; and 2. Those that arise from a due arrangement of these words or materials. 1. Communication of thought being the chief end of language, perspicuity ought never to be sacrificed to any other beauty whatever. Nothing therefore in language ought more to be studied, than to prevent all obscurity in the expression; for to have no meaning, is but one degree worse than to have a meaning that is not understood. 2. The language ought to correspond to the subject, in the same manner as dress the person, profession, or station in life: heroic actions or sentiments require elevated language; tender sentiments ought to be expressed in words soft and flowing; and plain language void of ornament, is adapted to subjects grave and didactic. For further information on this subject see ENGLISH LANGUAGE, GRAMMAR, ORATORY, and POETRY. We shall here only observe, that the most easy and correct method of acquiring languages, is a subject of very great consequence, and a just model, or plan of teaching, so useful an art as that of speech, to children or adults, has long been, and still remains, a great desideratum. And though we are not in possession of a perfect system of grammar, yet many excellent treatises have been written on that subject by ingenious men, who have, individually, contributed to render the art of speaking and writing more familiar to persons of ordinary conception. Unfortunately, however, less attention has, in general, been paid to the acquisition of modern languages, than to those of the ancients. Hence we may confidently recommend the method pursued by Dr. Egan of Greenwich, on whom the Society for the Encouragement of Arts, &c. in 1787, conferred a gold-medal, for teaching youth to write and speak Latin in common conversation, both fluently and correctly. His plan is, to divest instruction of that harshness, which intimidates juvenile minds, and retards their progress in learning. And he has succeeded in rendering the hours of amusement subservient to the promotion of the classical part of education, by inducing his pupils to speak Latin with equal ease and precision. To effect this purpose, he prohibits boys of a certain standing, from practising any language except the Latin and French; and a mark is circulated, for the prevention of solecisms and barbarous expressions. If a pupil, who has this mark, hear another speaking ungrammatically, it is passed to the latter, and he who receives such mark most frequently in the course of the day, incurs a small fine. To avoid this penalty, Dr. E.'s scholars pay the strictest attention to the choice and arrangement of their words, the construction of their sentences, as well as the style, purity, and harmony, of their diction. Thus a considerable portion of time and expence is saved, independently of the numerous other beneficial consequences that result from this plan, as it may be easily applied to the different living languages. Hence it well deserves to be more generally known, and adopted in those schools where years are wasted by the old method, which is comparatively absurd.

LANGUED, in heraldry, expresses an animal whose tongue, appearing out of the mouth, is borne of a different colour from the rest of the body.

LANGUEDOC, a late province of France, bounded on the N. by Quercy, Rouergue, Auvergne, and Lionnois; on the E. by Dauphiny and Provence; on the S. by the Mediterranean; and on the W. by Gascony. It is now divided into seven departments, viz. the Ardeche, Lozere, Gard, Herault, Tarn, Upper Garonne, and Aude.

LANGUOR, [*languor*, Lat.] a lassitude or faintness, which may arise from want or decay of spirits, through indigestion, or too much exercise; or from an additional weight of fluids, from a diminution of secretion by the common discharges. Languor is often attended with such debility of body, as well as defection of mind, that the patient can scarcely walk or even stand upright, without being apt to faint away.

LANJAN, or **LANJANG**, a city of Asia, capital of the kingdom of Laos. Lon. 101. 49. E. Lat. 18. 30. N.

LANJAN, or **LANJANG**, the S. district of Laos.

LANIARD, [from *lanier*, Fr.] a short piece of cord or line fastened to several machines in a ship, and serving to secure them in a particular place, or to manage them more conveniently. Such are the laniards of the gun-ports, the laniard of the buoy, the laniard of the cat-hook, &c. The principal laniards used in a ship, however, are those employed to extend the shrouds and stays of the masts by their communication with the dead eyes, so as to form a sort of mechanical power resembling that of a tackle.

LANISTA, in antiquity, is something used to signify an executioner; but more frequently for a master gladiator, who taught the use of arms, and educated slaves, or children that had been exposed in the art. See **GLADIATOR**.

LANIUS, the **SHRIKE**, or **BUTCHER-BIRD**, in ornithology, a genus of birds of the order accipitres. The characters are: bill somewhat straight, with a tooth on each side near the apex; tongue lacerated. There are above fifty species, besides many varieties.

L. ANTIGUANUS, the **ANTIGUAN SHRIKE**, or **PIED GRIESCHE D'ANTIGUE** of Sonnerat, is about the size of a lark. Its bill is large and black; the upper mandible very long, and the curvature so excessive, that one would rather take it for a monstrosity, than a characteristic of a species; the irides are dusky; the head is black; the back of a yellowish rufous colour; the throat and breast are white; the quills, and bastard wing-coverts, black. It inhabits the Philippines, but principally Antigue, one of the provinces of Panay. See Plate LVIII.

L. EXCUBITOR, the **GREAT CINCERUS SHRIKE**, or **GREATER BUTCHER-BIRD**, is ten inches long. The plumage on the upper parts is of a pale ash colour; the under, white; through the eyes there is a black stripe; the scapulars are white; the base of the greater quills white, the rest black; the tail is somewhat cuneiform; the two middle-feathers are black; the outermost on each side, white; those between are black, with the ends more or less white; the legs are black. Its bill is black, one inch long, and hooked at the end; the upper mandible furnished with a sharp process. It feeds upon small birds which it seizes by the throat. It also feeds on rats, mice, beetles, caterpillars, and other vermin. When it has killed the prey, it fixes them on some thorn, and when thus spitted pulls them to pieces with its bill: on this account the Germans call it thorntraer and thornfreker. When confined in a cage, it often treats its food in the same manner, sticking it against the wires before devouring it. This species inhabits many parts of Europe and North America. In countries where they are numerous, the husbandmen value them, on account of their destroying such animals as are noxious to the produce of the field.

LANKEN, a lake of Thibet, 45 miles in circuit.

LANNER, or **LANNAR**, a species of hawk. See **FALCO**.

LANNION, a town of France, in the department of the North Coast, 15 miles W. of Treguier.

LANNON, a town of France, in the department of the North, 7½ miles E. N. E. of Lille, and 7½ N. W. of Tournay.

LANSENBURGH, a town of New York, capital of Rensselaer county, 175 miles N. of New York, and 270 N. N. E. of Philadelphia. Lon. 73. 34 W. Lat. 42. 46. N.

LANTANA, or **INDIAN SAGE**, in botany, a genus of the angiospermia order, and didynamia class of plants; natural order, Personata. Calyx distinctly four-toothed; stigma hooked, refracted; drupe with a two-celled nucleus. There are nineteen species, mostly shrubs, very few being herbaceous. They are natives of Africa and America. For the L. aculeata, see Plate XCIX.

LANTHORN, or **LANTERN**, a well-known contrivance, which serves to carry a candle, without exposing it to the air, or otherwise incurring danger. Lanthorns are usually made of glass, horn, or other transparent matter, for the transmission of light; but, if they were covered externally with thin wire-work, many accidents might be prevented in stables and barns, as the lanthorns might thus be rendered less liable to injury from external accidents, while the communication of light would not be materially impeded.

LANTERN, in architecture, is a little dome raised over the roof of a building to give light, and serve as a crowning to the fabric.

LANTERN is also used for a square cage of carpentry, placed over the ridge of a corridor or gallery, between two rows of shops, to illumine them, like that of the Royal Exchange at London.

LANTERN, on ship-board, a well-known machine, of which there are many in a ship, to direct the course of other ships in a fleet or convoy; such are the poop and top lanterns, &c.

LANTERN, DARK, has only one opening, which may be closed up when the light is to be entirely hid, or opened when there is occasion for the light to discover some object.

LANTERN, FLY, in zoology. See **FULGORA**.

LANTERN, MAGIC. See **OPTICS**.

LANTERNS, FEAST OF, in China, is a celebrated festival held from the 13th to the 16th day of the first month; so called from the immense number of lanterns hung out of the houses and streets; which, it is said, is no less than 200,000,000. On this day are exposed lanterns of all prices, whereof some are said to cost 2000 crowns. Some of their grandees retrench somewhat every day out of their table, out of their dress, equipage, &c. to appear the more magnificent in their lanterns. They are adorned with gilding, sculpture, painting, japanning, &c. and their size is extravagant; some being from 25 to 30 feet diameter, representing halls and chambers.

LAN-TSAN, a river of Asia, which rises in, and runs across, the province of Yun-nan, in China, from N. to S. changes its name to Kou-long; enters Laos, where it is called Mecon, and falls into the East Indian Ocean.

LANUGO, the soft down of plants, like that growing on the fruit of the peach-tree. See **HAIR**.

LAO, or **LAOS**. See **LAOS**.

LAOCOON, in fabulous history, a son of Priam and Hecuba, or, according to others, of Antenor, or Capys. Being priest of Apollo and Neptune, he was commissioned by the Trojans to offer a bullock to Neptune to render him propitious. During the sacrifice two enormous serpents issued from the sea, and attacked Laocoon's two sons who stood next the altar. The father immediately attempted to defend his sons; but the serpents falling upon him squeezed him in their complicated wreaths, and he died in the greatest agonies. This punishment was said to have been inflicted upon him for dissuading the Trojans from bringing into the city the fatal wooden horse which the Greeks had consecrated to Minerva; as also for his impiety in hurling a javelin against the sides of the horse as it entered within the walls.

LAOCOON, in the history of the arts, is a celebrated monument of Greek sculpture, executed in marble by Polydorus, Athenodorus, and Agesander, the three famous artists of Rhodes. This relic of antiquity was found at Rome in the ruins of the palace of Titus, in the beginning of the 16th century, under the pontificate of Julius II. and since deposited in the Farnese palace. Laocoon is represented with his two sons, with two hideous serpents clinging round his body, gnawing it, and injecting their poison. Virgil has given us a beautiful description of the fact. *Æn. lib. ii. v. 201—222*. This statue exhibits the most astonishing dignity and tranquillity of mind in the midst of the most excruciating torments: Pliny says of it, that it is, *opus omnibus, pictura et statuaria artis, præferendum*. (*Lib. xxxvi. c. 5*.) "The Laocoon, Dr. Gillies observes, may be regarded as the triumph of Grecian sculpture;

sculpture; since bodily pain, the grossest and most ungovernable of all our passions, and that pain united with anguish and torture of mind, are yet expressed with such propriety and dignity, as afford lessons of fortitude superior to any taught in the schools of philosophy. This relict of antiquity was sent to Paris by Bonaparte in 1797.

LAODICEA, or **LAODICEA**, in ancient geography, a town of Phrygia, on the Lycus, first called Diospolis, then Rhoas. The memory of this place is consecrated in scripture, being commended by St. Paul, and being one of the seven churches to which St. John in the Apocalypse addresses himself.

LAODICEA, or **LAODICEA**, in ancient geography, a town of Syria, on the sea-coast, now called Ladikieh.

LAODICENE, a province of Syria, so named from Laodicea, its capital.

LAO-KIUN, or **LAO TSE**, a Chinese philosopher, who founded the sect of Tao-sse. He was born B. C. 603, and died in an advanced age, leaving to his disciples a book called Tao-te, being a collection of 5000 sentences. His morality resembles that of Epicurus.

LAOMEDON, in fabulous history, king of Troy, was son of king Ilus, and married Strymo, called by some Placia, or Leucippe, by whom he had Podarces, better known by the name of Priam, and Hesione. He built the walls of Troy, and was assisted by Apollo and Neptune, whom Jupiter had banished from heaven, and condemned to be subservient to the will of Laomedon for one year. When the walls were finished, Laomedon refused to reward the gods for their labours; and soon after his territories were laid waste by Neptune, and his subjects were visited by a pestilence from Apollo.

LAON, a town of France, in the department of Aisne, 77 miles N. E. of Paris.

LAOS, or **LAO**, a kingdom of Asia beyond the Ganges; bounded on the N. by China; on the E. by Tonquin and Cochinchina; on the S. by Cambodia; and on the W. by Siam, and Ava. It is surrounded by mountains and forests, and abounds in rice, fruits, and fish. The inhabitants are well made, robust, of an olive complexion, and mild in their dispositions; but very superstitious. Langion is the capital. Iron, lead, tin, silver, and gold, are found in Laos.

LAPATA, a chain of mountains, in Africa, called the Backbone of the World, extending about 600 miles from N. to S. Lon. from 27° to 33° E. Lat. from 12° 33' to 20° N.

LAPATHUS, **LAPETHUS**, or **LEBITHUS**, in ancient geography, a town of Cyprus, on the N. side, with a port or station for ships, and a cognominal river. It is now called Lapitha.

LAPIDARY, an artificer, who cuts precious stones. Dealers in precious stones are rather styled jewellers. The art of cutting these is of great antiquity. Various machines are employed in cutting precious stones according to their quality. The diamond, which is extremely hard, is cut on a wheel of soft steel, turned by a mill, with diamond-dust, tempered with olive-oil, which also serves to polish it. The oriental ruby, sapphire, and topaz, are cut on a copper-wheel, with diamond-dust tempered with olive-oil, and are polished on another copper-wheel with tripoli and water. Hyacinths, emeralds, amethysts, garnets, agates, and other stones not of inferior hardness, are cut on a leaden wheel with smalt and water, and polished on a tin-wheel with tripoli.

LAPIDARY is also used for a virtuoso skilled in the nature, kinds, &c. of precious stones.

LAPIDARY STYLE, denotes the style proper for monumental or other inscriptions. This is a kind of medium between prose and verse; the jejune and the brilliant are here equally to be avoided. Cicero has prescribed the rules of this style: "Accedat oportet oratio varia, vehemens, plena spiritus. Omnium sententiarum gravitate, omnium verborum ponderibus, est utendum." The lapidary style, which was lost with the ancient monuments, was revived at the beginning of the 18th century by Count Emmanuel Tesoro; it is now used various ways at the beginning of books; and even epistles dedicatory are composed in it, of which we have no example among the ancients.

LAPIDESCENT, a term applied to any thing which has the faculty of petrifying, or turning bodies to a stony nature.

LAPIS, [Lat.] in Roman antiquity, a geographical measure denoting a mile; because miles were distinguished by erecting a stone at the end of each; from the number marked on which, the length of the way from Rome might be known. The device is by Plutarch ascribed to Caius Gracchus. This was more accurately executed by Augustus, who erected a gilt pillar in the forum, at which all the public ways of Italy, distinguished by stones, were terminated. The same thing was done in the Roman provinces. Hence the phrases *tertius lapis*, *centesimus lapis*, &c. for 3, 100, &c. miles; and sometimes the ordinal number without lapis, as *ad duodecimum*, &c. at the 12th-mile distant.

LAPIS, in general, is used to denote a stone of any kind. See **MINERALOGY**.

LAPIS CALAMINARIS. See **CALAMINE**.

LAPIS INFERNALIS, **LUNAR CAUSTIC**, the old name for nitrate of silver.

LAPIS LAZULI. See **LAZURSTEIN**.

LAPIS CALCEDONIUS, a genus of stones consisting of silica, a small quantity of alumina, with about one-tenth of lime, and a slight trace of oxide of iron: hard, lightish, shining within, breaking into fragments with sharp edges; compact, not mouldering in the air; of a more or less perfectly conchoidal texture; never opaque, tough, admitting of a high polish, and generally of a common form; not melting before the blowpipe. See Plate XCIII.

LAPITHÆ, in fabulous history, an ancient people of Thessaly, the descendants of Lapithus, or rather the inhabitants of the country of which his sons Phorbas and Periphas obtained the sovereignty.

LAPITHIA, a territory of Cyprus, surrounding Lapathus.

LAPITHI, the people of Lapithia, who were tainted with a degree of fatuity; hence Lapathus denotes fatuus.

LAPITHUS, in fabulous history, a son of Apollo, by Stilbe, and brother to Centaurus. He married Orsinome, daughter of Euronymus, by whom he had Phorbas and Periphas, the progenitors of the Lapithæ.

LAPLAND, the most northern country of Europe, extending from the north cape in 71° 30' N. Lat. to the White Sea under the arctic circle; and inhabited by the same people, though subject to different powers; viz. Denmark, Russia, and Sweden. It is divided as follows:

I. **LAPLAND, NORWEGIAN**, under the dominion of Denmark, lies between the northern sea, the river Pals, and the lake Enarak.

II. **LAPLAND, RUSSIAN**, comprehends the eastern part, situated between the Lake Enarak and the White Sea, and is divided into three distinct prefectures; namely, that of the sea-coast towards the north, called Maunmankoi Leporie; the Terskoi Leporie, upon the coast of the White Sea; and the third, or inland, named Beilamoreskoi Leporie.

III. **LAPLAND, SWEDISH**, is the most extensive of the three, and comprehends all the northern part of Sweden. It is divided into six districts, called marks or territories; and these are distinguished by the names of rivers, such as Angermanland, Elma, Peta, Lula, Torno, and Kiemi. These marks are subdivided into smaller districts called biars, consisting each of a certain number of families; among which the land is parcelled out by government, or the prefect of the district appointed by the King of Sweden. The cold of Lapland is very intense during the winter, freezing even brandy and the watery part of spirit of wine, if the latter be not highly rectified: all the lakes and rivers are frozen to a prodigious thickness; and the whole face of the country is covered with snow to the depth of four or five feet. While this continues loose, it is impossible to travel; but if a partial thaw takes place for a few hours, the surface is soon frozen into a hard impenetrable crust, over which the Laplander travels in his sledge with great celerity. While the thaw prevails, the air is surcharged with vapours, and the climate is rainy; but while the north wind blows, the sky is beautifully serene, and the air very clear. The heat of summer is almost as intolerable in Lapland as the cold of winter. At the northern extremity, the sun never sets for three months in summer, and in winter there is an uninterrupted night of the same duration; but this is qualified in such a manner by a constant revolution of dawn and twilight, by a serene sky, moonlight, and aurora boreales, reflected from the snowy surface, that the inhabitants are enabled to hunt, fish, and proceed with their ordinary

ordinary occupations. The Laplanders, though for the most part vigorous and healthy, are subject to sore eyes, and even to blindness, from the smoke of their huts, and the ure to which they are almost continually exposed. Some waste away in consumptions; others are afflicted with rheumatic pains and the scurvy; and a few are subject to vertigo and apoplexy. For the cure of all their internal disorders, they use no other medicine than the decoction of a certain species of moss; and when this cannot be procured, they boil the stalks of angelica in the milk of the rein-deer. In order to remove a fixed pain, they apply a large mushroom, burning hot, to the part affected; and this produces a blister, which is supposed to draw off the peccant humour. To their wounds they apply nothing but the turpentine that drops from the fir-tree. When frost-bitten, (though this seldom happens), they thrust a red-hot iron into a cheese made of rein-deer's milk, and with the fat that drops from it anoint the frozen member, which generally recovers. Lapland is a huge congeries of frightful rocks and stupendous mountains, but interspersed with many pleasant vallies, watered by a vast number of rivulets that run into the rivers and lakes, which discharge their waters into the Gulf of Bothnia. The natives, however, believe it to be the terrestrial paradise; and indeed nothing could be more enchanting than its vast prospects of mountains, hills, forests, lakes, rivers, &c. if the climate were but moderate; though even here, in summer, the roses are seen blowing wild on the banks of the lakes and rivers, with all the beautiful glow of colour which appears in those cultivated in our gardens. But all the intervals between the mountains are not ingrossed by these agreeable prospects; great part of the flat country is covered with brown dusky forests of fir and pine trees; and these are often skirted by wide extended morasses, the stagnating waters of which in summer produce myriads of mischievous insects, that are more intolerable than even the cold of winter. The country, however, abounds with excellent springs; and is remarkable for some surprising cataracts, in which the water tumbles over frightful precipices, and dashes among rocks with amazing impetuosity and noise. The principal lakes in Lapland are the Great Umi, the Great Windel, the Oreavan, the Stor-avan, the Great Lula; the lakes of Kartom, Kali, Torno, Enara, and Kimi. Some of these extend sixty leagues in length, and contain a great number of islands: Stor-avan is said to contain 365; and Enara contains an archipelago of islands so large, that no Laplander has lived long enough to visit each particular island. The Laplanders are very low in stature, but have remarkably large heads. They are ill-shaped, and their features harsh. They are, however, strong, hardy, and robust; can bear incredible fatigue; and it is said that the stoutest Norwegian is not able to bend the bow of a Laplander. The women are much less homely than the men, and many of them have a delicate and florid complexion. These people are simple, honest, hospitable, and timorous; their timidity, however, respects war alone; for to many other species of dangers they expose themselves with surprising intrepidity, whether in ascending and descending mountains and precipices with their snow-shoes and in sledges, or in venturing amidst whirlpools and cataracts in little slender boats made of thin fir-boards, fastened together with thongs of leather, sinews of wild beasts, or tough and flexible twigs of willow and osier. It is not uncommon to see a Laplander in old age hunting, fowling, skating, and performing all the severest exercises of youth with agility. The Laplanders are naturally very ingenious. They make all their own furniture, their boats, sledges, bows, and arrows. They form neat boxes of thin birch-boards, and inlay them with the horn of the rein-deer. The Swedes are very fond of the Lapland baskets made of the roots of trees, slit in long thin pieces, and twisted together so nicely, that they will hold water. Among the manufactures of this country are curious horn-spoons, and moulds in which they cast the trinkets of tin which adorn their girdles. The men within doors dress victuals for the family. The women act as tailors and embroiderers; they make clothes, shoes, and boats, and harness for the rein-deer: they spin thread of fur, and knit it into caps and gloves that are very soft and warm. They draw tin into wire through a horn; and with this they cover the thread which they use in embroidering the figures of beasts, flowers, trees, and stars, upon their caps and girdles. Lapland, as well as Norway, is infested with a great number of grey wolves and bears, with whom the inhabitants wage perpetual war. The most honourable

exploit among the Laplanders is to kill a bear; and the heroes adorn their caps with a small plate of lead or pewter for every bear they have slain. The country abounds also with elks, bears, and otters, which live here unmolested, and find plenty of fish for their subsistence. The forests furnish haunts to a great number of beautiful martens and squirrels; as well as to the zibel-ling or sable, whose skin is extremely valuable; together with ermines, weazels, hares, &c. Large black cats attend the Laplanders in hunting, and little curs are also trained to the game. But the most remarkable animal of Lapland is the rein-deer. See CERVUS. These animals, so useful in various respects to the natives, are kept at no expence. In summer they feed upon grasses and alpine plants; in winter upon the lichen rangiferus, or rein-deer lichen, and its varieties, which are so abundant as in many parts almost totally to cover the ground for several miles, and which the sagacious animal discovers under the snow by the peculiar acuteness of its smell. The woods, mountains, and rivers, are well stocked with wild fowls, such as bustards, partridges, grouse, heathcocks, pheasants, lapwings, swans, wild geese, wild ducks, and all sorts of aquatic birds that breed in northern climates. In the beginning of spring the swans go thither in numerous flights from the German ocean; the lapwings follow in such swarms that they darken the sky, and scream so loud that they may be heard at a great distance. The rocks and mountains are likewise frequented by eagles, hawks, falcons, kites, and other birds of prey. The rivers abound with delicious salmon from the Gulf of Bothnia, trout, breams, and perches, of exquisite flavour, and amazing magnitude; and the inhabitants of Wardhuus, or Danish Lapland, are well supplied with fish from the northern ocean. The soil of Lapland is generally so chilled and barren, that it produces little or no grain, or fruit-trees of any kind. This sterility, however, is not so much owing to the soil, which is in many places of a rich mould, as to want of industry; for in some districts the Swedes have tilled and manured pieces of ground that bear plentiful crops of rye. There is also great plenty of berries; such as black currants, the Norwegian mulberry, growing upon a creeping plant, and much esteemed as an antiscorbutic; raspberries, cranberries, juniper-berries, and bilberries. The tops of the mountains are so much exposed to intense cold, and tempests of snow and hail, that no tree will grow near the summit; but in parts more sheltered, fine woods of birch, pine, and fir, grow naturally as if they had been planted by art in rows at regular distances, without any undergrowth. Some parts of Lapland produce the service-tree, the willow, the poplar, the elder, and the cornel. But the chief plant is the angelica; which is greatly esteemed by the natives, who use it in their food. There are also various kinds of grass, heath, fern, and moss.

LAPLYSIA, the SEA-HARE: a genus of the class and order vermes mollusca. Body covered with membranes reflected, with a shield-like membrane on the back, a lateral pore on the right side; anus on the extremity of the back; feelers four, resembling ears. There are two species, *L. depilems*, and *L. fasciata*, common about the shores of the European seas.

LAPMARK, **LAPPMARK**, or **LAPPMARKEN**, the name given by the Swedes to Lapland.

LAPMARK, is also used as an appellation for a province of Lapland.

LAPSANA, **NIPPLEWORT**; a genus of the polygamia aequalis order, and syngenesia class of plants; natural order, Compositæ. Calyx calyced; each of the inner scales channelled; receptacle naked. It has five species. *L. communis*, common nipple-wort, is very abundant in all parts of Europe, flowering in the summer-months.

LAPSE, in ecclesiastical law, an omission of a patron to present a clerk to a benefice within six months of its being void; in which case, the benefice is said to be in lapse, or lapsed, and the right of presentation devolved to the ordinary. If the ordinary neglect to present during the same time, the right of presentation accrues to the metropolitan, and to the king by neglect of the metropolitan. This right of lapse was first established in the reign of Henry II. when the bishops first began to exercise universally the right of institution to churches: and therefore when there is no right of institution, there is no right of lapse; so that no donative can lapse to the ordinary, unless it hath been augmented by the king's bounty; but no right of lapse can accrue, when the original presentation is

in the crown. In case the benefice becomes void by death or cession through plurality of benefices, the patron is bound to take notice of the vacancy at his own peril; but in case of a vacancy by resignation or canonical deprivation, or if a clerk presented be refused for insufficiency, these being matters of which the bishop alone is presumed to be cognizant, here the law requires him to give notice thereof to the patron, otherwise he can take no advantage by way of lapse; neither shall any lapse accrue thereby to the metropolitan or the king. If the bishop refuse or neglect to examine and admit the patron's clerk without good reason assigned or notice given, he shall have no title to present by lapse: and if the right of presentation be litigious or contested, and an action be brought against the bishop to try the title, no lapse shall occur till the question of right be decided. If the bishop be both patron and ordinary, he shall not have a double time allowed him to collate in: and if the bishop doth not collate his own clerk immediately to the living, and the patron presents, though after the six months are lapsed, yet the presentation is good, and the bishop is bound to institute the patron's clerk. If the bishop suffer the presentation to lapse to the metropolitan, the patron also has the same advantage if he present before the archbishop has filled up the benefice: yet the ordinary cannot, after lapse to the metropolitan, collate his own clerk to the prejudice of the archbishop. But if the presentation lapses to the king, the patron shall never recover his right, till the king has satisfied his turn by presentation; for *nullo tempore occurrit regi*.

LAPSED LEGACY, is where the legatee dies before the testator, or where a legacy is given upon a future contingency, and the legatee dies before the contingency happens. As if a legacy be given to a person when he attains the age of twenty-one years, and the legatee die before that age; in this case, the legacy is a lost or lapsed legacy, and shall sink into the residuum of the personal estate.

LAPWING, in ornithology. See **TRINGA**.

LAQUEARIUS, a kind of athleta among the ancients, who in one hand held a laqueus, *i. e.* a sort of snare, wherewith to embarrass and entangle his antagonist, and in the other a poignard to stab him.

LAQUEUS, in surgery, a ligature so contrived, that, when stretched by any weight, it draws up close. Its use is to extend broken or disjoined bones, to keep them in their places while they are set, and to bind the parts close together.

LAQUA, a large river of Asia, one of the four which rise out of Lake Chamay, and water the countries of Siam, Pegu, &c.

LAR, or **LARAR**, a town of Persia, the capital of the province of Laristan, 129 miles W. of Ormuz.

LARA, or **LARANDA**, in fabulous history, one of the Naiades, daughter of the River Almon in Lætiæ, famed for her beauty and loquacity.

LARACHA, an ancient town of Fez. Lon. 5. 59. W. Lat. 35. 40. N.

LARBOARD, the left hand side of a ship, when you stand with your face to the head: opposed to the starboard.

LARCENY. [*latrocinium*, Lat.] by contraction for *latrocinia*, is distinguished by the law into two sorts; the one called simple larceny, or plain theft, unaccompanied with any other atrocious circumstance; and mixed or compound larceny, which also includes in it the aggravation of a taking from one's house or person.

I. LARCENY, or SIMPLE LARCENY, when it is the stealing of goods above the value of 12*d.* is called grand larceny; when of goods to that value, or under, petit larceny: offences, which are considerably distinguished in their punishment, but not otherwise. See **THEFT**.

II. LARCENY, MIXED, or COMPOUND LARCENY, is such as has all the properties of the former; but is accompanied with either one or both of the aggravations of taking from one's house or person. First, therefore, of larceny from the house, and then of larceny from the person.

I. LARCENY FROM THE HOUSE though it might seem to have a higher degree of guilt than simple larceny, yet is not at all distinguished from the other at common law: unless where it is accompanied with the circumstance of breaking the house by night; and then it falls under another description, *viz.* that of burglary. (See **BURGLARY**.) But now by several acts of parliament the benefit of clergy is taken from larcenies committed in a house in almost

every instance: except that larceny of the stock or utensils of the plate-glass company from any of their houses, &c. is made only single felony, and liable to transportation for seven years. The multiplicity of the general acts is apt to create some confusion; but upon comparing them diligently, we may collect, that the benefit of clergy is denied upon the following domestic aggravations of larceny; *viz.* first, in larcenies above the value of twelvepence, committed, 1. In a church, or chapel, with or without violence, or breaking the same: 2. In a booth or tent in a market or fair, in the day-time or in the night, by violence or breaking the same, the owner or some of his family being therein: 3. By robbing a dwelling-house in the day-time (which robbing implies a breaking), any person being therein: 4. In a dwelling-house by day or by night, without breaking the same, any person being therein and put in fear; which amounts, in law, to a robbery; and in both these last cases the accessory before the fact is also excluded from his clergy. 2*dlly.* In larcenies to the value of five shillings, committed, 1. By breaking any dwelling-house, or any out-house, shop, or warehouse, thereunto belonging, in the day-time, although no person be therein; which also now extends to aiders, abettors, and accessories, before the fact: 2. By privately stealing goods, wares, or merchandise, in any shop, warehouse, coach-house, or stable, by day or by night; though the same be not broken open, and though no person be therein; which likewise extends to such as assist, hire, or command, the offence to be committed. Lastly, in larcenies to the value of forty shillings in a dwelling-house, or its out-houses, although the same be not broken, and whether any person be therein or not; unless committed against their masters by apprentices under the age of fifteen. This also extends to those who aid or assist in the commission of any such offence.

II. LARCENY FROM THE PERSON, is either by privately stealing, or by open and violent assault, which is usually called robbery. The offence of privately stealing from a man's person, as by picking his pocket or the like, privily, without his knowledge, was debarred of the benefit of clergy so early as by the statute 8 Eliz. c. 4. But then it must be such a larceny as stands in need of the benefit of clergy, *viz.* of above the value of 12*d.* else the offender shall not have judgement of death. For the statute creates no new offence; but only takes away the benefit of clergy, which was a matter of grace, and leaves the thief to the regular judgement of the ancient law. This severity seems to be owing to the ease with which such offences are committed, the difficulty of guarding against them, and the boldness with which they were practised (even in the queen's court and presence) at the time when this statute was made: besides that this is an infringement of property in the manual occupation or corporal possession of the owner, which was an offence even in a state of nature. And therefore the seculars, or cutpurses, were more severely punished than common thieves by the Roman and Athenian laws. As to open and violent larceny from the person, See **ROBBERY**.

RECEIVING STOLEN GOODS. Any person who shall buy or receive any stolen goods, knowing them to be stolen; or shall receive, harbour, or conceal, any felons or thieves, knowing them to be so, shall be deemed accessory to the felony; and being convicted on the testimony of one witness, shall suffer death as a felon convict; but he shall be entitled to his clergy. 5 Ann. c. 31. Any person convicted of receiving or buying stolen goods, knowing them to be stolen, may be transported for fourteen years. 4 George I. c. 11. Where the principal felon is found guilty to the value of 10*d.* that is, of petit larceny only, the receiver, knowing the goods to have been stolen, cannot be transported for fourteen years, and ought not to be put upon his trial. For the acts which make receivers of stolen goods, knowingly, accessories to the felony, must be understood to make them accessories in such case only, where, by law, an accessory may be; and there can be no accessory to petit larceny. Every person who shall apprehend any one guilty of breaking open houses in a felonious manner, or of privately and feloniously stealing goods, wares, or merchandises, of the value of 5*s.* in any shop, warehouse, coach-house, or stable, though it be not broken open, and though no person be therein to be put in fear, and shall prosecute him to conviction, shall have a certificate without fee, under the hand of the judge, certifying such conviction, and within what parish and place the felony was committed, and also that such felon was discovered and taken, by the

person so discovering or apprehending him; and if any dispute arise between several persons so discovering or apprehending, the judge shall appoint the certificate into so many shares, to be divided among the persons concerned, as to him shall seem just and reasonable. This certificate is commonly called a Tyburn ticket, and exempts the person from all parish and ward offices in the parish where the robbery was committed.

LARCIL, in botany. See **PINUS**.

LARDNER, NATHANIEL, an eminent English dissenting divine, born at Hawkhurst in Kent, June 6, 1684. After a grammatical education, to which great attention must have been given, and in which a no less rapid progress must have been made, he was sent first to a dissenting academy in London, which was under the care of the Rev. Dr. Joshua Oldfield; and thence, in his sixteenth year, to prosecute his studies at Utrecht, under the celebrated professor, D'Uries, Gravius, and Burman. Here he remained above three years, and then removed for a short space to Leyden. In 1703 he returned to England, continuing at his father's house to employ himself by close and diligent preparation for the sacred profession which he had in view. Qualified as he was, it was not till 1709 that he preached his first sermon, from Romans i. 16.—“a text (his biographer remarks) than which there could not have been a more proper one, for a man who was destined in the order of Divine Providence, to be one of the ablest advocates for the authenticity and truth of the Christian revelation that ever existed.” A few years after this, he was received into Lady Treby's family, as domestic chaplain and tutor to her son, and continued in this comfortable situation till her ladyship's death in 1721. This event threw him into circumstances of some perplexity, having preached to several congregations during his residence with Lady Treby, without the approbation or choice of any one congregation. Though Mr. Lardner had no church at which he officiated as minister, he was engaged with some of his dissenting brethren in preaching a Tuesday evening lecture at the Old Jewry. Acquainted probably with the direction of his studies, they appointed him to preach on the proof of the Credibility of the Gospel History. This he discussed in two sermons; and prosecuting the subject which he had taken up in these discourses, in February 1727, he published in two volumes 8vo. the first part of “The Credibility of the Gospel History, or the Facts occasionally mentioned in the New Testament, confirmed by Passages of ancient Authors, who were contemporary with our Saviour or his Apostles, or lived near their time.” An appendix was subjoined, relating to the time of Herod's death. Thus Mr. Lardner commenced author, and began his literary career with singular reputation. “It is scarcely necessary to say (observes Dr. Kippis), how well this work was received by the learned world. Not only was it highly approved by the Protestant Dissenters, with whom the author was more immediately connected, but by the clergy, in general, of the established church; and its reputation gradually extended into foreign countries. It is indeed an invaluable performance, and hath rendered the most essential service to the cause of Christianity. Whoever peruses this work will find it replete with admirable instruction, sound learning, and just and candid criticism.” These two, with the subsequent fifteen, volumes octavo, and the four thin quartos, entitled Jewish and Heathen Testimonies, occupied him, with the interruption arising from some smaller productions, during the space of forty-three years. Dr. Kippis, speaking of the “Supplement to the Credibility,” says, “I cannot avoid strongly recommending this work to the attention of all young divines. Indeed, I think that it ought to be read by every theological student before he quits the university or academy in which he is educated. There are three other works which will be found of eminent advantage to those who are intended for, or beginning to engage in, the Christian ministry. These are, Butler's Analogy, Bishop Law's Considerations on the Theory of Religion, and Dr. Taylor's Key to Apostolical Writings, prefixed to his Paraphrase on the Epistle to the Romans. Without agreeing with every circumstance advanced in these works, it may be said of them with the greatest truth, that they tend to open and enlarge the mind; that they give important views of the evidence, nature, and design, of revelation; and that they display a vein of reasoning and inquiry, which may be extended to other objects besides those immediately considered in the books themselves.

LAREDO, a sea-port of Spain in the Bay of Biscay, 30 miles W. of Bilbao. Lon. 3. 53. W. Lat. 43. 23. N.

LAURENTIALIA, in antiquity, a feast held among the Romans on the 23d day of December, but ordered to be observed twice a-year by Augustus; by some supposed to have been in honour of the lares; but by others with more probability, in honour of Acca Laurentia; and to have been the same with the Laurentalia.

LARES, among the ancients, derived by Apuleius, in his tract *De Deo Socratis*, from *lar familiaris*; a kind of domestic genii, or divinities worshipped in houses, and esteemed the guardians and protectors of families; supposed to reside more immediately in the chimney-corner. The lares were distinguished from the penates; as the former were supposed to preside over house-keeping, the servants in families, and domestic affairs; and the latter were the protectors of the masters of families, their wives and children. The term lares, according to Mr. Bryant, was formed from *laren*, an ancient word by which the ark was represented; and he supposes that the lares and manes were the same domestic deities under different names; and that by these terms the Etruscans and Latins denoted the dii arkitae, who were no other than their arkite ancestors, or the persons preserved in the laren, or ark; the genius of which was Isis, the reputed parent of the world.

LARGE, in the manege, a horse is said to go large and wide, when he takes in a great deal of ground, by going wide of the centre of the volt, and describing a great circumference.

LARGE, in sea-language, a term applied to the wind when it crosses the line of a ship's course in a favourable direction, particularly on the beam or quarter. Thus, if a ship steer west, then the wind in any point of the compass to the eastward of the south or north may be called large, unless when it is directly east, and then it is said to be right aft. Sailing large is, therefore, advancing with a large wind, so as that the sheets are slackened and flowing, and the bow-lines entirely disused. This phrase is generally opposed to sailing close-hauled.

LARGITIO, in Roman antiquity, was a distribution of corn, provision, clothes, money, &c. to the people.

LARGO, in the Italian music, a slow movement, one degree quicker than the grave, and two than the adagio.

LARICANIS, a province of South America, in Buenos Ayres about two hundred and forty miles long from east to west, and seventy-five broad. The whole of it abounds in mines of gold, so pure that it is often found of twenty-three carats three grains fineness.

LARINO, a town of Italy, in Naples, 25 miles N. E. of Molise.

LARINUM, in ancient geography, a town of Italy, near Apulia, now called Larino.

LARIO, a department of the late Italian republic. Como was the capital of the department.

LARISSA, an ancient, rich, and celebrated town of Greece, in the province of Janna Thessaly, with an archbishop's see of the Greek church, a palace, and several handsome mosques. According to Virgil, it was the country of Achilles. Lon. 23. 36. E. Lat. 38. 51. N.

LARISSA, the name of four other ancient cities, viz. 1. in Eolia, seventy stadia from Cyme: 2. in Asia Minor, near the south borders of Troas: 3. near Ephesus: 4. a large city on the banks of the Tigris, which had a pyramid, but much inferior to those of Egypt in height.

LARISSÆUS, a surname of Achilles, from his birth-place, Larissa; as well as of Jupiter, from his temple there.

LARISTAN, a province of Persia, formerly an independent kingdom, under the descendants of Cosroes, king of Persia; bounded on the north and east by Kerman; south by the Persian Gulf, and west by Farsistan. The air is unwholesome, and the water bad. Its chief trade is in camels. Lar is the capital.

LARIUS, in ancient geography, an extensive lake of Gallia Ci-alpina, now called Como. See **COMO**.

LARIX, the LARCH TREE. See **PINUS**.

LARK, in ornithology. See **ALAUDA**, and **BIRD-CATCHING**.

LARKSPUR, in botany. See **DELPHINIUM**.

LARMIER, [from *larme*, French, a tear,] in architecture, a flat square member of the cornice, below the cimasiuum, and jetting out farthest; so called from its use, which is to disperse the water, and cause it to fall at a distance from the wall, drop by drop, as it were by tears.

LARNAGE,

LARNAGE, a town of France, in the department of Drome, 10 miles N. of Valence.

LARNE, a river of Ireland, in Antrim.

LARNE, a town of Ireland, seated at the mouth of the river, 16 miles N.E. of Antrim. Lon. 5. 43. W. Lat. 54. 51. N.

LARNIC, a sea-port of Cyprus, on the S.E. coast, 30 miles S.W. of Famagosta.

LARRIBUNDAR, a sea-port town of Asia, in Hindoostan, seated at the mouth of the Sindu, or Indus. Lon. 67. 0. E. Lat. 25. 0. N.

LARVÆ, in antiquity, derived from the Etruscan word *lar*, or *lars*, signifying "prince or lord," denoted the ghosts of the deceased, considered as wicked and mischievous. Hence is formed the term *larvatus*, i. e. *larva indutus* or *demoniac*. The ingenious Mr. Farmer urges the etymology and use of this term to prove that the heathen daemons were human ghosts. The *larvæ* were also called *lemures*.

LARVÆ, in entomology, a name given by Linnæus to insects in that state called by other writers *crucæ* or caterpillars. See ENTOMOLOGY.

LARVIGEN, a county of Norway; also the capital of the county, 55 miles S. S. W. of Christiana. Lon. 10. 15. E. Lat. 59. 3. N.

LARUS, the GULL; in ornithology, a genus of the order anseres. Bill straight, cultrated, point a little bended, without teeth; inferior mandible gibbous below the apex; nostrils linear, a little broader before, and situated in the middle of the beak. There are about twenty species, principally distinguished by their colours.

L. CANUS, the COMMON GULL, is in length sixteen or seventeen inches. The bill is yellow; the irides are hazel, and the eyelids brown; the head, neck, under parts of the body, and tail, are white; the back and wings pale grey. This is found in vast numbers on our shores and rivers which are contiguous to the sea. It is seen also very far north, as far as Iceland and the Russian lakes; it is met with in the neighbourhood of the Caspian Sea, in various shores of the Mediterranean, and as far south as Greece: and it is found also in America, on the coast of Newfoundland. It breeds on the rocks and cliffs, like others of the genus. It is a tame species, and may be seen by hundreds on the shores of the Thames and other rivers, in the winter and spring, at low tides, picking up the various worms and small fish left by the tides, and will often follow the plough in the fields contiguous, for the sake of worms and insects which are turned up, particularly the cockchafer or dorbeetle in its larvæ state, which it joins with the rooks in devouring most greedily.

L. CATARACTES, the SKUA GULL, weighs about three pounds; the bill is two inches one-fourth long, much hooked at the end, and very sharp; the upper mandible covered more than half-way with a black cere or skin, as in the hawk kind; the nostrils are placed near the bend, and are pervious. The feathers on the head, neck, back, scapulars, and coverts of the wings, are of a deep brown, marked with rusty colour, brightest in the male. The breast, belly, and vent, are ferruginous, tinged with ash-colour. The tail, when spread, is circular, of a deep brown, white at the root, and with shafts of the same colour. The legs are covered with great black scabons: the talons black, strong, and crooked; the interior remarkably so. This species inhabits Norway, the Ferroe isles, Shetland, and also the South Sea. It is the most formidable of the gulls; its prey being not only fish, but, what is wonderful in a web-footed bird, all the less sort of water-fowl, such as teal, &c. Mr. Schröter, a surgeon in the Ferroe isles, relates that it likewise preys on ducks, poultry, and even young lambs. It has all the fierceness of the eagle in defending young; when the inhabitants of those islands visit the nest, it attacks them with great force, so that they hold a knife erect over their heads, on which the skua will transfix itself in its fall on the invaders. The Rev. Mr. Low, minister of Birse, in Orkney, confirmed part of the above account: on approaching the quarters of these birds, they attacked him and his company with very violent blows; and intimidated a bold dog of Mr. Low's in such a manner, as to drive him for protection to his master. The natives are often very roughly treated by them while they are attending their sheep on the hills; and are obliged to guard their head by holding up their sticks, on which the birds often kill themselves. In Foulca it is a privileged bird, because it defends

the flocks from the eagle, which it beats and pursues with great fury; so that even that rapacious bird seldom ventures near its quarters. The natives of Foulca, on this account, lay a fine on any person who destroys one: they deny that it ever injures their flocks or poultry.

L. FUSCUS, the HERRING GULL, weighs upwards of thirty ounces; the length, twenty-three inches. This species is a great devourer of fish, especially of herrings; it is a constant attendant on the nets, and so bold as to seize its prey in presence of the fishermen. It is common in this kingdom, and frequents the same places as the black-backed gull. It is also found in most of the northern parts of Europe, as well as about the Caspian and Black Seas; the rivers which fall into them, and the great lakes of Siberia.

L. MARINUS, the BLACK-BACKED GULL, is in length twenty-nine inches. The bill is very strong and thick, and almost four inches long: the colour a pale yellow; but the lower mandible is marked with a red spot, with a black one in the middle. It inhabits several parts of England, and breeds on the highest cliffs. It is also common on most of the northern coast of Europe. It frequents Greenland; but chiefly inhabits the distant rocks. Its lays three eggs in May, placing them on the heaps of dung which the birds leave there from time to time. It is said to attack other birds, and to be particularly an enemy to the eider duck. It very greedily devours carrion, though the most general food is fish. See in Plate LVIII. a delineation of L. parasiticus, which is found in the north of England and the northern countries of Europe and Asia, and is common in Greenland.

LARYNGOTOMY, [*λάρυγγις*, and *τομή*; *laryngotomie*, Fr.] an operation where the fore-part of the larynx is divided to assist respiration, during large tumours upon the upper-parts, as in a quinsy.

LARYNX, [*λάρυγγις*,] the upper part of the trachea, which lies below the root of the tongue, before the pharynx. See ANATOMY.

LASCARIS, CONSTANTINE, one of the Greeks who were principally concerned in the revival of learning in the West. He retired into Italy in 1454, and taught polite literature at Milan, whither he was called by Francis Sforza; he afterwards went to Rome, where he was well received by Cardinal Bessarion. He afterwards taught rhetoric and the Greek tongue at Naples; and ended his days at Messina, leaving the senate of that city many excellent manuscripts, which he had brought from Constantinople. He was interred at the public expence, and the senate of Messina erected a marble tomb to his memory. He wrote some grammatical works.

LASERPITIUM, LAZAR-WORT, a genus of the digynia order, and pentandria class of plants; natural order, Umbellatæ. Petals bent in, emarginate, spreading; fruit oblong, with eight membranaceous angles. It has fifteen species, natives of the south of Europe.

LASH, or LACE, in the sea-language, signifies to bind and make fast; as, to lash the bonnet to the course, or the drabblor to the bonnets.

LASHERS, in sea-language, are those ropes which bind fast the tackles, and the breechings of the ordnance, when hauled or made fast within board.

LASIOSTOMA, in botany, a genus of the tetrandria monogynia class and order. Calyx very short, five-petaled, with two acute scales; corolla funnel-form, four-cleft; capsule orbiculate, one-celled, two-seeded. There is only one species, viz. L. rounhamon, a shrub of Guiana, seven or eight feet in height, with a greyish irregular bark, and a whitish wood.

LASNEBOURG, a town of France in the department of Mont Blanc, late duchy of Savoy, 20 miles N.N.W. of Susa, and 23 E. of St. Jean.

LASKING, at sea, is much the same with going large, or veering, that is, going with a quarterly wind.

LASSA, or LAHASSA, a city of Asia, the capital of Great Thibet, called also Tonker, and Putala; and by the natives Baronthala. It is 220 miles N.E. of Patna, and 850 N. by E. of Calcutta. Lon. 91. 50. E. Lat. 30. 35. N.

LASSAY, a town of France, in the department of Maine, 9 miles N.N.E. of Maine.

LASSITUDE, or WEARINESS, [*lassitudo*, Lat.] in medicine, a morbid sensation, that comes on spontaneously, without

any previous motion, exercise, or labour. It is a frequent symptom in acute distempers.

LAST, the burden or load of a ship; also a certain measure of fish, corn, wool, leather, &c. A last of codfish, white herrings, meal, and ashes for soap, is twelve barrels; of corn or rapeseed, ten quarters; of gunpowder, twenty-four barrels; of red herrings, twenty cades; of hides, twelve dozen; of leather, twenty dickers; of pitch and tar, fourteen barrels; of wool twelve sacks; of stock-fish, 1000; of flax or leathers, 1700 pounds.

LASTA, a mountainous district of Abyssinia, in the province of Begemder.

LASTAGE, [*hlrest*, Saxon, a load,] custom paid for freightage; the ballast of a ship; lastage, or lestage, is also a duty exacted in some fairs and markets, for carrying things bought whither one will. It is sometimes used for garbage, rubbish, or such like filth.

LASTRES, a sea-port town and cape of Spain, on the north coast of Asturias, 30 miles N.E. of Oviedo.

LATAC, a town of Asia, in Thibet, on the north side of the Ganges.

LATACUNGA, a town of South America, the capital of a jurisdiction so named. It lies 50 miles S. of Quito.

LATAKIA, a sea-port of Asia, in Syria, anciently called Laodicea. See **LAODICEA**. It is 50 miles S. of Antioch, and 80 S.W. of Aleppo.

LATCHES, **LASKETS**, in a ship, are small lines like loops, fastened by sewing into the bonnets or drablers of a ship, in order to lace the bonnets to the courses, or the drablers, to the bonnets.

LATEEN SAIL, a long triangular sail extended by a lateen yard, and frequently used by xebecs, poleacres, setees, and other vessels navigated in the Mediterranean sea.

LATERAL EQUATION, in algebra, the same with simple equation. It has but one root, and may be constructed by right lines only. See **ALGEBRA**.

LATERAN was originally the proper name of a man; whence it descended to an ancient palace in Rome, and to the buildings since erected in its place; particularly a church called St. John of Lateran, which is the principal see of the popedom.

LATERAN, CANONS REGULAR OF THE CONGREGATION OF THE, is a congregation of regular canons, whereof that church is the principal place or seat. It is pretended there has been an uninterrupted succession of clerks, living in community from the time of the apostles; and that a number of these were established in the Lateran in the time of Constantine. But the canons were not introduced till the time of Leo I. and these held the church 800 years, till the reign of Boniface, who took it from them, and placed secular canons in their room: 150 years after, the regulars were reinstated.

LATERAN, COUNCILS OF THE, are those held in the basilica of the Lateran; of these there have been five, held in 1123, 1139, 1179, 1215, and 1513.

A **LATERE**, a term used to denote the qualifications of the cardinals whom the pope sends as legates into foreign countries. They are called legates a latere, as being his holiness's assistants and counsellors in ordinary.

DE LATERE, legates who are not cardinals, but yet are entrusted with an apostolical legation. See **LEGATE**.

LATH, in building, a long thin and narrow slip of wood, nailed to the rafters of a roof or ceiling, in order to sustain the covering. These are distinguished into three kinds, according to the different kinds of wood of which they are made, viz. heart of oak, sap-laths, and deal-laths; of which the two last are used for ceilings and partitions, and the first for tiling only. Laths are also distinguished according to their length, into five-feet, four-feet, and three-feet, laths, though the statute allows but of two lengths, those of five, and those of three-feet, each of which ought to be an inch and a half in breadth, and half an inch in thickness, but they are commonly less.

LATHS, CLEAVING OF. The lath-cleavers having cut their timbers into lengths, they cleave each piece with wedges, into eight, twelve, or sixteen, according to the size of their timber; these pieces are called bolts: this is done by the felt-grain, which is that grain which is seen to run round in rings at the end of a piece of a tree. Thus they are cut out for the breadth of the laths, and this

work is called felting. Afterwards they cleave the laths into their proper thicknesses with their chit, by the quarter-grain, which is that which runs in straight lines towards the pith.

LATH BRICKS, a particular sort of bricks made in some parts of England, of 22 inches in length and six in breadth, which are used in the place of laths or spurs, supported by pillars in casts, for the drying of malt. This is an excellent contrivance; for besides that they are not liable to fire, as the wooden laths are, they retain the heat vastly better; so that being once heated, a very small quantity of fire will serve to keep them so.

LATHE, a very useful engine for turning wood, ivory, metals, and other materials. (See **TURNING**.) The invention of the lathe is very ancient: Diodorus Siculus says, the first who used it was a grandson of Daedalus, named Talus. Pliny ascribes it to Theodorus of Samos; and mentions one Thericles, who rendered himself very famous by his dexterity in managing the lathe. With this instrument the ancients turned all kinds of vases, many whereof they enriched with figures and ornaments in basso relievo. Thus Virgil:

Lenta quibus torno facili superaddita vitis.

The Greek and Latin authors make frequent mention of the lathe; and Cicero calls the workmen who used it *vascularii*. It was a proverb among the ancients, to say a thing was formed in the lathe, to express its delicacy and justness. The lathe is composed of two wooden cheeks or sides, parallel to the horizon, having a groove or opening between; perpendicular to these are two other pieces called puppets, made to slide between the cheeks, and to be fixed down at any point at pleasure. These have two points, between which the piece to be turned is sustained; the piece is turned round, backwards and forwards, by means of a string put round it, and fastened above to the end of a pliable pole, and underneath to a terdle or board moved with the foot. There is also a rest which bears up the tool, and keeps it steady. For the description, use, and application, of this instrument, See **TURNING**.

LATHRÆA, in botany, a genus of the didynamia angiospermia class and order; natural order, Personate. Calyx four-cleft; gland depressed at the base of the suture of the germ; capsule one-celled. There are four species, of which,

L. SQUAMARIA, **GREAT TOOTH-WORT**, growing in most parts of Europe, has a headed root, branched and surrounded with white succulent scales; it is parasitical, and generally attached to the roots of elms, basels, or some other trees, in a shady situation.

LATHREVE, **LEIDGREVE**, or **TRITHENGREVE**, was an officer under the Saxon government, who had authority over a third part of the county; and whose territory was therefore called trithring, otherwise a leid lath or leatmin.

LATHYRUS, **CHICKLING**; in botany, a genus of the decandria order, and diadelphia class of plants; natural order, Papilionaceæ. Stylis plain, villous above, towards the end broader; upper two segments of the calyx shorter than the rest. There are nine species.

L. LATIFOLIUS, the **EVERLASTING PEA**, hath thick, fibrous, perennial roots; climbing, thick, branching annual stalks, having membranaceous wings between the joints, rising upon support by their cirri six or eight feet high; diphyllous leaves, of two spear-shaped lobes, terminated by claspers; and numerous large red or purple flowers on long foot-stalks, appearing plentifully from June till October, succeeded by abundance of seed. This plant grows naturally in some places, is easily cultivated, annually yields plenty of excellent provender, and may be cultivated to advantage as green food for cattle, on almost any strong soil.

L. ODORATUS, the **SWEET-SCENTED PEA**, hath a fibrous annual root; a climbing stalk, rising upon support by its claspers three or four feet high.

L. TANGITANUS, the **TANGIER PEA**, hath a fibrous annual root, a climbing stalk rising upon support for four or five feet high; diphyllous leaves, of two spear-shaped alternate lobes, terminated by tendrils; and from the joints of the stalk large reddish flowers by two's on long footstalks. All these species are of hardy growth; and may be propagated by seed in the common ground, in patches where it is designed the plants should flower, for they do not succeed so well by transplantation. They may be sowed in spring; though,

though, if sowed in autumn, the plants will flower earlier the following year.

LATIAN, [*Latiaris*, Lat.] in Roman antiquity, a feast or ceremony instituted by Tarquinius Superbus, in honour of Jupiter Latiaris or Latialis.

LATIARIS, a surname of Jupiter.

LATICLAVE, or **LATICLAVIUM**, in Roman antiquity, was an honourable distinction, peculiar in the times of the republic, to the senators; but whether it was a particular kind of garment, or only an ornament upon it, the critics are not agreed.

LATIMER, HUGH, bishop of Worcester, an illustrious Protestant martyr, born about the year 1480, at Thurcaston in Leicestershire, was the only son of a yeoman of that village. At the age of 14 he was sent to Christ's college, Cambridge; where he applied himself to the study of divinity, and in proper time took the degree of B. D. At this time he was a zealous Papist, and was honoured with the office of keeper of the cross to the university: but when he was about 30 years of age, he became a convert to the Protestant religion; and being now one of the 12 licensed preachers from Cambridge, he promulgated his opinions with great freedom. It was not long before he was accused of heresy; and being summoned before cardinal Wolsey, was obliged to subscribe certain articles of faith, which he certainly did not believe. About the year 1529, he was presented by Henry VIII. to the rectory of Westkinton in Wiltshire; to which place, after residing some time at court with his friend and patron Dr. Butts, he retired; but, resuming his former invectives against the Popish doctrines, he was again summoned to answer certain interrogatories, and again obliged to subscribe. In 1535 he was promoted to the bishopric of Worcester; in the possession of which dignity he continued till the year 1539, when, rather than assent to the act of the six articles, he resigned his mitre, and retired into the country; but was in a short time accused of speaking against the six articles, and committed to the Tower, where he continued prisoner till the death of Henry VIII. in January 1547. On the accession of Edward VI. Latimer was released, but not restored to his bishopric, though he preached several times before the king, and continued to exercise his ministerial function with unremitting zeal and resolution. Young Edward, alas! finished his short reign in 1553; and Mary I. of infamous memory, ascending the throne, Latimer was immediately doomed to destruction, and, together with Crammer and Ridley, confined in the Tower. In April 1554, they were removed to Oxford, that they might dispute with the learned doctors of both universities. Latimer declining the disputation on account of his great age and infirmities, delivered his opinion in writing; and refusing to subscribe to the Popish creed, was condemned for heresy; and in October following was, together with bishop Ridley, burnt alive. He behaved with uncommon fortitude on the occasion, and died a real martyr to the Reformation. His general character is that of a learned, virtuous, and brave man. His works are, 1. Sermons. 1635, fol. 2. Letters; in Fox's Acts and Monum. vol. ii. fol. 1580. 3. An injunction to the prior and convent of St. Mary's in Worcestershire. See record at the end of Burnet's History of the Reformation, part ii. p. 293.

LATIN, a dead language, first spoken in Latium, and afterwards at Rome; and still used in the Romish church, and among many of the learned. This language is principally derived from the Greek, and particularly from the Æolic dialect of that tongue, though it has a great number of words which it borrowed from the languages of the Etrusci, Osci, and other ancient people of Italy; and foreign commerce and wars, in course of time, added a great number more. The Latin is a strong nervous language, perfectly suitable to the character of the people who spoke it: we have still works of every kind admirably well written in the Latin. See **LANGUAGE**.

LATINI, the inhabitants of Latium.

LATINISM, [*latinisme*, French; *latinismus*, low Latin,] a Latin idiom; a mode of speech peculiar to the Latin.

LATITAT, a writ which issues out of the king's bench, so denominated from a supposition that the defendant lies lurking and concealed, after having fled out of Middlesex, into some other county; to the sheriff whereof this writ is directed, commanding him to apprehend the defendant there.

LATISSIMUS, in anatomy, the name of several muscles. See **ANATOMY**.

LATITUDE, in astronomy, is an arch of a great circle perpendicular to the ecliptic, contained between the ecliptic and any point in the heavens. See **ASTRONOMY**.

LATITUDE, in geography, an arch of the meridian, contained between any place of the earth, and the equator. See **GEOGRAPHY**.

LATITUDINARIAN, [*latitudinarius* low Latin,] a person who believes there is a latitude in the road to heaven, which may admit people of different persuasions. Thus the Protestants admit that papists may be saved. But when latitudinarianism allows salvation to those who receive not the doctrines of the gospel, it is exceedingly dangerous, and directly contrary to the assertions of Christ, who expressly declares the way to heaven to be a narrow way.

LATIUM, in ancient geography, the country of the Latins, at first contained within very narrow bounds, but afterwards increased by the accession of various people. The appellation, according to Virgil, is derived from *latendo*, concealing, from Saturn's lying hid there from the hostile pursuits of his son Jupiter; and from Latium comes the name Latini, the people; though Dionysius Halicarnassensis derives it from king Latinius, (*Λατίνιος*), who reigned about the time of the Trojan war. But whatever be in this, it is certain, that Latium, when under Æneas, and his descendants, or the Alban kings, contained only the Latins, exclusive of the Æqui, Volsci, Hernici, and other people; only that Æneas reckoned the Rutuli, after their conquest, among the Latins. And this constituted the ancient Latium confined to the Latins: but afterwards, under the kings, and after their time, it reached from the Tiber to Circeii. Under the consuls, the country of the Æqui, Volsci, Hernici, &c. after long bloody wars, was added to Latium, under the appellation adjectitious or superadded Latium, as far as the river Liris, the eastern boundary, and to the north as far as the Marsi and Sabines. The various people, which in succession occupied Latium, were the Aborigines, the Pelasgi, the Arcades, the Siculi, the Arunci, the Rutuli; and beyond Circeii, the Volsci, the Osci, the Ausones: but the time and order in which they occupied the country, are difficult to determine.

LATIUS, a surname of Jupiter at Rome.

LATOMIA properly signifies a stone-quarry: but the places whence stones had been dug having been made use of sometimes as dungeons, jails, or places for criminals, it is often applied as a name for a prison.

LATONA, in mythology, a pagan goddess, whose history is very obscure. Hesiod makes her the daughter of the Titan, Coeus, and Phœbe his sister.

LATOPOLIS, an ancient town of Egypt, now called Esne, or Asna.

LATRIA, [*λατρία*, Gr.] the highest kind of worship: distinguished by the papists from *dulia*, or inferior worship.

LATRIA, in theology, that religious worship due only to God. See **ADORATION**. The Romanists say, "They honour God with the worship of latria, and the saints with the worship of *dulia*; but the terms, however distinct, are usually confounded."

LATRINE, in Roman antiquity, public houses of office, or necessaries.

LATRUNCULI, a game amongst the Romans, of much the same nature with our chess.

LATTEN, iron-plates tinned over, of which tea canisters are made. Plates of iron being prepared of a proper thinness, are smoothed by rusting them in an acid liquor, as common water made eager with rye. With this liquor they fill certain troughs, and then put in the plates, which they turn once or twice a-day, that they may be equally rusted over. After this they are taken out, and well scoured with sand; and, to prevent their rusting again, are immediately plunged into pure water, in which they are to be left till the instant they are to be tinned or blanchèd; the manner of doing which is this: they flux the tin in a large iron crucible, which has the figure of an oblong pyramid with four faces, of which two opposite ones are less than the two others. The crucible is heated only from below, its upper part being luted with the furnace all round. It is always deeper than the plates which are to be tinned are long; they always put them in downright, and the tin ought to swim over them; for this purpose artificers of different trades prepare plates of different shapes, though Mr. Reaumur thinks them all exceptionable. But the Germans use no sort of preparation of the iron to make it receive

the tin more than the keeping of it always steeped in water till the time; only when the tin is melted in the crucible, they cover it with a layer of a sort of suet, which is usually two inches thick, and the plate must pass through this before it can come to the melted tin. The first use of this covering is to keep the tin from burning; for if any part should take fire, the suet would soon moisten it, and reduce it to its primitive state again. The suet must be prepared by first frying and burning it; which not only gives it the colour, but puts it in a condition to give the iron a disposition to be tinned. The melted tin must also have a certain degree of heat: for if it be not hot enough, it will not stick to the iron; and if it be too hot, it will cover it with too thin a coat, and the plates will have several colours, as red, blue, and purple, and upon the whole will have a cast of yellow. To prevent this, by knowing when the fire has a proper degree of heat, they might try with small pieces of iron; but in general, use teaches them to know the degree, and they put in the iron when the tin is at a different standard of heat, according as they would give it a thicker or thinner coat. Sometimes also they give the plates a double layer, as they would have them very thickly covered. This they do by dipping them into the tin when very hot the first time, and when less hot the second. The tin which is to give the second coat must be fresh covered with suet; and that with the common suet, not the prepared.

LATTEN BRASS, signifies plates of milled brass, of different thickness, according to the uses they are intended for.

LATTIMO, in the glass-trade, a name for a fine milk-white glass.

LATUS, in anatomy, a name given by some to the Levator Ani, and by others to the latissimus colli.

LATUS PRIMARIUM, in conic sections, a right line drawn through the vertex of the section of a cone, within the same and parallel to the base.

LATUS RECTUM, the same with Parameter. See **CONIC SECTIONS**.

LATUS TRANSVERSUM OF THE HYPERBOLA, is a right line intercepted between the vertices of the two opposite sections; or that part of their common axis which lies between the vertices of the two opposite cones.

LAVA, a stream of melted minerals which runs out of the mouths, or bursts out through the sides, of Volcanoes, or burning mountains during the time of an eruption. Sir William Hamilton informs us, that the lavas of Etna and Vesuvius are much the same, but those of Etna rather blacker and more porous than those of Vesuvius. Some kinds of lava take a fine polish, and are frequently manufactured into boxes, tables, &c. In Naples, the inhabitants commonly make use of it for paving the streets, and even the subterraneous cities of Pompeii and Herculaneum have been paved with the same substance. A fine large cubic piece of lava is preserved in the hall of the British Museum. See **ETNA**, **HECLA**, **VESUVIUS**, **VOLCANO**, &c.

LAVAL, a city of France, capital of the department of Maine, 15 miles S. of the town of Maine, and 40 W. of Mans.

LAVAMUND, a town of Germany, in Carinthia, 24 miles E. of Clagenfurt. Lon. 15. 18. E. Lat. 46. 44. N.

LAVANDULA, **LAVENDER**: a genus of the angiospermiæ order, and didynamia class of plants: natural order, Verticillatæ. Calyx ovate, a little dentated, supported by a bracten or floral leaf; corolla resupinated; stamina within the tube. There are seven species.

L. SPICA, the **LAVENDER SPIKE**, hath a short shrubby stalk, rising two or three feet high; small spear-shaped entire leaves; and from the ends of the branches, numerous, long, erect, naked spikes of small ringent flowers, of different colours in the varieties. The varieties of this are common narrow-leaved lavender, with blue flowers, and with white flowers; broad-leaved lavender; dwarf lavender: all of them flowering in July. This species is the common lavender; but the narrow-leaved variety, with blue flowers, is the sort commonly cultivated for its flowers for medicine, &c. The flowers are gathered for use in July, which being the time of their perfection, cut off the spikes close in a dry day, and tie them in small bunches for use. These and the summits are in a very eminent degree cephalic and nervine. They are given in palsies, vertigoes, lethargies, tremors, and suppression of the menstrual evacuation. The compound spirit distilled from

them is famous in these and many similar cases. The distilled oil is peculiarly celebrated for destroying the pediculi inguinales, and other cutaneous insects. If soft spongy paper, dipt in this oil, either alone or mixed with oil of almonds, be applied at night to the parts infected, the insects will certainly, says Geoffroy, be all found dead in the morning. The spikes of flowers are much esteemed, not only for their grateful odour, when deposited in chests, or boxes, among linen; but chiefly for preventing the depredations of moths and other insects.

LAVATER, **JOHN CASPAR**, the celebrated physiognomist, was born at Zurich, in 1740. He studied theology, but without making himself master of the learned languages, which he often regretted afterwards. He was first appointed preacher to the Orphan-house, and afterwards, in 1778, deacon and pastor of the principal church of St. Peter at Zurich; in which office he continued till his death, labouring zealously by his example, as well as by preaching, writing, and exhortation, to recommend to others those Christian principles and moral virtues, which he himself entertained and practised. In his peculiar religious tenets, though he might appear whimsical and even heretical to many, yet he was followed and idolized by thousands; and was the centre of what some stile "an invisible church, whose members, extending from Naples to Copenhagen, never failed to entertain the highest respect for their founder and prophet." These peculiar opinions are found in his various works: particularly in his "View of Immortality;" his "Pocket Bible;" his "Messiah," his "Pontius Pilate;" his "Treatise on Miracles;" his "Sermons on the Existence of the Devil;" his "Visions;" and his "Observations on Important Passages in the Evangelists;" along with many other curious and interesting remarks, which evince a deep penetration into the human heart, and a prodigious knowledge of mankind. In politics as well as in religion, he maintained a constant struggle against every kind of tyranny and intolerance: and his integrity was so undaunted, and his philanthropy so unbounded, that he thought no sacrifice too great to accomplish any object that tended to promote the good of his fellow-creatures. He is said to have written 3000 letters and notes annually, besides those he dictated to his secretary. For a long time, too, he kept a Journal, of which above 50 copies were made out, and sent to his principal partisans abroad, who dispersed copies of them among their friends. The evangelical doctrine and duty of Brotherly Love were always the chief subjects of those apostolical epistles. In the midst of these various and incessant labours, he found time to compose his treatise on Physiognomy, a work which has rendered his name universally known throughout Europe and America. He was accidentally led to turn his attention to the expression of human sentiment and character, in the varied conformation of the countenance, head, and other parts, of the human frame; in the complexion, temperament, habitual motions and attitudes, &c. He perceived that in all these, not only transient passions, but even the more permanent qualities of character, are often very distinctly expressed. He carried his observations on this subject much farther, than any other physiognomist on record had ever before attempted to advance. Success inflamed his imagination, and he became an enthusiast in this his favourite study. The opinions and theory which he published upon it were a medley of judicious observations, ingenious conjectures, and fanciful reveries. The novelty as well as mystery of the subject attracted the public attention. Every person was eager to learn to read his neighbour's heart in his face. In Switzerland, Germany, France, Britain, and North America, vast numbers became passionate admirers of Lavater's theory. His books, published originally in the German language, were multiplied by many editions, and repeated translations into French, English, &c. They were every where read, admired, and studied, with a considerable degree of that enthusiasm, with which they were composed. Physiognomy was spoken of as a science almost susceptible of mathematical certainty, and as capable of endowing man with a degree of omniscience sufficient to enable him to pry into the hearts and intentions of his fellow-mortals. Yet so variable is public opinion, that, notwithstanding the labours of Dr. Hunter and Mr. Hecroft, the physiognomical writings of Lavater, have been since treated with a degree of neglect, that falls short of doing justice to their real merits. Still, however Lavater retained great numbers of disciples; and was visited and admired by travellers from all parts

of Europe. His private life was simple, regular, and pious. His wife became as zealous a physiognomist as himself. He rose early, and seldom took breakfast till he had earned it by performing some literary task. He died in 1801, in the 60th year of his age.

LAVATERA, in botany, a genus of the polyandria order, and polyadelphia class of plants; natural order, *Columeliferae*. Calyx double, outer trifid; anils very many, one-seeded. There are nine species, of which *L. arborea*, *lavatera* or mallow-tree, frequently rises in gardens, eight or ten feet, with a thick stem.

LAVATORY, or **LAVADERO**, a name given to certain places in Chili and Peru, where gold is got out of earth by washing.

LAVAU, a town of France, in the department of the Tarn, and late province of Langnedoc, 18 miles N. E. of Toulouse.

LAUBACH, a river of Germany; also, a town in Carniola, on the above river. Lon. 14. 52. E. Lat. 46. 20. N.

LAUBACH, a town of Germany, in the late circle of the Upper Rhine, 40 miles N. E. of Mentz. Also, a strong town in Austria.

LAUBAN, or **LUBAN**, a town of Lusatia, 62 miles E. of Dresden.

LAUD, **WILLIAM**, Archbishop of Canterbury in the 17th century, was born at Reading, in 1573, and educated in St. John's college, Oxford, of which he was afterwards a fellow. In 1610, he went into orders. In 1611, he was elected president of St. John's college; but his election being disputed, King James confirmed it. The same year he was sworn the king's chaplain. In 1621, he was nominated bishop of St. David's; and in 1628, bishop of London.

In 1630, he was elected chancellor of the university of Oxford. In 1633, he attended the king into Scotland, and was sworn a privy counsellor for that kingdom. During his stay in Scotland, he formed the resolution of bringing that church to an exact conformity with the church of England. In the same year, he succeeded Archbishop Abbot in the see of Canterbury; and soon after came out the king's declaration about lawful sports on Sundays, which the archbishop was charged with having revived and enlarged, and that with the vexatious prosecutions of such clergymen as refused to read it in their churches. In 1634-5, he was put into the great committee of trade and the king's revenue; on the 4th of March following, he was appointed one of the commissioners of the treasury; and on the 6th of March 1635-6, he received the staff of the lord high treasurer of England. To prevent the printing and publishing what he thought improper books, he procured a decree to be passed in the star-chamber, on the 11th of July 1637, whereby it was enjoined that the master-printers should be reduced to a certain number, and that none of them should print any books till they were licensed, either by the archbishop or the bishop of London, or some of their chaplains, or by the chancellors or vice-chancellors of the two universities. A new parliament being summoned met on the 13th April 1640; and the convocation the day following: but the commons launching out into complaints against the archbishop, and insisting upon a redress of grievances before they granted any supply, the parliament was dissolved on the 7th of May. The convocation, however, continued sitting: and made 17 canons, which were supposed to be formed under the immediate direction of the archbishop. In the beginning of the long parliament, he was attacked on account of those canons: and they being condemned by the house of commons on the 16th of December 1640, "as containing many things contrary to the king's prerogative, to the fundamental laws and statutes of this realm, to the rights of parliament, to the property and liberty of the subject, and tending to sedition, and of dangerous consequence;" he was, on the 18th of December, accused by the commons of high treason, and sent to the Tower. Being tried before the house of lords, for endeavouring to subvert the laws, and to overthrow the Protestant religion, he was found guilty, and beheaded on Tower-hill on January 10th following, in the 72d year of his age. This learned prelate, notwithstanding his being charged with a design to bring in Popery, wrote an answer to Dr. Fisher, which is esteemed one of the best pieces that has been printed against that religion; and when he was privately offered a cardinal's hat by the Pope, he refused it, saying that "some thing dwelt within him, which would not suffer his compliance, till Rome were other than it is." He was temperate in his diet, and regular in his private life; but his fondness for intro-

ducing new ceremonies, in which he shewed an indiscreet zeal, his encouraging of sports on Sundays, his illegal and cruel severity in the star-chamber and high-commission courts, and the fury with which he persecuted the dissenters, and all who presumed to contradict his sentiments, exposed him to popular hatred. Besides his Answer to Fisher, he published several Sermons, and other works.

LAUDANUM. See **OPIMUM**.

LAUDATIO, in a legal sense, was anciently the testimony delivered in court of the accused person's good behaviour and integrity of life. It resembled the custom, which prevails in our trials, of calling persons to speak to the character of the prisoner. The least number of the *laudatores* amongst the Romans was ten.

LAUDER, a town of Scotland, in Berwickshire, 22 miles S. of Edinburgh.

LAUDES, **LAUDS**, the second part of the ordinary office of the breviary, said after matins; though, heretofore, it ended the office of the night. The laudes consist principally of psalms, hymns, &c. whence the name, from *laus*, *laudis*, praise.

LAUDICENI, amongst the Romans, applauders who for reward entered the rehearsal rooms, attended the repetition of plays, and were in waiting when orations were pronounced, in order to raise or increase the acclamation and applause.

LAVELLO, a town of Naples, in the province of Basilicata, 30 miles N. by E. of Naples. Lon. 15. 55. E. Lat. 41. 5. N.

LAVENDER, in botany. See **LAVANDELA**.

LAVENDER COTTON, in botany. See **SANTOLINA**.

LAVENHAM, or **LANHAM**, a town of Suffolk.

LAVENIA, in botany, a genus of the syngnesia polygamia aequalis class and order; natural order, *Compositae Discoidaeae*. Calyx neatly regular, style bifid; down three-awned, glandular at the tip. There are two species, viz. *L. decumbens*, and *L. erecta*, the former is a native of Jamaica, and the latter of the East Indies and the Society Isles.

LAUENSTEIN, a town of Upper Saxony, in Meissen, 13 miles S. of Dresden. Lon. 31. 31. E. Lat. 51. 42. N.

LAVER, in scripture-history, was a sacred utensil placed in the court of the Jewish tabernacle, consisting of a bason, whence they drew water by cocks, for washing the hands and feet of the officiating priests, and also the entrails and legs of the victims.

LAVERNA, in antiquity, the goddess of thieves and cheats among the Romans, who honoured her with public worship, because she was supposed to favour those who wished that their designs might not be discovered.

LAUFFEN, a town of Bavaria, in Salzburg on the Salza; 26 miles N. E. of Kuffstein.

LAUFFEN, a town of Germany, in the late circle of the Upper Rhine, 6 miles S. of Basle, and 16. N. of Soleure.

LAUFFEN, a town of Suabia, in Wurtemberg, on the Neckar; 4 miles S. of Heilbron, and 16 N. of Stutgard.

LAUFFENBURG, a fortified town of Suabia, 18 miles E. of Basle, and 26 W. of Scaffhausen.

LAUGERIA, in botany, a genus of the pentandria monogynia class and order; corolla five-cleft; drupe with a five-celled nut. There are three species, natives of America, the West Indies, and Santa Cruz.

LAUGHTER, a sudden and convulsive expression of mirth, peculiar to the countenance of man; and which is occasioned by some object that surprizes the fancy. This emotion, however, more frequently arises from an unexpected disappointment of the mind, while its attention is arrested by an object apparently of great importance; but suddenly terminating in ridicule, or insignificance. With respect to its influence on the body, moderate laughter is very beneficial; for it contributes to promote the circulation of the blood through the lungs, and has frequently removed colics, pains in the stomach, and similar complaints. Various instances have likewise occurred, in which deep-seated ulcers of the lungs and liver, that could not be relieved by any remedies, burst, and were perfectly cured by a fit of laughter, artificially excited. Beside the pleasing sensations with which it is accompanied, this affection powerfully operates on the organs of digestion, and greatly contributes to the assimilation of food.

LAUINGEN, a town of Bavaria, in Neuburg, 22 miles N. E. of Ulm.

LAVINGTON,

LAVINGTON, EAST, a town of Wilts, four miles S. of Devizes, and 89 miles from London.

LAVINIA, in fabulous history, the daughter of Latinus and Amata, and the second wife of Æneas.

LAVINIUM, or **LAVINUM**, in ancient geography, a town of Latium, six miles E. of Laurentum, according to an ancient map; so named from Lavinia, and built by the Trojans.

LAVIT, or **VIT DE LOMAGNE**, a town of France, in the department of Ger., 13 miles E. of Lectouie.

LAUNCE. See **AMMODYTES**.

LAUNCESTON, the capital of Cornwall called also Dunhiuid, from its situation on a down. It is seated on the Tamar, 23 miles N. of Plymouth, and 214 W. by S. of London. Lon. 4. 35. W. Lat. 50. 40. N.

LAUNCH, in the sea-language, signifies to put out: as, Launch the ship, that is, Put her out of dock; launch aft, or forward, speaking of things that are stowed in the hold, is, put them more forward: launch ho! is a term used when a yard is hoisted high enough, and signifies hoist no more. See **LAUNCH**.

LAUNDER, in mineralogy, a name given in Devonshire, and other places, to a long and shallow trough, which receives the powdered ore after it comes out of the box or coffer, which is a sort of mortar, in which it is powdered with iron-pestles.

LAVOISIER, ANTHONY LAURENCE, the great reformer of Chemistry, was born at Paris, Aug. 16th, 1743. Being of a noble family he received a very liberal education, which he improved by the most unremitting industry. In his 23d year, on the 9th April, 1760, the Academy of Sciences presented him with a gold medal, for his Dissertation on the best mode of enlightening the streets of a great city during the night. In 1768, he was admitted a member of that learned society, to whose service he chiefly devoted his scientific labours, and thus became one of its most active and useful associates. In these exertions, his attention was successively occupied with every branch of physical and mathematical science. The analysis of gypsum, the crystallization of salts, the supposed conversion of water into earth, the effects produced by the grande deloupe of the garden of the infant, the congelation of water, the project of bringing water from the Yvette to Paris, the phenomena of thunder and lightning, of the aurora borealis, of electricity, mineralogy, and every other important object of experimental science, gave constant employment to the genius and talents of this great chemist. Journeys, in concert with M. Guettari, through every province of France, enabled him to procure numerous materials for a proper description and arrangement of the various genera and species in the mineral kingdom. These he arranged into a kind of Chart, which served as a groundwork for a more laborious work on the revolutions of the Globe, and the formation of Couches de la Terre; a work of which two beautiful sketches are to be seen in the Memoirs of the French Academy, for 1772 and 1787. All his time and fortune were devoted to the culture of the sciences in general, nor did he seem to have an attachment to one science more than to another, till one of those great events, which do not frequently occur in the progress of science, directed his attention exclusively to chemistry, in the cultivation of which he has since acquired immortal fame. About 1770, the important discovery of elastic fluids was just announced to the public, and Messrs. Black, Priestley, Cavendish, and M'Bride, had opened a new mine, for the exertions of genius, and the investigations of physiologists, when Lavoisier, struck with the importance of this discovery, and the influence it must have upon the whole train of physical investigations, perceived by a kind of intuitive instinct the glorious prospect which opened to his view. No sooner had the discoveries of Dr. Black and Mr. Cavendish arrived in France, than Lavoisier repeated and varied their experiments, in every possible manner; whereby he established and enlarged the results drawn by the British chemists. Proceeding thus from one process to another, putting no confidence in any former theories, but trusting solely to experiments supported by clear facts, error and prejudice fled before him, and he became the founder of an entire new system of chemistry, the incontrovertible truth of which, as well as its success, will be sufficient to eternize his fame and his memory, as long as the science shall be cultivated. Lavoisier's great objects being to illustrate facts already published, and to investigate and announce new discoveries, he compared and collated his observations, and reduced them into

a regular system. In the end of 1775 he presented to the Academy his first chemical work, entitled, *New Experiments relative to the Existence of a fixed elastic fluid in certain substances, and to the phenomena which result from its fixation or disengagement*. This work came out at Paris just about the same time that Dr. Priestley's treatise, on the different species of air, appeared at London; and though it may be considered rather as a syllabus, or outline, than a complete treatise, yet it was executed with so much perspicuity, and his processes were described in it with so much exactness and accuracy, that it surpassed every former publication of the kind. The new principles contained, and the new methods of operation proposed, in it, at last changed the very appearance and language of chemistry, and operated an entire revolution in the science. Lavoisier quickly became in chemistry, what Newton, Kepler, and Euler, were in mathematics, the centre of all discoveries and researches made on the subject of elastic fluids, from 1774 to 1792. He appropriated his fortune to the improvement of his favourite science, and spared no expence in the pursuit of this important object. His house became a grand laboratory, in which nothing was wanting that could tend to throw light on his experiments. He kept in constant employment several of the most ingenious artisans, for the invention and construction of mathematical instruments, and other new and expensive apparatus of every kind, superior in accuracy to any formerly used. To these advantages, derived from the proper application of his large fortune, Lavoisier added the instructive conversation of his learned friends, which he rendered subservient to his enlarged plan of the improvement of chemistry. Twice a-week he held in his house philosophical assemblies, to which he invited every literary character, that was celebrated in geometrical, chemical, and physical investigations. In these instructive conversations, discussions were regularly held, similar to those that preceded the first establishment of Academies; the opinions of the most eminent literati in Europe were canvassed, the most new and striking passages in the works of foreign authors were quoted and discussed, and modern theories were investigated and tried by the touch-stone of experiment. To these assemblies the literati of all nations found a ready admission; and Priestley, Watt, Bolton, Blagden, Fontana, Jacquin, Ingenhousz, Landriani, and other illustrious Physiologists of Great Britain, Germany, and Italy, mingled in the same company with Berthollet, Monge, Borda, Cousin, Laplace, Lagrange, Guyton, Meunier, and Vandermonde. At these learned interviews no subject was left uninvestigated, that could contribute to the improvement of science, or the amelioration of the state of human society. One great advantage, resulting from these meetings, the influence of which soon reached the academy itself, was the agreement established between the natural philosophers and the geometers: the philosophical method and precision of style of the latter being insensibly transfused into the former, and the philosophers becoming thus gradually disciplined in the tactics of the geometers. In the assemblage of such a constellation of scientific lights, Lavoisier improved and embellished his own great talents. To the critical examination of these philosophers he submitted the results of his most important experiments, and invited his critical friends to state the most weighty objections that occurred to them; nor did he venture to announce any of his discoveries to the public, till they had undergone this literary ordeal. Thus Lavoisier became the founder of the French Chemical School, the distinctive character of which is, a close and mathematical mode of reasoning in theory, combined with a rigid attention to facts in conducting experiments. This school, in which every individual was both tutor and pupil, lasted from 1776 to 1792, but the period, when it flourished in its greatest vigour, was between 1780 and 1788. This period was marked by the most important discoveries, and the most striking alterations were made both in the foundation and superstructure, the doctrine and language, of chemistry. See **CHEMISTRY**. In 1789, he published his "*Elements of Chemistry*," which presented the science in a form entirely new, and completely distinguished the discoveries and improvements of Lavoisier from those of Dr. Priestley and all former chemists. Numerous were the services rendered by Lavoisier, both in his public and private character, to trade and manufactures, to arts and sciences; as well as to the cause of liberty, before it degenerated into licentiousness and anarchy. Nor should his private and domestic virtues be omitted: as a

friend, relative, husband, and parent, his conduct was exemplary. In his manners he was unaffectedly plain and simple; in acts of beneficence and generosity, unbounded. Many young men, excited by genius and inclination to court the sciences, but deficient in the means, were liberally supplied by him, with pecuniary aid: and many unfortunate individuals were relieved in private without the ostentation of benevolence. In the communes of the department of Loir and Cher, where he was possessed of several considerable estates, he often visited the cottages of the indigent, and relieved their distresses. At last this virtuous and truly great man, after having been repeatedly elected by his fellow-citizens, a member of the National Assembly and National Convention, and a commissioner of the National treasury, &c. was falsely accused of being an accomplice in a plot to favour the success of the enemies of the republic. And being brought before that bloody revolutionary tribunal, which, under Robespierre, murdered many of the greatest and best men in France, he was condemned to be guillotined. The bloody sentence was executed on the 9th May, 1794, to the infinite regret of every friend to virtue, science, and humanity. The sanguinary monsters, with barbarity worse than Gothic, refused to allow this great man the short respite of fourteen days, to finish an important experiment in chemistry.

LAVORA, LAVORO, or TERRA DI LAVORA, a province of Naples, bounded on the N. by the two Abruzzos; E. by Molise; E. and S. by Principato Ultra: S. by the Gulf of Naples; and W. by the Mediterranean and Campagna di Roma. Naples is the capital. It abounds with sulphur and mineral waters.

LAURA, in church history, a collection of little cells at some distance from each other, in which the hermits in ancient times lived together in a wilderness.

LAUREATE, or POET LAUREATE, [*poeta laureatus*, Lat.] an officer of the household of the kings of Britain, whose business consists only in composing an ode annually on his majesty's birth-day, and on the new year; sometimes also, though rarely, on occasion of any remarkable victory.

LAUREATION, in the Scottish universities, the act or state of having degrees conferred, as they have in some of them a flowery crown, in imitation of laurel among the ancients.

LAUREL MOUNTAINS, a ridge of mountains in the United States, extending from N. Carolina to Pennsylvania, and forming part of the great range called the Allegany Mountains.

LAURELS, pieces of gold coined in the year 1619, with the king's head laureated, which gave them the name of laurels; the 20s. pieces were marked with XX. the 10s. X. and 5s. pieces with V.

LAURENCE, St. a river of North America, which issues from lake Ontario, 30 miles from the Mississippi, and, taking its course N. E. washes Montreal, where it receives the Ouatawaia, and forms many fertile islands. It continues the same course, and meets the tide upwards of 400 miles from the sea, where it is navigable for large vessels; and below Quebec, 320 miles from the sea, it becomes so broad and so deep, that ships of the line contributed in the French war to reduce that city. After receiving in its progress innumerable streams, it falls into the Gulf of St. Lawrence, at cape Rosiers, where it is 90 miles broad, and where the cold is intense, and the sea boisterous.

LAURENCE, St. GULF OF, a part of the Atlantic Ocean, between Newfoundland, Labrador, Canada, Nova Scotia, and Cape Breton. Lon. from 57. to 65. W. Lat. 47. to 51. N.

LAURENCEKIRK, a town of Scotland, in Kincardineshire, eight miles N. of Montrose, and seven W. of Bervie.

LAURENTALES, LAURENTALIA, or LARENTALIA, called also **LARENTIALIA**, and **LARENTALES**, feasts celebrated among the Romans on the tenth of the kalends of January, or 23d. of December, in memory of Acca Laurentia, wife of the shepherd Faustulus, and nurse of Romulus and Remus.

LAURENTINI, a name anciently given to the inhabitants of Latium, from the great number of laurels which grew in that country.

LAURENTUM, or LAURENS CASTRA, in ancient geography, a town of Latium, supposed to be the royal residence of those most ancient kings, Latinus, Picus, and Faunus.

LAURION, in ancient geography, a town of Attica, famous for its gold-mines.

LAURO, or LAURON, in ancient geography, a town of Hispania Citra, now called Lorigne, and lies 15 miles N. of Iliria, in Valencia.

LAURUS, the **BAY-TREE**; a genus of the monogynia order, and eucandria class of plants; natural order, *Holocarpeæ*. Calyx none; corolla calycine, six-parted; nectary of three two-bristled glands, surrounding the germ; filaments inner, glanduliferous; drupe one-seeded. It has thirty-two species, consisting of trees or shrubs; leaves mostly entire, in a few nearly opposite, commonly perennial, as in most trees of the torrid zone.

L. CAMPHORA, the **CAMPHOR-TREE**, grows naturally in the woods of the western parts of Japan, and in the adjacent islands. The root smells stronger of camphor than any of the other parts, and yields it in greater plenty. The bark of the stalk is outwardly somewhat rough; but in the inner surface smooth and mucous, and therefore easily separated from the wood, which is dry, and of a white colour. The flowers are produced on the tops of footstalks, which proceed from the arm-pits of the leaves; but not till the tree has attained considerable age and size. The flower-stalks are slender, branched at the top, and divided into very short pedicles, each supporting a single flower. These flowers are white, and consist of six petals, which are succeeded by a purple and shining berry of the size of a pea. The medicine called camphor, though solid, is the essential oil of the *laurus camphora*; and is obtained from it by distillation in the East Indies. The Abbé Grosier informs us, that in China some of these trees are above 100 cubits in height, and so thick that twenty persons cannot inclose them. The tree is there called *tchang*; and it is said that the trunk, when old, emits sparks of fire, but of so subtle a nature as not even to injure the hair of those who are near it. The camphor does not drop to the earth, like the gums of certain resinous trees, which are preserved by discharging that part of their substance which is too oily; neither does it distil from the top to the bottom of the tree through an incision made in it. The Chinese would practise this method could it be employed with success; for it is very common in China to make such kind of incisions in resinous trees; but the camphor is obtained by boiling the branches of the tree, and then purifying the juice so extracted. See Plate XCIX.

L. CINNAMOMUM, the **CINNAMON-TREE**, is a native of Ceylon. It hath a large root, and divides into several branches, covered with a bark, which on the outer side is of a greyish brown, and on the inside has a reddish cast. The wood of the root is hard, white, and has no smell. The body of the tree, which grows to the height of twenty or thirty feet, is covered, as well as its numerous branches, with a bark which at first is green, and afterwards red. The leaf is longer and narrower than the common bay-tree; and it is three-nerved, the nerves vanishing towards the top. The flowers are small and white, and grow in large bunches at the extremity of the branches: they have an agreeable smell, something like that of the lily of the valley. Cinnamon is the under bark of the cinnamomum. The best season for separating it from the outer bark, which is grey and rugged, is the spring, when the sap flows in the greatest abundance. It is cut into thin slices, and exposed to the sun, and curls up in drying. The old trees produce a coarse kind of cinnamon; the spice is in perfection in the island of Ceylon, when the trees are not older than three or four years. When the trunk has been stripped of its bark, it receives no further nourishment; but the root is still alive, and continues to throw out fresh shoots. The fruit of the tree is shaped like an acorn, but is not so large. Its seed, when boiled in water, yields an oil which swims at top, and takes fire. If left to cool, it hardens into a white substance, of which candles are made, which have an agreeable smell, and are reserved for the use of the king of Ceylon.

L. NOBILIS, the **EVERGREEN BAY-TREE**, is a native of Italy, and hath an upright trunk branching on each side from the bottom upward; with spear-shaped, nervous, stiff, evergreen leaves, three inches long and two broad; and small, yellowish, quadrifid, dioecious flowers, succeeded by red berries in autumn and winter. Of this species there are varieties, with broad, narrow, striped, or waved leaves. They are propagated by layers, or by the berries. Evelyn says, he has seen bay-trees near thirty feet high, and almost two feet in diameter; and enumerates the bay amongst useful trees. The bay, a beautiful evergreen, said to be the true

laurus of the ancients, with which they adorned the brows of their successful generals. Like the holly, box, and laurel, the bay will bear the shade and drip of taller trees. The leaves and berries have a moderately strong aromatic smell, and a warm, bitterish, pungent taste: the berries are stronger in both respects than the leaves, and afford in distillation a larger quantity of essential aromatic oil.

LAUS, or LAOS, in ancient geography, a river of Italy, separating Lucania from the Bruttii, and running from E. to W. into the Tuscan sea.

LAUS POMPEIA, in ancient geography, a town of Insubria, situated to the east of Milan, between the rivers Addua and Lamber. The modern Lodi is built from its ruins, at some distance. Lon. 10. 15. E. Lat. 45. 22. N.

LAUSANNE, a large, ancient, and handsome town of Switzerland, capital of the country of Vaud, in the canton of Berne. Lon. 6. 50. E. Lat. 46. 31. N.

LAW, EDMUND, D. D. bishop of Carlisle, was born in the parish of Cartmel in Lancashire, A. D. 1703. His father, who was a clergyman, held a chapel in Cartmel. He was educated first at Cartmel, afterwards at Kendal, and completed his studies at St. John's college, Cambridge. Soon after taking his first degree, he was elected fellow of Christ's college. During his residence there, he published a translation of archbishop King's "Essay upon the Origin of Evil," with copious notes; in which many metaphysical subjects are treated of with great ingenuity and learning. To this work was prefixed, as a Preliminary Dissertation, a valuable piece, by the Rev. Mr. Gay of Sidney college, of whom Dr. Law had a high opinion. At this time he also prepared for the press an edition of Stephens's Thesaurus. In the year 1737, he was presented to the rectory of Graystock in Cumberland, worth 300l. a year. Soon after this he married Mary, the daughter of John Christian, Esq. of Unerigg, in Cumberland; a lady esteemed by all who knew her. In 1743, he was promoted by the bishop of Carlisle, to the archdeaconry of that diocese; and in 1746, went to reside at Salkeld, on the Eden, where he published "Considerations on the Theory of Religion:" to which were subjoined, "Reflections on the Life and Character of Christ;" and an Appendix concerning the use of the words Soul and Spirit in Holy Scriptures, and the State of the Dead there described. In 1754, he took his degree of D. D. In 1768, the duke of Grafton recommended him to his majesty for the bishopric of Carlisle, not only without solicitation, but without knowledge. About 1777, our bishop gave to the public a handsome edition, in three vols. 4to. of Mr. Locke's Works, with the Author's Life, and a Preface. Mr. Locke's writings and character he held in the highest esteem, and drew from them many of his own principles. He died in 1787, aged 84.

LAW, WILLIAM, a pious English divine, was born at King's-cliffe, in Northamptonshire, in 1686, and educated at Oxford, where he took his degrees, and entered into orders, but entertaining scruples respecting the oaths, he remained a nonjuror, and thus missed preferment which was repeatedly offered to him. He lived for the most part a retired life at the house of Mrs. Hester Gibbon, aunt of the celebrated historian, in Northamptonshire, where he died in 1761. He wrote against bishop Hoadley, and some valuable practical books, as, a Serious Call to a Devout and Holy Life; a Treatise on Christian Perfection, &c.

LAW, JOHN, the famous projector, was the eldest son of a goldsmith in Edinburgh, by Elizabeth Campbell, heiress of Laurieston near that city; and was born about 1681. He was bred to no business; but possessed great abilities, and a very fertile invention. He had the address, when but a very young man, to recommend himself to the king's ministers in Scotland to arrange and fit the revenue accounts, which were in great disorder at the time of settling the equivalent before the union. He also laid a proposal before the Scots parliament, for supplying the kingdom with money, by establishing a bank, which should issue paper to the value of the whole landed property in the kingdom: but his plan, being thought too wild, was rejected. His father dying about 1704, Law succeeded to the small estate of Laurieston; but the rents being insufficient for his expences, he had recourse to gaming. He was forced to fly his country, however, in the midst of his career, in consequence of having fought a duel, and killed his antagonist. He escaped to Holland; thence proceeded to Venice, and wandered over Italy, studying the nature of banks, and making himself an adept in the mysteries of exchanges and re-exchanges. At the close of the reign of Lewis XIV. when the French finances were in great disorder, Law having obtained an audience, the bankrupt king was delighted by his projects; but the minister Desmarest, menacing him with the Bastille, obliged him to fly from Paris. He next applied to Victor Amadeus, D. of Savoy, who told him he was not rich enough to ruin himself. At the death of Lewis XIV. the Regent Duke of Orleans in despair called in our numerical quack. By an arret of the 2d March, 1716, a bank was established by authority, in favour of Law and his associates; 200,000 shares were instituted, of 1,000 livres each; and Law deposited in it to the value of 2 or 3,000 crowns, which he had accumulated in Italy, by gaming. Many people had at first little confidence in this bank; but when it was found that the payments were made with quickness and punctuality, they began to prefer its notes to ready money. In consequence of this shares rose to more than twenty times their original value; and in 1719 their valuation was more than eighty times the amount of all the current specie in the kingdom. Law was created Count Tankerville, and his native city humbly presented him with her freedom, in which appears these remarkable expressions: "The city of Edinburgh presents its freedom to John Law, Count of Tankerville, &c. &c. a most accomplished gentleman, the first of all bankers in Europe, the fortunate inventor of sources of Commerce, in all parts of the remote world, and who has so well deserved of his nation." Law was in fact adored; the proudest courtiers were reptiles before this mighty man, and dukes and duchesses patiently waited in his antichamber. But in 1720, this mighty commercial meteor burst, and his immense fabric of false credit fell to the ground, and almost overthrew the French government, ruining some thousands of families; and it is remarkable, that the same desperate game was played by the South Sea directors in England, in the same fatal year, 1720. Law being exiled as soon as the credit of his projects began to fail, retired to Venice, where he died in 1729. Montesquieu, who saw him there, says, "He is still the same man: his mind ever busied in financial schemes; his head is full of figures, of agios, and of banks. Of all his more than princely revenues, he has only saved a large white diamond, which, when he has no money, he pawns."

LAW.

LAW, [*Ulg.* Sax. *lex*, Lat. from *lego*, or *legendo*, choosing, or rather a *ligando*, from binding,] the rule and bond of men's actions: or it is a rule for the well governing of civil society, to give to every man that which doth belong to him. Law, in its most general and comprehensive sense, signifies a rule of action; and is applied indiscriminately to all kinds of action, whether animate or inanimate, rational or irrational. Thus we say, the laws of motion, of gravitation, of optics, of mechanics, as well as the laws of nature and of nations. And it is that rule of action which is prescribed by some superior, and which the inferior is bound to

obey. But law, in its more confined sense, and in which it is our present business to consider it, denotes the rules, not of action in general, but of human action or conduct: that is, the precepts, by which man, the noblest of all sublunary beings, a creature endowed with both reason and free will, is commanded to make use of those faculties in the general regulation of his behaviour. Man, considered as a creature, must necessarily be subject to the laws of his Creator, for he is entirely a dependent being. A being, independent of any other, has no rule to pursue but such as he prescribes to himself: but a state of dependence inevitably obliges the inferior

inferior to take the will of him on whom he depends as the rule of his conduct; not indeed in every particular, but in all those points wherein his dependence consists. This principle therefore has more or less extent and effect, in proportion as the superiority of the one, and the dependence of the other, is greater or less, absolute or limited. And consequently, as man depends absolutely upon his Maker for every thing, it is necessary that he should in all points, conform to his Maker's will. This will of his Maker is called the law of nature. For as God, when he created matter, and endued it with a principle of mobility, established certain rules for the perpetual direction of that motion; so, when he created man, and endued him with free will to conduct himself in all parts of life, he laid down certain immutable laws of human nature, whereby that free will is in some degree regulated and restrained, and gave him also the faculty of reason to discover the purport of those laws. As God is a Being of infinite wisdom, he has laid down only such laws as were founded in those relations of justice that existed in the nature of things antecedent to any positive precept. These are the eternal immutable laws of good and evil, to which the Creator himself in all his dispensations conforms; and which he has enabled human reason to discover, so far as they are necessary for the conduct of human actions. Such, among others, are these principles: that we should live honestly, should hurt nobody, and should render to every one his due. But if the discovery of these first principles of the law of nature depended only upon the due exertion of right reason, and could not otherwise be obtained, than by a chain of metaphysical disquisitions, mankind would have wanted some inducement to have quickened their inquiries, and the greater part of the world would have rested content in mental indolence, and ignorance, its inseparable companion. As therefore the Creator is a being, not only of infinite power and wisdom, but also of infinite goodness, he has been pleased in the constitution of human nature, so intimately to connect the laws of eternal justice with the true happiness of each individual, that the latter cannot be attained but by observing the former; and if the former be punctually obeyed, it cannot but induce the latter. In consequence of which mutual connection of justice and human felicity, he has not perplexed the law of nature with a multitude of abstract rules and precepts, referring merely to the fitness or unfitness of things, as some have vainly surmised; but has graciously reduced the rule of obedience to this one paternal precept, "that man should pursue his own real happiness." This is the foundation of what we call ethics, or natural law. See MORALITY. For the several articles into which it is branched in our systems, amount to no more than demonstrating, that this or that action tends to man's real happiness; and therefore very justly concluding, that the performance of it is a part of the law of nature; or, on the other hand, that this or that action is destructive of man's real happiness, and therefore that the law of nature forbids it. This law of nature, being coeval with mankind, and dictated by God himself, is of course superior in obligation to any other. It is binding over all the globe, in all countries, and at all times: no human laws are of any validity, if contrary to this; and such of them as are valid derive all their force, and all their authority, mediately or immediately, from this original. But to apply this to the particular exigencies of each individual, we must still have recourse to reason, to discover what the law of nature directs in every circumstance of life; by considering, what method will tend the most effectually to our own substantial happiness. And if our reason were always, as in our first ancestor before his transgression, clear and perfect, unruled by passions, unclouded by prejudice, unimpaired by disease or intemperance, the task would be pleasant and easy; we should need no other guide but this. But every man now finds the contrary in his own experience; that his reason is corrupt, and his understanding full of ignorance and error, and therefore he cannot distinguish between right and wrong, or what would bring happiness and what misery. This has given manifold occasion for the benign interposition of Divine Providence; who, in compassion to the frailty, imperfection, and blindness, of human reason, hath been pleased, at sundry times and in divers manners, to discover and enforce his laws by an immediate and direct revelation. The doctrines, thus delivered, are called the revealed or divine law, and are to be found only in the Holy Scriptures. These precepts are found upon comparison to be really a part of the original law of nature, as they tend in all their consequences

to man's felicity. But we must not thence conclude, that the knowledge of these truths was attainable by reason in its present corrupted state; as we find, that, until they were revealed, they were hid from the wisdom of ages. Besides on account of the dreadful lapse already mentioned the original law of nature was insufficient for the happiness of man, therefore the grand design of the all-beneficent Creator was to point out the gracious remedy, and the way of obtaining this blessing, so essential to our happiness. Hence it is evident that without this revelation which nowhere clashes with the law of nature, our understandings must have remained in absolute darkness in the most necessary article relating to our welfare. As then the moral precepts of this law are indeed of the same original with those of the law of nature, so their intrinsic obligation is of equal strength and perpetuity. Yet undoubtedly the revealed law is of infinitely more authenticity than that moral system which is framed by ethical writers, and denominated the natural laws; because the one is the law of nature, expressly declared so to be by God himself; the other is only what, by the assistance of human reason, we imagine to be that law. If we could be as certain of the latter as we are of the former, both would have an equal authority: but till then, they can never be put in any competition together. Upon these two foundations, the law of nature and the law of revelation, depend all human laws; that is to say, no human laws should be suffered to contradict these. There is, indeed, a great number of indifferent points, in which both the divine law and the natural leave a man at his liberty; but which are found necessary, for the benefit of society, to be restrained within certain limits. And herein it is, that human laws have their greatest force and efficacy; for, with regard to such points as are not indifferent, human laws are only declaratory of, and act in subordination to, the former. To instance in the case of murder: this is expressly forbidden by the divine, and demonstrably by the natural, law; and from these prohibitions arises the true unlawfulness of this crime. Those human laws that annex a punishment to it, do not at all increase its moral guilt, or superadd any fresh obligation in foro conscientie to abstain from its perpetration. Nay, if any human law should allow or enjoin us to commit it, we are bound to transgress that human law, or else we must offend both the natural and the divine. But with regard to matters that are in themselves indifferent, and are not commanded or forbidden by those superior laws; such, for instance, as exporting of wool into foreign countries; the inferior legislature has scope and opportunity to interpose, and to make that action unlawful which before was not so. If man were to live in a state of nature, unconnected with other individuals, there would be no occasion for any other laws than the law of nature and the law of God. Neither could any other law possibly exist: for a law always supposes some superior who is to make it; and in a state of nature we are all equal, without any other superior but him who is the Author of our being. But man was formed for society, and is neither capable of living alone, nor indeed has he the courage to do it. However, as it is impossible for the whole race of mankind to be united in one great society, they must necessarily divide into many; and form separate states, commonwealths, and nations, entirely independent of each other, and yet liable to a mutual intercourse. Hence arises a third kind of law to regulate this mutual intercourse, called the Law of Nations: which, as none of these states will acknowledge a superiority in the other, cannot be dictated by either; but depends entirely upon the rules of natural law, or upon mutual compacts, treaties, leagues, and agreements, between these several communities: in the construction also of which compacts, we have no other rule to resort to, but the law of nature; being the only one to which both communities are equally subject: and therefore the civil law justly observes, that *quod naturalis ratio inter omnes homines constituit, vocatur jus gentium*.

To the consideration, then, of the law of nature, the revealed law, and the law of nations, succeeds that of the MUNICIPAL or CIVIL LAW; that is, the rule by which particular districts, communities, or nations, are governed; being thus defined by Justinian, "*jus civile est, quod quisque sibi populus constituit*." We call it municipal law, in compliance with common speech; for though, strictly, that expression denotes the particular customs of one single municipium or free town, yet it may with sufficient propriety be applied to any one state or nation,

which

which is governed by the same laws and customs. Municipal law, thus understood, is properly defined to be "a rule of civil conduct prescribed by the supreme power in a state, commanding what is right, and prohibiting what is wrong." According to the difference in the disposing of the supreme power, different forms of government are constituted. The political writers of antiquity do not allow more than three regular forms of government: the first, when the sovereign power is lodged in an aggregate assembly consisting of all the members of a community which is called a Democracy; the second, when it is lodged in a council composed of select members, and then it is styled an Aristocracy; the last, when it is entrusted in the hands of a single person, and then it takes the name of a Monarchy. All other species of government, they say, are either corruptions of, or reducible to, these three. By the sovereign power, is meant the making of laws; for wherever that power resides, all others must conform to, and be directed by, it, whatever appearance the outward form and administration of the government may put on. For it is at any time in the option of the legislature to alter that form and administration by a new edict or rule, and to put the execution of the laws into whatever hands it pleases: and all the other powers of the state must obey the legislative power in the execution of their several functions, or else the constitution is at an end. In a democracy, where the right of making laws resides in the people at large, public virtue or goodness of intention is more likely to be found than either of the other qualities of government. Popular assemblies are frequently foolish in their contrivance, and weak in their execution; but generally mean to do the thing that is right and just, and have always a degree of patriotism or public spirit. In aristocracies there is more wisdom to be found than in the other forms of government; being composed, or intended to be composed, of the most experienced citizens: but there is less honesty than in a republic, and less strength than in a monarchy. A monarchy is indeed the most powerful of any, all the sinews of government being knit and united together in the hand of the prince; but then there is imminent danger of his employing that strength to improvident or oppressive purposes. Thus these three species of government have all of them their several perfections and imperfections. Democracies are usually the best calculated to direct the end of a law; aristocracies, to invent the means by which that end shall be obtained; and monarchies, to carry those means into execution. And the ancients had in general no idea of any other permanent form of government but these three: for though Cicero declares himself of opinion, "*esse optimè constitutam rempublicam, quæ ex tribus generibus illis, regali, optimo, et populari, sit modicè confusa*"; yet Tacitus treats this notion of a mixed government, formed out of them all, and partaking of the advantages of each, as a visionary whim, and one that, if effected, could never be lasting or secure. But, happily for the people of this island, the British Constitution has long remained, and we trust will long continue, a standing exception to the truth of this observation. For, as with us the executive power of the law is lodged in a single person, they have all the advantages of strength and dispatch that are to be found in the most absolute monarchy; and, as the legislative power of the kingdom is entrusted to three distinct estates, entirely independent of each other: 1st, the king; 2d, the lords spiritual and temporal, which is an aristocratical assembly of persons selected for their piety, birth, wisdom, valour, or property; and, 3d, the house of commons, freely chosen by the people from among themselves, which makes it a kind of democracy; as this aggregate body, actuated by different springs, and attentive to different interests, composes the British parliament, and has the supreme disposal of every thing, there can no inconvenience be attempted by either of the three branches, but will be withstood by one of the other two, each branch being armed with a negative power sufficient to repel any innovation which it shall think inexpedient or dangerous. Here, then, is lodged the sovereignty of the British constitution; and lodged as beneficially as is possible for society. For in no other shape could we be so certain of finding the three great qualities of government so happily united. If the supreme power were lodged in any one of the three branches separately, we must be exposed to the inconveniences of either absolute monarchy, aristocracy, or democracy; and so want two of the three principal ingredients of good polity, either virtue, wisdom, or power. If it were lodged in any two of the branches; for in-

stance, in the king and house of lords; our laws might be providently made and well executed, but they might not always have the good of the people in view: if lodged in the king and commons, we should want that circumspection and mediatory caution which the wisdom of the peers is to afford: if the supreme rights of legislature were lodged in the two houses only, and the king had no negative upon their proceedings, they might be tempted to encroach upon the royal prerogative, or perhaps to abolish the king's office, and thereby weaken (if not totally destroy) the strength of the executive power. But the constitutional government of this island is so admirably tempered and compounded, that nothing can endanger or hurt it, but destroying the equilibrium of power between one branch of the legislature and the rest. For if ever it should happen, that the independence of any one of the three should be lost, or that it should become subservient to the views of either of the other two, there would soon be an end of our constitution. The legislature would be changed from that which was originally set up by the general consent and fundamental act of the society: and such a change, however effected, is, according to Mr. Locke (who perhaps carries his theory too far), at once an entire dissolution of the bands of government; and the people are thereby reduced to a state of anarchy, with liberty to constitute to themselves a new legislative power. As the power of making laws constitutes the supreme authority, so wherever the supreme authority in any state resides, it is the right of that authority to make laws: that is, in the words of our definition, to prescribe the rule of civil action. And this may be discovered from the very end and institution of civil states. For a state is a collective body, composed of a multitude of individuals, united for their safety and convenience, and intending to act together as one man. It ought, therefore, to act by one uniform will. But, inasmuch as political communities are made up of many natural persons, each of whom has his particular will and inclination, these several wills cannot by any natural union be joined together, or tempered into a lasting harmony, so as to constitute that one uniform will of the whole. It can, therefore, be only produced by a political union; by the consent of all persons to submit their own private wills to the will of one man, or of one or more assemblies of men, to whom the supreme authority is entrusted; and this will of that one man, or assemblage of men, is in different states, according to their different constitutions, understood to be law. Thus far as to the right of the supreme power to make laws: but farther, it is its duty likewise. For since the respective members are bound to conform themselves to the will of that state, it is expedient that they receive directions from the state declaratory of that will. But as it is impossible in so great a multitude, to give injunctions to every particular man, relative to each particular action, therefore the state establishes general rules, for the perpetual information and direction of all persons in all points, whether of positive or negative duty; that every man may know what to look upon as his own, what another's; what absolute and what relative duties are required at his hands; what is to be esteemed honest, dishonest, or indifferent; what degree every man retains of his natural liberty, and what he has given up as the price of the benefits of society; and after what manner each person is to moderate the use and exercise of those rights which the state assigns him, in order to promote and secure the public tranquillity. From what has been advanced, the truth of the former branch of our definition is sufficiently evident; that "municipal law is a rule of civil conduct, prescribed by the supreme power in a state." We proceed now to the latter branch of it; that it is a rule so prescribed, "commanding what is right, and prohibiting what is wrong." Now, to do this completely, it is first of all necessary that the boundaries of right and wrong be ascertained by law. And when this is done, it follows of course, that it is likewise the business of the law, considered as a rule of civil conduct, to enforce these rights, and to restrain or redress these wrongs. It remains, therefore, only to consider, in what manner the law is said to ascertain the boundaries of right and wrong; and the methods which it takes to command the one, and prohibit the other. For this purpose, every law may be said to consist of several parts; one, declaratory; whereby the rights to be observed, and the wrongs to be eschewed, are clearly defined and laid down; another, directory; whereby the subject is instructed and enjoined to observe those rights, and to abstain from the commission of those wrongs: a third,

third, *remedial*; whereby a method is pointed out to recover a man's private rights, or redress his private wrongs: to which may be added a fourth, usually termed the *sanction* or *vindictory* branch of the law; whereby it is signified what evil or penalty shall be incurred by such as commit any public wrongs, and transgress or neglect their duty. With regard to the first of these, the *declaratory* part of the municipal law; this depends not so much upon the law of revelation or of nature, as upon the wisdom and will of the legislator. Those rights which God has established, called *natural rights*, because every man has naturally a right to them, such as life and liberty, need not the aid of human laws to be more effectually invested in every man than they are; neither do they receive any additional strength, when declared by the municipal laws to be inviolable. On the contrary, no human legislature has power to abridge or destroy them, unless the owner shall himself commit some act that amounts to a forfeiture. Neither do divine or natural duties (such as, for instance, the worship of God, the maintenance of children, and the like,) receive any stronger sanction from being also declared to be duties by the law of the land. The case is the same as to crimes and misdemeanors, that are forbidden by the laws, and therefore styled *mala in se*, such as murder, theft, and perjury; which contract no additional turpitude from being declared unlawful by the legislature. For that legislature in all these cases acts only in subordination to the Great Lawgiver, transcribing and publishing his precepts. So that, upon the whole, the declaratory part of the municipal law has no force, with regard to actions that are naturally and intrinsically right or wrong. But with regard to things in themselves indifferent, the case is entirely altered. These become either right or wrong, just or unjust, duties or misdemeanors, according as the municipal legislator sees proper, for promoting the welfare of the society, and more effectually carrying on the purposes of civil life. Thus the common law has declared, that the goods of the wife do instantly upon marriage become the property and right of the husband; and the statute law has declared all monopolies a public offence; yet that right, and this offence, have no foundation in nature; but are merely created by the law, for the purposes of civil society. And sometimes, where the thing itself has its rise from the law of nature, the particular circumstances and mode of doing it become right or wrong, as the laws of the land shall direct. Thus, for instance, in civil duties; obedience to superiors is the doctrine of revealed as well as natural religion: but who those superiors shall be, and in what circumstances, or to what degrees they shall be obeyed, is the province of human laws to determine. And so, as to injuries or crimes, it must be left to our own legislature to decide, in what cases the seizing another's cattle shall amount to the crime of robbery; and where it shall be a justifiable action, as when a landlord takes them by way of distress for rent. The *directory* part of the municipal law stands much upon the same footing; for this virtually includes the former, the declaration being usually collected from the direction. The law that says, "Thou shalt not steal," implies a declaration that stealing is a crime. And we have seen, that, in things naturally indifferent, the very essence of right and wrong depends upon the direction of the laws to do or to omit them. The *remedial* part of a law is so necessary a consequence of the former two, that laws must be very vague and imperfect without it. For in vain would rights be declared, in vain directed to be observed, if there were no method of recovering and asserting those rights when wrongfully withheld or invaded. This is what we mean properly, when we speak of the protection of the law. When, for instance, the declaratory part of the law has said, "that the field or inheritance which belonged to Titius's father is vested by his death in Titius," and the directory part has "forbidden any one to enter on another's property without the leave of the owner;" if Gaius after this will presume to take possession of the land, the remedial part of the law will then interpose its office; will make Gaius restore the possession to Titius, and also pay him damages for the invasion. With regard to the sanction of laws, or the evil that may attend the breach of public duties; human legislators have for the most part chosen to make the sanction of their laws rather vindictory than remuneratory, or to consist rather in punishments than in actual particular rewards: because, in the first place, the quiet enjoyment and protection of all our civil rights and liberties, which are the sure and general consequence of obedience to the munici-

pal law, are in themselves the best and most valuable of all rewards: because also were the exercise of every virtue to be enforced by the proposal of particular rewards, it were impossible for any state to furnish stock enough for so profuse a bounty. Of all the parts of a law the most effectual is the *vindictory*. For it is but lost labour to say, "Do this, or avoid that," unless we also declare, "This shall be the consequence of your non-compliance." The main strength of a law, therefore, consists in the penalty annexed to it. In this lies the principal obligation of human laws. Legislators and their laws are said to *compel* and *oblige*; because, by declaring a penalty against offenders, they bring it to pass that no man can easily choose to transgress the law; since, by reason of the impending correction, compliance is in a high degree preferable to disobedience. It hath been justly helden, by ethical writers, that human laws are binding upon men's consciences. But if that were the only or most forcible obligation, the good only would regard the laws, and the bad would set them at defiance. And, true as this principle is, it must still be understood with some restriction. It holds, we apprehend, as to rights; and that, when the law has determined the field to belong to Titius, it is a matter of conscience no longer to withhold or to invade it. So also in regard to natural duties, and such offences as are *mala in se*: here we are bound in conscience, because we are bound by superior laws before those human laws were in being, to perform the one and abstain from the other. But in relation to those laws which enjoin only positive duties, and forbid only such things as are not *mala in se*, but *mala prohibita* merely, without any intermixture of moral guilt, annexing a penalty to non-compliance; here conscience seems to be no farther concerned, than by directing a submission to the penalty, in case of our breach of those laws: for otherwise the multitude of penal laws in a state would not only be looked upon as an impolitic, but would also be a very wicked, thing; if every such law were a snare for the conscience of the subject. But in these cases the alternative is offered to every man; "either abstain from this, or submit to such penalty:" and his conscience will be clear, whichever side of the alternative he thinks proper to embrace. Thus, by the statutes for preserving the game, a penalty is denounced against every unqualified person that kills a hare, and against every person who possesses a partridge in August. And so too, by other statutes, pecuniary penalties are inflicted for exercising trades without serving an apprenticeship thereto, for erecting cottages without annexing four acres of land to each, for not burying the dead in woollen, for not performing statute-work on the public roads, and for numerable other positive misdemeanors. Now these prohibitory laws do not make the transgression a moral offence, or sin: the only obligation in conscience is to submit to the penalty, if levied. 'Tis must, however, be observed, that we are here speaking of laws that are simply and purely penal, where the thing forbidden or enjoined is wholly a matter of indifference, and where the penalty inflicted is an adequate compensation for the civil inconvenience supposed to arise from the offence. But where disobedience to the law involves in it also any degree of public mischief or private injury, there it falls within our former distinction, and is also an offence against conscience. In many cases doubts may arise respecting the meaning of the law, and a little consideration will shew that the fairest and most rational method to interpret the will of the legislator, is by exploring his intentions at the time when the law was made, by signs the most natural and probable. And these signs are either the words, the context, the subject-matter, the effects and consequence, or the spirit and reason, of the law. Let us take a short view of them all.

1. Words are generally to be understood in their usual and most known signification; according to their general and popular use. Thus the law mentioned by Puffendorf, which forbade a layman to lay hands on a priest, was adjudged to extend to him who had hurt a priest with a weapon. Again, terms of art, or technical terms, must be taken according to the acceptation of the learned in each art, trade, and science. So in the act of settlement, where the crown of England is limited "to the Princess Sophia, and the heirs of her body being Protestants, it becomes necessary to call in the assistance of lawyers, to ascertain the precise idea of the words "heirs of her body;" which in a legal sense comprise only certain of her lineal descendants. Lastly, where words are clearly repugnant in two laws, the latter law takes place of the elder; poste-

flores priores contrarias abrogant, is a maxim of universal law, as well as of our own constitutions.

2. If words happen to be still dubious, we may establish their meaning from the *CONTEXT*; with which it may be of singular use to compare a word or a sentence, whenever they are ambiguous, equivocal, or intricate. Thus the preamble is often called in to help the construction of an act of parliament. Of the same nature is the comparison of a law with other laws made by the same legislator, that have some affinity with the subject, or that expressly relate to the same point.

3. As to the *SUBJECT-MATTER*, words are always to be understood as having a regard thereto; for that is always supposed to be in the eye of the legislator, and all his expressions directed to that end. Thus, when a law of Edward III. forbids all ecclesiastical persons to purchase provisions at Rome, it might seem to prohibit the buying of grain and other victuals; but when we consider that the statute was made to repress the usurpations of the papal see, and that the nominations to benefices by the pope were called provisions, we shall see that the restraint is intended to be laid upon such provisions only.

4. As to the *EFFECTS* and *CONSEQUENCE*, the rule is, that where words bear either none, or a very absurd signification, if literally understood, we must deviate from the received sense of them. Therefore the Bolognian law, mentioned by Puffendorf, which enacted "that whoever drew blood in the streets should be punished with the utmost severity," was held not to extend to the surgeon who opened the vein of a person that fell down in the street in a fit.

5. But, lastly, the most universal and effectual way of discovering the true meaning of a law, when the words are dubious, is by considering the *REASON* and *SPIRIT* of it, or the cause which moved the legislator to enact it. For when this reason ceases, the law itself ought likewise to cease with it. An instance of this is given in a case put by Cicero, or whoever else was the author of the rhetorical treatise inscribed to Herennius. There was a law, that those who in a storm forsook the ship should forfeit all property therein, and the ship and lading should belong entirely to those who staid in it. In a dangerous tempest, all the mariners forsook the ship, except only one sick passenger, who was unable to get out and escape. By chance the ship came safe to port. The sick man kept possession, and claimed the benefit of the law. Now here all the learned agree, that the sick man is not within the reason of the law; for the reason of making it was, to give encouragement to such as should venture their lives to save the vessel: but this is a merit which he could never pretend to, who neither staid in the ship upon that account, nor contributed any thing to its preservation.

From this method of interpreting laws by the reason of them, arises what we call *EQUITY*: which is thus defined by Grotius, "the correction of that, wherein the law (by reason of its universality) is deficient." For since in laws all cases cannot be foreseen or expressed, it is necessary, that, when the general decrees of the law come to be applied to particular cases, there should be somewhere a power vested of defining those circumstances, which (had they been foreseen) the legislator himself would have expressed. And these are the cases which, according to Grotius, "*lex non exacte definit, sed arbitrio boni viri permittit.*" Equity thus depending, essentially, upon the particular circumstances of each individual case, there can be no established rules and fixed precepts of equity laid down, without destroying its very essence, and reducing it to a positive law. And, on the other hand, the liberty of considering all cases in an equitable light must not be indulged too far; lest thereby we destroy all law, and leave the decision of every question entirely in the breast of the judge. And law, without equity, though hard and disagreeable, is much more desirable for the public good, than equity without law; which would make every judge a legislator, and introduce infinite confusion: as there would then be almost as many different rules of action laid down in our courts, as there are differences of capacity and sentiment in the human mind. We shall now present a short view of the English law. The principal parts of the law here only noticed, are explained more fully in the order of their names in the alphabet.

THE LAW OF ENGLAND.

The municipal law of England, or the rule of civil conduct pre-

scribed to the inhabitants of our own kingdom, may, with sufficient propriety, be divided into two kinds: the *lex non scripta*, the unwritten, or common law; and the *lex scripta*, the written, or statute law.

The *lex non scripta*, or unwritten law, includes not only general customs, or the common law, properly so called; but also the particular customs of certain parts of the kingdom, and likewise these particular laws that are by custom observed only in certain courts and jurisdictions. It is properly distinguishable into three kinds: I. General customs; which are the universal rule of the whole kingdom, and form the common law in its stricter and more usual signification. II. Particular customs; which, for the most part, affect only the inhabitants of particular districts. III. Certain particular laws; which, by custom, are adopted and used by some particular courts, of pretty general and extensive jurisdiction.

I. As to *GENERAL CUSTOMS*, or the *COMMON LAW*, properly so called; this is that law, by which proceedings and determinations in the king's ordinary courts of justice are guided and directed. This, for the most part, settles the course in which lands descend by inheritance; the manner and form of acquiring and transferring property; the solemnities and obligation of contracts; the rules of expounding wills, deeds, and acts of parliament; the respective remedies of civil injuries; the several species of temporal offences, with the manner and degree of punishment, and an infinite number of minuter particulars, which diffuse themselves as extensively as the ordinary distribution of common justice requires.

II. The second branch of the unwritten laws of England are particular customs, or laws which affect only the inhabitants of particular districts. When a custom is actually proved to exist, the next inquiry is into the legality of it; for if it is not a good custom, it ought to be no longer used. *Malus usus abolendus est*, is an established maxim of the law. To make a particular custom good, the following are necessary requisites:

1. That it have been *used* so long, that the memory of man runneth not to the contrary.

2. It must have been *continued* without interruption of the right: an interruption of the possession only, for ten or twenty years, will not destroy the custom: but if the right be discontinued even for a day, the custom is quite at an end.

3. It must have been *peaceable*, and acquiesced in; not subject to contention and dispute.

4. Customs must be *reasonable*; or rather, they must not be *unreasonable*.

5. Customs ought to be *certain*. A custom that lands shall descend to the most worthy of the owner's blood, is void; for how shall this superior worth be determined? but a custom to descend to the next male of the blood, exclusive of females, is certain, and therefore good.

6. Customs, though established by consent, must (when established) be *compulsory*; and not left to the option of every man, whether he will use them or no.

7. Lastly, customs must be *consistent* with each other. One custom cannot be set up in opposition to another. For if both are really customs, then both are of equal antiquity, and both established by mutual consent: which to say of contradictory customs is absurd.

Next, as to the *allowance* of special customs. Customs, in derogation of the common law, must be construed strictly: and all special customs must submit to the king's prerogative.

III. The third branch of the *leges non scriptæ*, or customary laws, are those peculiar laws which by custom are adopted and used only in certain peculiar courts and jurisdictions. And by these are understood the civil and canon laws. It may seem improper, at first view, to rank these laws under the head of unwritten laws, seeing they are set forth in pandects, codes, institutions, &c. and enforced by an immense number of expositions, decisions, and treatises, of the learned in both branches of the law. But it is plain, that it is not on account of their being written laws, that either the canon law, or the civil law, have any obligation within this kingdom. They bind not the subjects of England, because their materials were collected from popes or emperors; digested by Justinian, or declared authentic by Gregory: for the legislature of England doth not, nor ever did, recognise any foreign power, as superior or equal to it in this kingdom; or as having the right to give law to any the meanest of its subjects. But all

all the strength that either the papal or imperial laws have obtained from this realm is because they have been admitted and received by immemorial usage and custom in some particular cases and courts: or because they are in some other cases introduced by consent of parliament. This is expressly declared in stat. 25 Henry VIII. cap. 21.

1. By the civil law, absolutely taken, is generally understood the civil or municipal law of the Roman empire, as comprised in the institutes, the code, and the digest, of the emperor Justinian, and the novel constitutions of himself and some of his successors. It was under Justinian's auspices that the present body of civil law was compiled and finished by Tribonian and other lawyers, about the year 533. It consisted of, 1. The institutes; which contain the elements or first principles of the Roman law, in four books. 2. The digests or pandects, in fifty books; containing the opinions and writings of eminent lawyers, digested in a systematical method. 3. A new code, or collection of imperial constitutions; the lapse of a whole century having rendered the former code of Theodorus imperfect. 4. The novels, or new constitutions, posterior in time to the other books, and amounting to a supplement to the code; containing new decrees of successive emperors, as new questions happened to arise. These form the body of Roman law, or *corpus juris civilis* of Justinian: which, however, fell soon into neglect, till about A. D. 1130, when a copy of the digests was found at Amalfi, in Italy; which accident, concurring with the policy of the Roman ecclesiastics, suddenly gave new authority to the civil law, and introduced it into various nations.

2. The canon law is a body of Roman ecclesiastical law, relative to such matters as that church either has, or pretends to have, the proper jurisdiction over. This is compiled from the opinions of the ancient Latin fathers, the decrees of the general councils, the decretal epistles and bulls of the holy see; and contains also the *Decretum Gratiani*, compiled by one Gratian, an Italian monk, about A. D. 1151; and entitled by him *Concordia discordantium Canonum*: the *Decretalia* of Gregory IX. published about 1230: the *Sextus Decretalia* of Boniface VIII. in 1298: the *Constitutions* of Clement V. authenticated, in 1317: and the *Extravagantes* of John XXII. and his successors.

The *leges scriptæ*, or the written laws of the kingdom, are statutes, acts, or edicts, made by the king's majesty, by and with the advice of the lords spiritual and temporal, and commons, in parliament assembled. The oldest of these now extant, and printed in our statute-books, is the famous *magna charta*, as confirmed in parliament 9 Hen. III.

1. As to their several kinds, statutes are either *general* or *special*, public or private. 1. A *general* or *public act* is an universal rule that regards the whole community: and of this the courts of law are bound to take notice judicially, and *ex officio*, without the statute being particularly pleaded, or formally set forth, by the party who claims an advantage under it. 2. *Special* or *private acts* are rather exceptions than rules, being those which only operate upon particular persons and private concerns; such as the Romans entitled *senatus decreta*, in contradistinction to the *senatus consulta*, which regarded the whole community; and of these the judges are not bound to take notice, unless they be formally shewn and pleaded.

Statutes also are either *declaratory* of the common law, or *remedial* of some defects therein. 1. *Declaratory*, where the old custom of the kingdom is almost fallen into disuse, or become disputable; in which case the parliament has thought proper, in *perpetuum rei testimonium*, and for avoiding all doubts and difficulties, to declare what the common law is and ever hath been. 2. *Remedial* statutes are those made to supply defects, and abridge such superfluities, in the common law, as arise either from the general imperfection of all human laws, from change of time and circumstances, from the mistakes and unadvised determinations of unlearned judges, or from any other cause whatsoever. And this being done, either by enlarging the common law where it was too circumscribed, or by restraining it where it was too lax, hath occasioned another subordinate division of remedial acts of parliament into *enlarging* and *restraining* statutes.

II. The rules to be observed with regard to the construction of statutes are principally the following:

1. There are three points to be considered in the construction of all remedial statutes; the old law, the mischief, and the re-

medy; that is, how the common law stood at the making of the act; what the mischief was, for which the common law did not provide; and what remedy the parliament hath provided to cure this mischief.

2. A statute, which treats of things or persons of an inferior rank cannot by any *general words* be extended to those of a superior.

3. Penal statutes must be construed strictly.

4. Statutes against frauds are to be liberally and beneficially expounded. This may seem a contradiction to the last rule; most statutes against frauds being in their consequence penal. But this difference is here to be taken: where the statute acts upon the offender, and inflicts a penalty, as the pillory or a fine, it is then to be taken strictly; but when the statute acts upon the offence, by setting aside the fraudulent transaction, here it is to be construed liberally.

5. One part of the statute must be so construed by another, that the whole may (if possible) stand: *ut res magis valeat quam pereat*.

6. A saving, totally repugnant to the body of the act, is void.

7. Where the common law and a statute differ, the common law gives place to the statute; and an old statute gives place to a new one, upon the general principle laid down in the last section, that *leges posteriores contrarias abrogant*. But this is to be understood only when the latter statute is couched in negative terms, or by its matter necessarily implying a negative.

8. If a statute, that repeals another, is itself repealed afterwards, the first statute is hereby revived, without any formal words for that purpose.

9. Acts of parliament derogatory from the power of subsequent parliaments bind not.

10. Lastly, acts of parliament that are impossible to be performed are of no validity: and if there arise out of them collaterally any absurd consequences, manifestly contradictory to common reason, they are with regard to these consequences void.

These are the chief grounds of the laws of England: over and above which, equity is also frequently called in to assist, to moderate, and to explain, them. There are courts of equity established for the benefit of the subject, to detect latent frauds and concealments, which the process of the courts of law is not adapted to reach; to enforce the execution of such matters of trust and confidence, as are binding in conscience, though not cognizable in a court of law; to deliver from such dangers as are owing to misfortune or oversight; and to give a more specific relief, and more adapted to the circumstances of the case, than can always be had by most of the rules of the positive or common law. This is the business of the courts of equity, which, however, are only conversant in matters of property. For the freedom of our constitution will not permit, that in criminal cases a power should be lodged in any judge to construe the law otherwise than according to the letter. This caution, while it admirably protects the public liberty, can never bear hard upon individuals. A man cannot suffer more punishment than the law assigns, but he may suffer less. The laws cannot be strained by partiality to inflict a penalty beyond what the letter will warrant; but in cases where the letter induces any apparent hardship, the crown has the power to pardon. The objects of the laws of England are, 1. Rights. 2. Wrongs. Rights are the rights of persons, or the rights of things. Wrongs are the privation of right, and are, 1. Private wrongs. 2. Public wrongs.

I. OF THE RIGHTS OF PERSONS.

1. The rights of persons are such as concern, and are annexed to, the persons of men; and, when the person to whom they are due is regarded, they are called simply rights: but when we consider the person from whom they are due, they are then denominated duties.

2. Persons are either natural, *i. e.* such as they are formed by nature; or artificial, *i. e.* created by human policy, as bodies politic or corporate.

3. The rights of natural persons are, 1. Absolute, or such as belong to individuals. 2. Relative, or such as regard members of society.

4. The absolute rights of individuals, regarded by the municipal laws (which pay no attention to duties of the absolute kind), compose what is called political or civil liberty.

5. Political or civil liberty is the natural liberty of mankind, so far restrained by human laws as is necessary for the good of society.

6. The absolute rights or civil liberties of Englishmen, as frequently declared in parliament, are principally three; the rights of personal security, of personal liberty, and of private property.

7. The right of personal security consists in the legal enjoyment of life, limb, body, health, and reputation.

8. The right of personal liberty consists in the free power of loco-motion, without illegal restraint or banishment.

9. The right of private property consists in every man's free use and disposal of his own lawful acquisitions, without injury or illegal diminution.

10. Besides these three primary rights, there are others which are secondary and subordinate, viz. (to preserve the former from unlawful attacks), 1. The constitution and power of parliaments. 2. The limitation of the king's prerogative. And (to vindicate them when actually violated), 3. The regular administration of public justice. 4. The right of petitioning for redress of grievances. 5. The right of having and using arms for self-defence.

OF THE PARLIAMENT.

1. The relations of persons are, 1. Public. 2. Private. The public relations are those of magistrates and people. Magistrates are superior or subordinate. And of supreme magistrates, in England, the parliament is the supreme legislative, the king the supreme executive.

2. Parliaments, in some shape, are of as high antiquity as the Saxon government in this island; and have subsisted, in their present form, at least 500 years.

3. The parliament is assembled by the king's writs and its sitting must not be intermitted above three years.

4. Its constituent parts are the king's majesty, the lords spiritual and temporal, and commons represented by their members: each of which parts has a negative, or necessary, voice in making laws.

5. With regard to the general law of parliament; its power is absolute: each house is the judge of its own privileges; and all the members of either house are entitled to the privilege of speech, of person, of their domestics, and of their lands and goods.

6. The peculiar privileges of the lords (besides their judicial capacity), are to hunt in the king's forests; to be attended by the sages of the law; to make proxies; to enter protests; and to regulate the election of the peers of the realm.

7. The peculiar privileges of the commons are to frame taxes for the subject, and to determine the merits of their own elections, with regard to the qualifications of the electors and elected, and the proceedings at elections themselves.

8. Bills are usually twice read in each house, committed, engrossed, and then read a third time; and when they have obtained the concurrence of both houses, and received the royal assent, they become acts of parliament.

9. The houses may adjourn their meetings; but the king only can prorogue the parliament.

10. Parliaments are dissolved, 1. At the king's will. 2. By the demise of the crown, that is, within six months after. 3. By length of time, or having sat for the space of seven years.

OF THE KING AND HIS TITLE.

1. The supreme and executive power of this kingdom is lodged in a single person; the king or queen.

2. This royal person may be considered with regard to, 1. His title. 2. His royal family. 3. His councils. 4. His duties. 5. His prerogative. 6. His revenue.

3. With regard to his title; the crown of England, by the positive constitution of the kingdom, hath ever been descendible, and so continues.

4. The crown is descendible in a course peculiar to itself.

5. This course of descent is subject to limitation by parliament.

6. Notwithstanding such limitations, the crown retains its descendible quality, and becomes hereditary in the prince to whom it is limited.

7. King Egbert, king Canute, and king William I. have been

successively constituted the common stock, or ancestors, of this descent.

8. At the revolution, the convention of estates or representative body of the nation, declared, that the misconduct of king James II. amounted to an abdication of the government, and that the throne was thereby vacant.

9. In consequence of this vacancy, and from a regard to the ancient line, the convention appointed the next Protestant heirs of the blood-royal of king Charles I. to fill the vacant throne, in the old order of succession; with a temporary exception, or preference, to the person of king William III.

10. On the impending failure of the Protestant line of king Charles I. (whereby the throne might again have become vacant), the king and parliament extended the settlement of the crown to the Protestant line of king James I. viz. to the princess Sophia of Hanover, and the heirs of her body, being Protestants: and she is now the common stock, from whom the heirs of the crown must descend.

OF THE KING'S ROYAL FAMILY.

1. The king's royal family consists, first, of the queen: who is regent, consort, or dowager.

2. The queen-consort is a public person, and hath many personal prerogatives and distinct revenues.

3. The Prince and Princess of Wales, and the Princess-royal, are peculiarly regarded by the law.

4. The other princes of the blood royal are only entitled to precedence.

OF THE COUNCILS BELONGING TO THE KING.

1. The king's councils are, 1. The parliament. 2. The great council of peers. 3. The judges, for matters of law. 4. The privy council.

2. In privy counsellors may be considered, 1. Their creation. 2. Their qualifications. 3. Their duties. 4. Their powers. 5. Their privileges. 6. Their dissolution.

OF THE KING'S DUTIES.

The king's duties are to govern his people according to law, to execute judgement in mercy, and to maintain the established religion. These are his part of the original contract between himself and the people; founded in the nature of society, and expressed in his oath at the coronation.

OF THE KING'S PREROGATIVES.

1. Prerogative is that special power and pre-eminence which the king hath above other persons, and out of the ordinary course of law, in right of his regal dignity.

2. Such prerogatives are either direct or incidental. The incidental, arising out of other matters, are considered as they arise: we now treat only of the direct.

3. The direct prerogatives regard, 1. The king's dignity, or royal character. 2. His authority or regal power. 3. His revenue, or royal income.

4. The king's dignity consists in the legal attributes of, 1. Personal sovereignty. 2. Absolute perfection. 3. Political perpetuity.

5. In the king's authority, or legal power, consists the executive part of government.

6. In foreign concerns; the king, as the representative of the nation, has the right or prerogative, 1. Of sending and receiving ambassadors. 2. Of making treaties. 3. Of proclaiming war or peace. 4. Of issuing reprisals. 5. Of granting safe conducts.

7. In domestic affairs; the king is, first, a constituent part of the supreme legislative power; hath a negative upon all new laws; and is bound by no statute, unless specially named therein.

8. He is also considered as the general of the kingdom, and may raise fleets and armies, build forts, appoint havens, erect beacons, prohibit the exportation of arms and ammunition, and confine his subjects within the realm, or recall them from foreign parts.

9. The king is also the fountain of justice, and general conservator of the peace; and, therefore, may erect courts (wherein he hath a legal ubiquity), prosecute offenders, pardon crimes, and issue proclamations.

10. He is likewise the fountain of honour, of office, and of privilege.

11. He is also the arbiter of domestic commerce; not of foreign, which is regulated by the law of merchants; and is, therefore, entitled to the erection of public marts, the regulation of weights and measures, and the coinage or legitimation of money.

12. The king is, lastly, the supreme head of the church; and as such, convenes, regulates, and dissolves, synods, nominates bishops, and receives appeals, in all ecclesiastical causes.

OF THE KING'S REVENUE.

1. The king's revenue is either ordinary, or extraordinary. And the ordinary is, 1. Ecclesiastical. 2. Temporal.

2. The king's ecclesiastical revenue consists in, 1. The custody of the temporalities of vacant bishoprics. 2. Corodies and pensions. 3. Extra-parochial tithes. 4. The first-fruits and tenths of benefices.

3. The king's ordinary temporal revenue consists in, 1. The demesne lands of the crown. 2. The hereditary excise; being part of the consideration for the purchase of his feudal profits, and the prerogatives of purveyance and pre-emption. 3. An annual sum issuing from the duty on wine-licences; being the residue of the same consideration. 4. His forests. 5. His courts of justice. 6. Royal fish. 7. Wrecks, and things jetsam, flotsam, and ligan. 8. Royal mines. 9. Treasure trove. 10. Waifs. 11. Estrays. 12. Forfeitures for offences, and deodands. 13. Escheats of lands. 14. Custody of idiots and lunatics.

4. The king's extraordinary revenue consists in aids, subsidies, and supplies, granted him by the commons in parliament.

5. Heretofore these were usually raised by grants of the (nominal) tenth or fifteenth part of the moveables in every township; or by scutages, hydages, and talliages; which were succeeded by subsidies assessed upon individuals, with respect to their lands and goods.

6. A new system of taxation took place about the time of the revolution: our modern taxes are therefore, 1. Annual. 2. Perpetual.

7. The annual taxes are, 1. The land-tax, or the ancient subsidy raised upon a new assessment. 2. The malt-tax, being an annual excise on malt, rum, cyder, and perry. 3. The income-tax, being an annual tax on property.

8. The perpetual taxes are, 1. The customs, or tonnage, and poundage, of all merchandise exported, or imported. 2. The excise duty, or inland imposition on a great variety of commodities. 3. The salt-duty, or excise on salt. 4. The post-office, or duty for the carriage of letters. 5. The stamp-duty on paper, parchment, &c. 6. The duty on houses and windows. 7. The duty on licences for hackney-coaches and chairs. 8. The duty on offices and pensions.

9. Part of this revenue is applied to pay the interest of the national debt, till the principal is discharged by parliament.

10. The produce of these several taxes were originally separate and specific funds, to answer specific loans upon their respective credits; but are now consolidated by parliament into three principal funds, the aggregate, general, and South Sea funds, to answer all the debts of the nation: the public faith being also superadded, to supply deficiencies, and strengthen the security of the whole.

11. The surplusses of these funds, after paying the interest of the national debt, are carried together, and denominated the sinking fund: which, unless otherwise appropriated by parliament, is annually to be applied towards paying off some part of the principal.

12. But, previous to this, the aggregate fund is now charged with an annual sum for the civil list; which is the immediate proper revenue of the crown, settled by parliament on the king at his accession, for defraying the charges of the civil government.

OF SUBORDINATE MAGISTRATES.

1. Subordinate magistrates, of the most general use and authority, are, 1. Sheriffs. 2. Coroners. 3. Justices of the peace. 4. Constables. 5. Surveyors of the highways. 6. Overseers of the poor.

2. The sheriff is the keeper of each county, annually nominated in due form by the king; and is (within his county) a judge, a conservator of the peace, a ministerial officer, and the king's bailiff.

3. Coroners are permanent officers of the crown in each county,

elected by the freeholders; whose office it is to make inquiry concerning the death of the king's subjects, and certain revenues of the crown; and also in particular cases, to supply the office of sheriff.

4. Justices of the peace are magistrates in each county, statutorily qualified, and commissioned by the king's majesty: with authority to conserve the peace; to hear and determine felonies, and other misdemeanors; and to do many other acts committed to their charge by particular statutes.

5. Constables are officers of hundreds and townships, appointed at the leet, and empowered to preserve the peace, to keep watch and ward, and to apprehend offenders.

6. Surveyors of the highways are officers appointed annually in every parish to remove annoyance in, and to direct the reparation of, the public roads.

7. Overseers of the poor are officers appointed annually in every parish; to relieve such impotent, and employ such sturdy poor, as are settled in each parish, by birth, by parentage, by marriage, or by forty days residence; accompanied with, 1. Notice. 2. Renting a tenement of ten pounds annual value. 3. Paying their assessed taxations. 4. Serving an annual office. 5. Hiring and service for a year. 6. Apprenticeship for seven years. 7. Having a sufficient estate in the parish.

OF THE PEOPLE, WHETHER ALIENS, DENIZENS, OR NATIVES.

1. The people are either aliens, that is, born out of the dominions, or allegiance of the crown of Great Britain; or natives, that is, born within it.

2. Allegiance is the duty of all subjects; being the reciprocal tie of the people to the prince, in return for the protection he affords them; and, in natives, this duty of allegiance is natural and perpetual; in aliens local and temporary only.

3. The right of natives are also natural and perpetual: those of aliens, local and temporary only; unless they be made denizens by the king, or naturalized by parliament.

OF THE CLERGY.

1. The people, whether aliens, denizens, or natives, are also either clergy, that is, all persons in holy orders, or in ecclesiastical offices; or laity; which comprehends the rest of the nation.

2. The clerical part of the nation thus defined, are, 1. Archbishops and bishops; who are elected by their several chapters, at the nomination of the crown, and afterwards confirmed and consecrated by each other. 2. Deans and chapters. 3. Archdeacons. 4. Rural deans. 5. Parsons (under which are included appropriators) and vicars; to whom there are generally requisite, holy orders, presentation, institution, and induction. 6. Curates. To which may be added, 7. Church-wardens. 8. Parish-clerks, and sextons.

OF THE CIVIL STATE.

1. The laity are divisible into three states; civil, military, and maritime.

2. The civil state (which includes all the nation, except the clergy, the army, and the navy, and many individuals among them also), may be divided into the nobility and the commonalty.

3. The nobility are dukes, marquises, earls, viscounts, and barons. These had anciently duties annexed to their respective honours: they are created either by writ, that is, by summons to parliament; or by the king's letters patent, that is, by royal grant; and they enjoy many privileges exclusive of their senatorial capacity.

4. The commonalty consist of knights of the garter, knights bannerets, baronets, knights of the bath, knights bachelors, esquires, gentlemen yeomen, tradesmen, artificers, and labourers.

OF THE MILITARY AND MARITIME STATES.

1. The military state, by the standing constitutional law, consists of the militia of each county, raised from among the people by lot, officered by the principal landholders, and commanded by the lord-lieutenant.

2. The more disciplined occasional troops of the kingdom are kept on foot only from year to year by parliament; and, during that period, are governed by martial law, or arbitrary articles of war, formed at the pleasure of the crown.

3. The maritime state consists of the officers and mariners of the British navy; who are governed by express and permanent laws, or the articles of the navy, established by act of parliament.

OF MASTER AND SERVANT.

1. The private, æconomical, relations of persons, are those of, 1. Master and servant. 2. Husband and wife. 3. Parent and child. 4. Guardian and ward.

2. The first relation may subsist between a master and four species of servants; (for slavery is unknown to our laws): viz. 1. Menial servants; who are hired. 2. Apprentices who are bound by indentures. 3. Labourers; who are casually employed. 4. Stewards, bailiffs, and factors, who are rather in a ministerial state.

3. From this relation result divers powers to the master, and emoluments to the servant.

4. The master hath a property in the service of his servant; and must be answerable for such acts as the servant does by his express, or implied, command.

OF HUSBAND AND WIFE.

1. The second private relation is that of marriage; which includes the reciprocal rights and duties of husband and wife.

2. Marriage is duly contracted between persons, 1. Consenting: 2. Free from canonical impediments, which make it voidable: 3. Free also from the civil impediments of prior marriage, of want of age, of non-consent of parents or guardians, where requisite, and of want of reason; either of which make it totally void. And it must be celebrated by a clergyman in due form and place.

3. Marriage is dissolved, 1. By death. 2. By divorce in the spiritual court; not à mensâ et thoro only, but à vinculo matrimonii, for canonical cause existing previous to the contract. 3. By act of parliament, as for adultery.

4. By marriage the husband and wife become one person in law; which unity is the principal foundation of their respective rights, duties, and disabilities.

OF PARENT AND CHILD.

1. The third and most universal private relation, is that of parent and child.

2. Children are, 1. Legitimate; being those who are born in lawful wedlock, or within a competent time after. 2. Bastards, being those who are not so.

3. The duties of parents to legitimate children are, 1. Maintenance. 2. Protection. 3. Education.

4. The power of parents consists principally in correction, and consent to marriage. Both may after death be delegated by will to a guardian; and the former also, the parent living, to a tutor or master.

5. The duties of legitimate children to parents are obedience, protection, and maintenance.

6. The duty of parents to bastards is only that of maintenance.

7. The rights of a bastard are such only as he can acquire; for he is incapable of inheriting any thing.

OF GUARDIAN AND WARD.

1. The fourth private relation is that of guardian and ward, which is plainly derived from the last; these being, during the continuance of their relation, reciprocally subject to the same rights and duties.

2. Guardians are of divers sorts: 1. Guardians by nature, or the parents. 2. Guardians for nurture, assigned by the ecclesiastical courts. 3. Guardians in socage, assigned by the common law. 4. Guardians by statute, assigned by the father's will. All subject to the superintendence of the court of chancery.

3. Full age in male or female for all purposes is the age of 21 years (different ages being allowed for different purposes;) till which age the person is an infant.

4. An infant, in respect of his tender years, hath various privileges, and various disabilities, in law; chiefly with regard to suits, crimes, estates, and contracts.

OF CORPORATIONS.

1. Bodies politic, or corporations, which are artificial persons, are established for preserving in perpetual succession certain rights; which, being conferred on natural persons only, would fail.

2. Corporations are, 1. Aggregate, consisting of many members. 2. Sole, consisting of one person only.

3. Corporations are also either spiritual, erected to perpetuate the rights of the church; or lay. And the lay are, 1. Civil; erected for many temporal purposes. 2. Eleemosynary; erected to perpetuate the charity of the founder.

4. Corporations are usually erected and named, by virtue of the king's royal charter; but may be created by act of parliament.

5. The powers incident to all corporations are, 1. To maintain perpetual succession. 2. To act in their corporate capacity like an individual. 3. To hold land; subject to the statutes of mortmain. 4. To have a common seal. 5. To make by-laws. Which last power, in spiritual or eleemosynary corporations, may be executed by the king or the founder.

6. The duty of corporations is to answer the ends of their institution.

7. To enforce this duty, all corporations may be visited: spiritual corporations by the ordinary: lay corporations by the founder, or his representatives; viz. the civil by the king (who is the founder incipiens of all) represented in his court of king's bench; the eleemosynary by the endower (who is the fundator perficiens of such,) or by his heirs or assigns.

8. Corporations may be dissolved, 1. By act of parliament. 2. By the natural death of all their members. 3. By surrender of their franchises. 4. By forfeiture of their charter.

II. OF THE RIGHTS OF THINGS.

1. The rights of things consist in the right of possessing property, or dominion, and all dominion over external objects has its original from the gift of the Creator to man in general.

2. The substance of things was, at first, common to all mankind; yet a temporary property, in the use of them, might even then be acquired, and continued, by occupancy.

3. In process of time, a permanent property was established in the substance, as well as the use, of things; which was also originally acquired by occupancy only.

4. Lest this property should determine by the owner's dereliction or death, whereby the thing would again become common, societies have established conveyances, wills, and heirships, in order to continue the property of the first occupant; and, where by accident such property becomes discontinued or unknown, the thing usually results to the sovereign of the state, by virtue of the municipal law.

5. But of some things, which are incapable of permanent substantial dominion, there still subsists only the same transient usufructuary property, which originally subsisted in all things.

OF REAL PROPERTY; AND, FIRST, OF CORPOREAL HEREDITAMENTS.

1. In this property, or exclusive dominion, consist the rights of things; which are, 1. Things real. 2. Things personal.

2. In things real may be considered, 1. Their several kinds. 2. The tenures by which they may be holden. 3. The estates which may be acquired therein. 4. Their title, or the means of acquiring and losing them.

3. All the several kinds of things real are reducible to one of these three, viz. lands, tenements, or hereditaments; whereof the second includes the first, and the third includes the first and second.

4. Hereditaments, therefore, or whatever may come to be inherited (being the most comprehensive denominations of things real,) are either corporeal or incorporeal.

5. Corporeal hereditaments consist wholly of lands, in their largest legal sense; wherein they include not only the face of the earth, but every other object of sense adjoining thereto, and subsisting either above or beneath it.

OF INCORPOREAL HEREDITAMENTS.

1. Incorporeal hereditaments are rights issuing out of thing corporeal, or concerning, or annexed to, or exercisable within, the same.

2. Incorporeal hereditaments are, 1. Advowsons. 2. Tithes. 3. Commons. 4. Ways. 5. Offices. 6. Dignities. 7. Franchises. 8. Corodies or pensions. 9. Annuities. 10. Rents.

1. An advowson is right of presentation to an ecclesiastical benefice; either appendant, or in gross. This may be, 1. Presentative. 2. Collative. 3. Donative.

4. Tithes are the tenth part of the increase yearly arising from the profits and stock of lands, and the personal industry of mankind. These, by the ancient and positive law of the land, are due of common right to the parson, or (by endowment) to the vicar; unless specially discharged, 1. By real composition. 2. By prescription, either *de modo decimandi*, or *de non decimando*.

5. Common is a profit which a man hath in the lands of another: being, 1. Common of pasture; which is either appendant, appurtenant, because of vicinage, or in gross. 2. Common of piscary. 3. Common of turbary. 4. Common of estovers, or botes.

6. Ways are a right of passing over another man's ground.

7. Offices are the right to exercise a public or private employment.

8. Dignities are titles of honour.

9. Franchises are a royal privilege, or branch of the king's prerogative, subsisting in the hands of a subject.

10. Corodies are allotments for one's sustenance; which may be converted into pensions.

11. An annuity is a yearly sum of money, charged upon the person, and not upon the lands of the granter.

12. Rents are a certain profit issuing yearly out of lands and tenements: and are reducible to, 1. Rent-service. 2. Rent-charge. 3. Rent-seek.

OF THE FEODAL SYSTEM.

1. The doctrine of tenures is derived from the feudal law; which was planted in Europe by its northern conquerors at the dissolution of the Roman empire.

2. Pure and proper feuds were parcels of land allotted by a chief to his followers, to be held on the condition of personally rendering due military service to their lord.

3. These were granted by investiture; were held under the bond of fealty; were inheritable only by descendants; and could not be transferred without the mutual consent of the lord and vassal.

4. Improper feuds were derived from the other; but differed from them in their original, their services and renders, their descent, and other circumstances.

5. The lands of England were converted into feuds, of the improper kind, soon after the Norman conquest; which gave rise to the grand maxim of tenure, viz. That all lands in the kingdom are holden, mediately or immediately, of the king.

OF THE ANCIENT ENGLISH TENURES.

1. The distinction of tenures consisted in the nature of their services: as, 1. Chivalry, or knight-service; where the service was free, but uncertain. 2. Free socage; where the service was free, and certain. 3. Pure villenage, or villein socage; where the service was base, but certain.

2. The most universal ancient tenure was that in chivalry, or by knight-service; in which the tenant of every knight's fee was bound, if called upon, to attend his lord to the wars. This was granted by livery, and perfected by homage and fealty; which usually drew after them suit of court.

3. The other fruits and consequences of the tenure by knight-service were, 1. Aid. 2. Relief. 3. Primerseisin. 4. Wardship. 5. Marriage. 6. Fines upon alienation. 7. Escheat.

4. Grand serjeanty differed from chivalry principally in its render, or service; and not in its fruits and consequences.

5. The personal service in chivalry was at length gradually changed into pecuniary assessments, which were called scutage or escuage.

6. These military tenures (except the services of grand serjeanty) were, at the restoration of king Charles, totally abolished, and reduced to free socage by act of parliament.

OF THE MODERN ENGLISH TENURES.

1. Free socage is a tenure by any free, certain, and determinate service.

2. This tenure, the relic of Saxon liberty, includes petit serjeanty, tenure in burgage, and gavelkind.

3. Free socage-lands partake strongly of the feudal nature, as well as those in chivalry: being holden; subject to some service, at the least to fealty and suit of court; subject to relief, to wardship, and to escheat, but not to marriage; subject also formerly to aids, primerseisin, and fines for alienation.

4. Pure villenage was a precarious and a slavish tenure, at the absolute will of the lord upon uncertain services of the basest nature.

5. From hence, by tacit consent or encroachment, have arisen the modern copyholds, or tenure by copy of court-roll; in which lands may be still held at the (nominal) will of the lord, (but regulated) according to the custom of the manor.

6. These are subject, like socage-lands, to services relief, and escheat; and also to heriots, wardship, and fines upon descent and alienation.

7. Privileged villenage, or villein socage, is an exalted species of copyhold tenure, upon base, but certain, services; subsisting only in the ancient demesnes of the crown; whence the tenure is denominated the tenure in ancient demesne.

8. These copyholds of ancient demesne have divers immunities annexed to their tenure; but are still held by copy of court-roll, according to the custom of the manor, though not at the will of the lord.

9. Frankalmoin is a tenure by spiritual services at large, whereby many ecclesiastical and eleemosynary corporations now hold their lands and tenements; being of a nature distinct from tenure by divine services in certain.

OF FREEHOLD ESTATES OF INHERITANCE.

1. Estates in lands, tenements, and hereditaments, are such interest as the tenant hath therein; to ascertain which, may be considered, 1. The quantity of interest. 2. The time of enjoyment. 3. The number and connections of the tenants.

2. Estates, with respect to their quantity of interest, or duration, are either freehold, or less than freehold.

3. A freehold estate, in lands, is such as is created by livery of seisin at common law; or, in tenements of an incorporeal nature, by what is equivalent thereto.

4. Freehold estates are either estates of inheritance, or for life: only: and inheritance are, 1. Absolute, or fee simple. 2. Limited fees.

5. Tenant in fee simple is, he that hath lands, tenements, or hereditaments, to hold to him and his heirs for ever.

6. Limited fees are, 1. Qualified, or base, fees. 2. Fees conditional at the common law.

7. Qualified or base fees are those which, having a qualification subjoined thereto, are liable to be defeated when that qualification is at an end.

8. Conditional fees, at the common law, were such as were granted to the donee, and the heirs of his body, in exclusion of collateral heirs.

9. These were held to be fees, granted on condition that the donee had issue of his body; which condition being once performed by the birth of issue, the donee might immediately alienate the land: but the statute *de donis* being made to prevent such alteration, thereupon from the division of the fee (by construction of this statute) into a particular estate and a reversion, the conditional fees began to be called fees tail.

10. All tenements real, or savouring of the realty, are subject to entails.

11. Estates tail may be, 1. general, or special: 2. male, or female; 3. given in frank marriage.

12. Incident to estates tail are, 1. Waste. 2. Dower. 3. Curtesy. 4. Bar;—by fine, recovery, or lineal warranty with assets.

13. Estates tail are now, by many statutes and resolutions of the courts, almost brought back to the state of conditional fees at the common law.

OF FREEHOLDS FOR LIFE.

1. Freeholds, not of inheritance, or for life only, are, 1. Conventional, or created by the act of the parties. 2. Legal, or created by operation of law.

2. Conventional estates for life are created by an express grant for term of one's own life, or *pur autre vie*; or by a general grant, without expressing any term at all.

3. Incident to this, and all other estates for life, are estovers, and emblements; and to estates per auter vie general occupancy was also incident; as special occupancy still is, if cestuy que vie survives the tenant.

4. Legal estates for life are, 1. Tenancy in tail, after possibility of issue extinct. 2. Tenancy by the curtesy of England. 3. Tenancy in dower.

5. Tenancy in tail, after possibility of issue extinct, is where an estate is given in special tail; and, before issue had, a person dies from whose body the issue was to spring; whereupon the tenant (if surviving) becomes tenant in tail, after possibility of issue extinct.

6. This estate partakes both of the incidents to an estate tail, and those of an estate for life.

7. Tenancy by the curtesy of England is where a man's wife is seised of an estate of inheritance; and he by her has issue, born alive, which was capable of inheriting her estate; in which case he shall upon her death, hold the tenements for his own life, as tenant by the curtesy.

8. Tenancy in dower is where a woman's husband is seised of an estate of inheritance, of which her issue might by any possibility have been heir; and the husband dies: the woman is thereupon intitled to dower, or one-third part of the lands and tenements, to hold for her natural life.

9. Dower is either by the common law; by special custom; ad ostium ecclesiae; or, ex assensu patris.

10. Dower may be forfeited or barred, particularly by an estate in jointure.

OF ESTATES LESS THAN FREEHOLD.

1. Estates less than freehold are, 1. Estates for years. 2. Estates at will. 3. Estates at sufferance.

2. An estate for years is where a man, seised of lands and tenements, letteth them to another for a certain period of time, which transfers the interest of the term; and the lessee enters thereon, which gives him possession of the term, but not legal seisin of the land.

3. Incident to this estate are estovers; and also emblements, if it determines before the full end of the term.

4. An estate at will is where lands are let by one man to another, to hold at the will of both parties; and the lessee enters thereon.

5. Copyholds are estates held at the will of the lord, (regulated) according to the custom of the manor.

6. An estate at sufferance is where one comes into possession of land by lawful title, but keeps it afterwards without any title at all.

OF ESTATES UPON CONDITION.

1. Estates (whether freehold or otherwise) may also be held upon condition; in which case their existence depends on the happening, or not happening of some uncertain event.

2. These estates are, 1. On condition implied. 2. On condition expressed. 3. Estates in gage. 4. Estates by statute, merchant or staple. 5. Estates by elegit.

3. Estates on condition implied are where a grant of an estate has, from its essence and constitution, a condition inseparably annexed to it; though none be expressed in words.

4. Estates on condition expressed are where an express qualification or provision is annexed to the grant of an estate.

5. On the performance of these conditions either expressed or implied (if precedent) the estate may be vested or enlarged; or, on the breach of them (if subsequent) an estate already vested may be defeated.

6. Estates in gage, in vadio, or in pledge, are estates granted as a security for money lent; being, 1. In vivo vadio, or living gage: there the profits of land are granted till a debt be paid, upon which payment the grantor's estate will revive. 2. In mortuo vadio, in dead or mort gage; where an estate is granted, on condition to be void at a day certain, if the grantor then repays the money borrowed; on failure of which, the estate becomes absolutely dead to the grantor.

7. Estates by statute-merchant, or statute-staple, are also estates conveyed to creditors, in pursuance of certain statutes, till their profits shall discharge the debt.

8. Estates by elegit are where, in consequence of a judicial

writ so called, lands are delivered by the sheriff to a plaintiff, till their profits shall satisfy a debt adjudged to be due by law.

OF ESTATES IN POSSESSION, REMAINDER, AND REVERSION.

1. Estates, with respect to their time of enjoyment, are either in immediate possession, or in expectancy; which estates in expectancy are created at the same time, and are parcel of the same estates, as those upon which they are expectant. These are, 1. Remainders. 2. Reversions.

2. A remainder is an estate limited to take effect, and be enjoyed, after another particular estate is determined.

3. Therefore, 1. There must be a precedent particular estate, in order to support a remainder. 2. The remainder must pass out of the grantor, at the creation of the particular estate. 3. The remainder must vest in the grantee, during the continuance, or at the determination, of the particular estate.

4. Remainders are, 1. Vested; where the estate is fixed to remain to a certain person, after the particular estate is spent. 2. Contingent; where the estate is limited to take effect, either to an uncertain person, or upon an uncertain event.

5. An executory devise is such a disposition of lands, by will, that an estate shall not vest thereby at the death of the deviser, but only upon some future contingency, and without any precedent particular estate to support it.

6. A reversion is the residue of an estate left in the grantor, to commence in possession after the determination of some particular estate granted: to which are incident fealty, and rent.

7. Where two estates, the one less, the other greater, the one in possession, the other in expectancy, meet together in one and the same person, and in one and the same right, the less is merged in the greater.

OF ESTATES, IN SEVERALTY, JOINT TENANCY, COPARCENARY, AND COMMON.

1. Estates, with respect to the number and connections of their tenants, may be held, 1. In severalty. 2. In joint-tenancy. 3. In coparcenary. 4. In common.

2. An estate in severalty is where one tenant holds it in his own sole right, without any other person being joined with him.

3. An estate in joint tenancy is where an estate is granted to two or more persons; in which case the law construes them to be joint-tenants, unless the words of the grant expressly exclude such construction.

4. Joint-tenants have an unity of interest, of title, of time, and of possession; they are seized per my & per tout; and therefore upon the decease of one joint-tenant, the whole interest remains to the survivor.

5. Joint-tenancy may be dissolved, by destroying one of its four constituent unities.

6. An estate in coparcenary is where an estate of inheritance descends from the ancestor to two or more persons; who are called parceners, and altogether make but one heir.

7. Parceners have an unity of interest, title, and possession; but are only seized per my, and not per tout; wherefore there is no survivorship among parceners.

8. Incident to this estate is the law of hotchpot.

9. Coparcenary may also be dissolved, by destroying any of its three constituent unities.

10. An estate in common is where two or more persons hold lands, possibly by distinct titles, and for distinct interest; but by unity of possession, because none knoweth his own severalty.

11. Tenants in common have therefore an unity of possession, (without survivorship; being seized per my and not per tout;) but no necessary unity of title, time, or interest.

12. This estate may be created, 1. By dissolving the constituent unities of the two former; 2. By express limitation in a grant: and may be destroyed, 1. By uniting the several titles in one tenant; 2. By partition of the land.

OF THE TITLE TO THINGS REAL, IN GENERAL.

1. A title to things real is the means whereby a man cometh to the just possession of his property.

2. Herein may be considered, 1. A mere or naked possession. 2. The right of possession; which is, 1st, an apparent, 2dly, an actual right. 3. The mere right of property. 4. The conjunction of

of actual possession with both these rights; which constitutes a perfect title.

OF TITLE BY DESCENT.

1. The title to things real may be reciprocally acquired or lost. 1. By descent. 2. By purchase.

2. Descent is the means whereby a man, on the death of his ancestor, acquires a title to his estate, in right of representation, as his heir at law.

3. To understand the doctrine of descents, we must form a clear notion of consanguinity; which is the connection, or relation, of persons descended from the same stock or common ancestor; and it is, 1. Lineal, where one of the kinsmen is lineally descended from the other. 2. Collateral, where they are lineally descended, not one from the other, but both from the same common ancestor.

4. The rules of descent, or canons of inheritance, observed by the laws of England, are these: 1. Inheritances shall lineally descend to the issue of the person last actually seised, in infinitum; but shall never lineally ascend. 2. The male issue shall be admitted before the female. 3. Where there are two or more males in equal degree, the eldest only shall inherit; but the females all together. 4. The lineal descendants, in infinitum, of any person deceased shall represent their ancestor; that is, shall stand in the same place as the person himself would have done, had he been living. 5. On failure of lineal descendants, or issue, of the person last seised, the inheritance shall descend to the blood of the first purchaser; subject to the three preceding rules. To evidence which blood, the two following rules are established. 6. The collateral heir of the person last seised must be his next collateral kinsman, of the whole blood. 7. In collateral inheritances, the male stocks shall be preferred to the female: that is, kindred derived from the blood of the male ancestors shall be admitted before those from the blood of the female: unless where the lands have, in fact, descended from a female.

OF TITLE BY PURCHASE, AND FIRST BY ESCHATE.

1. Purchase, or perquisition, is the possession of an estate which a man hath by his own act or agreement; and not by the mere act of law, or descent from any of his ancestors. This includes, 1. Escheat. 2. Occupancy. 3. Prescription. 4. Forfeiture. 5. Alienation.

2. Escheat is where, upon deficiency of the tenant's inheritable blood, the estate falls to the lord of the fee.

3. Inheritable blood is wanting to, 1. Such as are not related to the person last seised. 2. His maternal relations in paternal inheritances, and vice versa. 3. His kindred of the half-blood. 4. Monsters. 5. Bastards. 6. Aliens, and their issue. 7. Persons attainted of treason or felony. 8. Papists, in respect of themselves only, by the statute law.

OF TITLE BY OCCUPANCY.

1. Occupancy is the taking of possession of those things which before had no owner.

2. Thus, at the common law, where tenant *pur auter vie* died during the life of *cestuy que vie*, he, who could first enter, might lawfully retain the possession; unless by the original grant the heir was made a special occupant.

3. The law of derelictions and alluvions has narrowed the title by occupancy.

OF TITLE BY PRESCRIPTION.

Prescription (as distinguished from custom) is a personal immemorial usage of enjoying a right in some incorporeal hereditament, by a man, and either his ancestors or those whose estate of inheritance he hath: of which the first is called *prescribing* in his ancestors, the latter in a *que estate*.

OF TITLE BY FORFEITURE.

1. Forfeiture is a punishment annexed by law to some illegal act, or negligence, in the owner of things real; whereby the estate is transferred to another, who is usually the party injured.

2. Forfeitures are occasioned, 1. By crimes. 2. By alienation, contrary to law. 3. By lapse. 4. By simony. 5. By nonper-

formance of conditions. 6. By waste. 7. By breach of copyhold customs. 8. By bankruptcy.

3. Forfeitures for crimes, or misdemeanors, are for, 1. Treason. 2. Felony. 3. Misprision of treason. 4. Praemunire. 5. Assaults on a judge, and batteries, fitting the courts. 6. Popish recusancy, &c.

4. Alienations, or conveyances, which induce a forfeiture, are, 1. Those in mortmain, made to corporations contrary to the statute law. 2. Those made to aliens. 3. Those made by particular tenants, when larger than their estates with warrant.

5. Lapse is a forfeiture of the right of presentation to a vacant church, by neglect of the patron to present within six calendar months.

6. Simony is the corrupt presentation of any one to an ecclesiastical benefice, whereby that turn becomes forfeited to the crown.

7. Forfeiture by nonperformance of conditions, see above.

8. Waste is a spoil, or destruction, in any corporeal hereditaments, to the prejudice of him that hath the inheritance.

9. Copyhold estates may have also other peculiar causes of forfeiture, according to the custom of the manor.

10. Bankruptcy is the act of becoming a bankrupt; that is, a trader who secretes himself, or does certain other acts tending to defraud his creditors.

11. By bankruptcy all the estates of the bankrupt are transferred to the assignees of his commissioners, to be sold for the benefit of his creditors.

OF TITLE BY ALIENATION.

1. Alienation, conveyance, or purchase in its more limited sense, is a means of transferring real estates, wherein they are voluntarily resigned by one man, and accepted by another.

2. This formerly could not be done by a tenant, without licence from his lord; nor by a lord, without attornment of his tenant.

3. All persons are capable of purchasing; and all that are in possession of any estates, are capable of conveying them: unless under peculiar disabilities by law; as being attainted, non compos, infants, under duress, *femme-couvertes*, aliens, or papists.

4. Alienations are made by common assurances; which are, 1. By deed, or matter in pais. 2. By matter of record. 3. By special custom. 4. By devise.

OF ALIENATION BY DEED.

1. In assurances by deed may be considered, 1. Its general nature. 2. Its several species.

2. A deed, in general, is the solemn act of the parties: being usually a writing sealed and delivered: and it may be, 1. A deed indented, or indenture. 2. A deed-poll.

3. The requisites of a deed are, 1. Sufficient parties, and proper subject-matter. 2. A good and sufficient consideration. 3. Writing on paper, or parchment duly stamped. 4. Legal and orderly parts: which are usually, 1. the premises; 2. the habendum; 3. the tenendum; 4. the reddendum; 5. the conditions; 6. the warranty, which is either lineal or collateral; 7. the covenants; 8. the conclusion, which includes the date). 5. Reading it, if desired. 6. Sealing, and, in many cases, signing it also. 7. Delivery. 8. Attestation.

4. A deed may be avoided, 1. By the want of any of the requisites before-mentioned. 2. By subsequent matter; as, 1. Rasure, or alteration. 2. Defacing its seal. 3. Cancelling it. 4. Disagreement of those whose consent is necessary. 5. Judgement of a court of justice.

5. Of the several species of deeds, some serve to convey real property, some only to charge and discharge it.

6. Deeds which serve to convey real property, or conveyances, are either by common law, or by statute. And, of conveyances by common law, some are original or primary, others derivative or secondary.

7. Original conveyances are, 1. Feoffments. 2. Gifts. 3. Grants. 4. Leases. 5. Exchanges. 6. Partitions. Derivatives are, 7. Releases. 8. Confirmations. 9. Surrenders. 10. Assignments. 11. Defeazances.

8. A feoffment is the transfer of any corporeal hereditament to another, perfected by livery of seisin, or delivery of bodily possession

session from the feoffor to the feoffee; without which no freehold estate therein can be created at common law.

9. A gift is properly the conveyance of lands in tail.

10. A grant is the regular method, by common law, of conveying incorporeal hereditaments.

11. A lease is the demise, granting, or letting to farm of any tenement, usually for a less term than the lessor hath therein; yet sometimes possibly for a greater; according to the regulations of the restraining and enabling statutes.

12. An exchange is the mutual conveyance of equal interests, the one in consideration of the other.

13. A partition is the division of an estate held in joint tenancy, in coparcenary, or in common, between the respective tenants; so that each may hold his distinct part in severalty.

14. A release is the discharge or conveyance of a man's right, in lands and tenements, to another that hath some former estate in possession therein.

15. A confirmation is the conveyance of an estate or right in esse, whereby a voidable estate is made sure, or a particular estate is increased.

16. A surrender is the yielding up of an estate or life, or years, to him that hath the immediate remainder or reversion; wherein the particular estate may merge.

17. An assignment is the transfer, or making over to another, of the whole right one has in any estate; but usually in a lease, for life or years.

18. A defeazance is a collateral deed, made at the same time with the original conveyance; containing some condition, upon which the estate may be defeated.

19. Conveyances by statute depend much on the doctrine of uses and trusts: which are a confidence reposed in the terretenant, or tenant of the land, that he shall permit the profits to be enjoyed, according to the directions of *cestuy que use*, or *cestuy que trust*.

20. The statute of uses, having transferred all uses into actual possession, (or, rather, having drawn the possession to the use), has given birth to divers other species of conveyance: 1. A covenant to stand seised to use. 2. A bargain and sale, enrolled. 3. A lease and release. 4. A deed to lead or declare the use of other more direct conveyances. 5. A revocation of uses; being the execution of a power, reserved at the creation of the use, of recalling at a future time the use or estate so creating. All which owe their present operation principally to the statute of uses.

21. Deeds which do not convey, but only charge, real property, and discharge it, are, 1. Obligations. 2. Recognizances. 3. Defeazances upon both.

OF ALIENATION BY MATTER OF RECORD.

1. Assurances by matter of record are where the sanction of some court of record is called to substantiate and witness the transfer of real property. These are, 1. Private acts of parliament. 2. The king's grants. 3. Fines. 4. Common recoveries.

2. Private acts of parliament are a species of assurances, calculated to give (by the transcendent authority of parliament) such reasonable powers or relief as are beyond the reach of the ordinary course of law.

3. The king's grants, contained in charters or letters patent, are all entered on record, for the dignity of the royal person, and security of the royal revenue.

4. A fine (sometimes said to be a feoffment of record) is an amicable composition and agreement of an actual, or fictitious, suit: whereby the estate in question is acknowledged to be the right of one of the parties.

5. The parts of a fine are, 1. The writ of covenant. 2. The licence to agree. 3. The concord. 4. The note. 5. The foot. To which the statute hath added, 6. Proclamations.

6. Fines are of four kinds: 1. *Sur cognizance de droit*, come ceo que il ad de son done. 2. *Sur cognizance de droit tantum*. 3. *Sur concessit*. 4. *Sur done, grant, et render*; which is a double fine.

7. The force and effect of fines (when levied by such as have themselves any interest in the estate) are to assure the lands in question to the cognizee, by barring the respective rights of parties, privies, and strangers.

8. A common recovery is by an actual, or fictitious, suit or ac-

tion for land, brought against the tenant of the freehold; who thereupon vouches another, who undertakes to warrant the tenant's title: but, upon such vouchee's making default, the land is recovered by judgement at law against the tenant; who, in return obtains judgement against the vouchee to recover lands of equal value in recompence.

9. The force and effect of a recovery are to assure lands to the recoverer, by barring estates tail, and all remainders and reversions expectant thereon; provided the tenant in tail either suffers, or is vouched in such recovery.

10. The use of a fine or recovery may be directed by, 1. Deeds to lead such uses; which are made previous to the levying or suffering them. 2. Deeds to declare the uses; which are made subsequent.

OF ALIENATION BY SPECIAL CUSTOM.

1. Assurances by special custom are confined to the transfer of copyhold estates.

2. This is effected by, 1. Surrender by the tenant into the hands of the lord to the use of another, according to the custom of the manor. 2. Presentment, by the tenants or homage, of such surrender. 3. Admittance of the surrender by the lord, according to the uses expressed in such surrender.

3. Admittance may also be had upon original grants to the tenant from the lord, and upon descents to the heir from the ancestor.

OF ALIENATION BY DEVISE.

1. Devise, is a disposition of lands and tenements, contained in the last will and testament of the owner.

2. This is not permitted by the common law, as it stood since the conquest; but was introduced by the statute law, under Henry VIII. since made more universal by the statute of tenures under Charles II. with the introduction of additional solemnities by the statute of frauds and perjuries in the same reign.

3. The construction of all common assurances should be, 1. Agreeable to the intention. 2. To the words of the parties. 3. Made upon the entire deed. 4. Bearing strongest against the contractor. 5. Conformable to law. 6. Rejecting the latter of two totally repugnant clauses in a deed, and the former in a will. 7. Most favourable in case of a devise.

OF THINGS PERSONAL.

1. Things personal are comprehended under the general name of chattels; which includes whatever wants either the duration, or the immobility, attending things real.

2. In these are to be considered, 1. Their distribution. 2. The property of them. 3. The title to that property.

3. As to the distribution of chattels, they are, 1. Chattels real. 2. Chattels personal.

4. Chattels real are such quantities of interest in things immoveable, as are short of the duration of freeholds; being limited to a time certain, beyond which they cannot subsist.

5. Chattels personal are things moveable; which may be transferred from place to place, together with the person of the owner.

OF PROPERTY IN THINGS PERSONAL.

1. Property, in chattels personal, is either in possession, or in action.

2. Property in possession, where a man has the actual enjoyment of a thing, is, 1. Absolute. 2. Qualified.

3. Absolute property is where a man has such an exclusive right in the thing, that it cannot cease to be his, without his own act or default.

4. Qualified property is such as is not, in its nature, permanent; but may sometimes subsist, and at other times not subsist.

5. This may arise, 1. Where the subject is incapable of absolute ownership. 2. From the peculiar circumstances of the owners.

6. Property in action, is where a man hath not the actual occupation of the thing; but only a right to it, arising upon some contract, and recoverable by an action at law.

7. The property of chattels personal is liable to remainders, expectant on estates for life; to joint-tenancy; and to tenancy in common.

OF TITLE TO THINGS PERSONAL BY OCCUPANCY.

1. The title to things personal may be acquired or lost by, 1. Occupancy. 2. Prerogative. 3. Forfeiture. 4. Custom. 5. Succession. 6. Marriage. 7. Judgement. 8. Gift, or grant. 9. Contract. 10. Bankruptcy. 11. Testament. 12. Administration.
2. Occupancy still gives the first occupant a right to those few things which have no legal owner, or which are incapable of permanent ownership. Such as, 1. Goods of alien enemies. 2. Things found. 3. The benefit of the elements. 4. Animals *feræ naturæ*. 5. Emblements. 6. Things gained by accession; or, 7. By confusion. 8. Literary property.

OF TITLE BY PREROGATIVE, AND FORFEITURE.

1. By prerogative is vested in the crown, or its grantees, the property of the royal revenue; and also the property of all game in the kingdom, with the right of pursuing and taking it.
2. By forfeiture, for crimes and misdemeanors, the right of goods and chattels may be transferred from one man to another; either in part or totally.
3. Total forfeitures of goods arise from conviction of, 1. Treason, and misprision thereof. 2. Felony. 3. Excusable homicide. 4. Outlawry for treason or felony. 5. Flight. 6. Standing mute. 7. Assaults on a judge; and batteries, sitting the courts. 8. Praemunire. 9. Pretended prophecies. 10. Owling. 11. Residing abroad of artificers. 12. Challenges to fight for debts at play.

OF TITLE BY CUSTOM.

1. By custom, obtaining in particular places, a right may be acquired in chattels: the most usual of which customs are those relating to, 1. Heriots. 2. Mortuaries. 3. Heir looms.
2. Heriots are either heriot-service, which differs little from a rent; or heriot-custom, which is a customary tribute, of goods and chattels, payable to the lord of the fee on the decease of the owner of lands.
3. Mortuaries are a customary gift due to the minister in many parishes, on the death of his parishioners.
4. Heir looms are such personal chattels, as descend by special custom to the heir, along with the inheritance of his ancestor.

OF TITLE BY SUCCESSION, MARRIAGE, AND JUDGEMENT.

1. By succession the right of chattels is vested in corporations aggregate: and likewise in such corporations sole as are the heads and representatives of bodies aggregate.
2. By marriage the chattels real and personal of the wife are vested in the husband, in the same degree of property, and with the same powers, as the wife when sole had over them; provided he reduces them to possession.
3. The wife also acquires, by marriage, a property in her own paraphernalia.
4. By judgement, consequent on a suit at law, a man may in some cases, not only recover, but originally acquire, a right to personal property. As, 1. To penalties recoverable by action popular. 2. To damages. 3. To costs of suit.

OF TITLE, BY GIFT, GRANT, AND CONTRACT.

1. A gift, or grant, is a voluntary conveyance of a chattel personal in possession, without any consideration or equivalent.
2. A contract is an agreement, upon sufficient consideration, to do or not to do a particular thing: and, by such contract, any personal property (either in possession or in action) may be transferred.
3. Contracts may either be express or implied; either executed or executory.
4. The consideration of contracts is, 1. A good consideration. 2. A valuable consideration; which is, 1. *Do, ut des.* 2. *Facio, ut facias.* 3. *Facio, ut des.* 4. *Do, ut facias.*
5. The most usual species of personal contracts are, 1. Sale or exchange. 2. Bailment. 3. Hiring or borrowing. 4. Debt.
6. Sale or exchange is a transmutation of property from one man to another, in consideration of some recompense in value.
7. Bailment is the delivery of goods in trust; upon a con-

tract, express or implied, that the trust shall be faithfully performed by the bailee.

8. Hiring or borrowing is a contract, whereby the possession of chattels is transferred for a particular time, on condition that the identical goods (or sometimes their value) be restored at the time appointed: together with (in case of hiring) a stipend or price for the use.

9. This price, being calculated to answer the hazard as well as inconvenience of lending, gives birth to the doctrine of interest, or usury, upon loans; and, consequently, to the doctrine of bottomry or respondentia, and insurance.

10. Debt is any contract, whereby a certain sum of money becomes due to the creditor. This is, 1. A debt of record. 2. A debt upon special contract. 3. A debt upon simple contract: which last includes paper credit, or bills of exchange, and promissory notes.

OF TITLE BY BANKRUPTCY.

1. Bankruptcy (as already observed) is the act of becoming a bankrupt.
2. Herein may be considered, 1. Who may become a bankrupt. 2. The acts whereby he may become a bankrupt. 3. The proceedings on a commission of bankruptcy. 4. How his property is transferred thereby.
3. Persons of full age, using the trade of merchandize, by buying, and selling, and seeking their livelihood thereby, are liable to become bankrupts for debts of a sufficient amount.
4. A trader, who endeavours to avoid his creditors, or evade their just demands, by any of the ways specified in the several statutes of bankruptcy, doth thereby commit an act of bankruptcy.
5. The proceedings on a commission of bankrupt, so far as they affect the bankrupt himself, are principally by, 1. Petition. 2. Commission. 3. Declaration of bankruptcy. 4. Choice of assignees. 5. The bankrupt's surrender. 6. His examination. 7. His discovery. 8. His certificate. 9. His allowance. 10. His indemnity.
6. The property of a bankrupt's personal estate is, immediately upon the act of bankruptcy, vested by construction of law in the assignees: and they, when they have collected, distribute the whole by equal dividends among all the creditors.

OF TITLE BY TESTAMENT, AND ADMINISTRATION.

1. Concerning testaments and administrations, considered jointly, are to be observed, 1. Their original and antiquity. 2. Who make a testament. 3. Its nature and incidents. 4. What are executors and administrators. 5. Their office and duty.
2. Testaments have subsisted in England immemorially; whereby the deceased was at liberty to dispose of his personal estate, reserving anciently to his wife and children their reasonable part of his effects.
3. The goods of intestates belonged anciently to the king; who granted them to the prelates to be disposed in pious uses: but, on their abuse of this trust in the times of popery, the legislature compelled them to delegate their power to administrators expressly provided by law.
4. All persons may make a testament unless disabled by, 1. Want of discretion. 2. Want of freewill. 3. Criminal conduct.
5. Testaments are the legal declaration of a man's intentions, which he wills to be performed after his death. These are, 1. Written. 2. Nuncupative.
6. An executor is he to whom a man by his will commits the execution thereof.
7. Administrators are, 1. *Durante minore ætate* of an infant executor or administrator; or *durante absentia*; or *pendente lite*. 2. *Cum testamento annexo*; when no executor is named, or the executor refuses to act. 3. General administrators; in pursuance of the statutes of Edward III. and Henry VIII. 4. Administrators *de bonis non*; when a former executor or administrator dies without completing his trust.
8. The office and duty of executors (and, in many points, of administrators also,) are, 1. To bury the deceased. 2. To prove the will, or take out administration. 3. To make an inventory. 4. To collect the goods and chattels. 5. To pay debts; observing the rules of priority. 6. To pay legacies, either general or specific;

specific; if they be vested, and not lapsed. 7. To distribute the undivided surplus, according to the statute of distributions.

OF PRIVATE WRONGS.

OF THE REDRESS OF PRIVATE WRONGS, BY THE MERE ACT OF THE PARTIES.

1. Wrongs are the privation of right; and are, 1. Private.
2. Public.
2. Private wrongs, or civil injuries, are an infringement, or privation, of the civil rights of individuals, considered as individuals.
3. The redress of civil injuries is one principal object of the laws of England.
4. This redress is effected, 1. By the mere act of the parties.
2. By the mere operation of law. 3. By both together, or suit in courts.
5. Redress, by the mere act of the parties, is that which arises, 1. From the sole act of the party injured. 2. From the joint act of all the parties.
6. Of the first sort are, 1. Defence of one's self, or relations.
2. Recaption of goods. 3. Entry on lands and tenements. 4. Abatement of nuisances. 5. Distress, for rent, for suit or service, for amercements, for damage, or for divers statutable penalties;—made of such things only as are legally distrainable;—and taken and disposed of according to the due course of law. 6. Seising of heriots, &c.
7. Of the second sort are, 1. Accord. 2. Arbitration.

OF REDRESS BY THE MERE OPERATION OF LAW.

Redress, effected by the mere operation of law, is, 1. In the case of retainer; where a creditor is executor or administrator, and is thereupon allowed to retain his own debt. 2. In the case of remitter; where one, who has a bad one, and is thereupon remitted to his ancient good title, which protects his ill-acquired possession.

OF COURTS IN GENERAL.

1. Redress, that is effected by the act both of the law and of the parties, is by suit or action in the courts of justice.
2. Herein may be considered, 1. The courts themselves. 2. The cognizance of wrongs or injuries therein. And of courts, 1. Their nature and incidents. 2. Their several species.
3. A court is a place wherein justice is judicially administered, by officers delegated by the crown; being a court either of record or not of record.
4. Incident to all courts are a plaintiff, defendant, and judge: and there are also usually attorneys; and advocates or counsel, viz. either barristers or serjeants at law.

OF THE PUBLIC COURTS OF COMMON LAW AND EQUITY.

1. Courts of justice, with regard to their several species, are, 1. Of a public, or general jurisdiction throughout the realm. 2. Of a private, or special, jurisdiction.
2. Public courts of justice are, 1. The courts of common law and equity. 2. The ecclesiastical courts. 3. The military courts.
4. The maritime courts.
3. The general and public courts of common law and equity are, 1. The court of piepoudre. 2. The court-baron. 3. The hundred court. 4. The county court. 5. The court of common pleas. 6. The court of king's bench. 7. The court of exchequer. 8. The court of chancery. (Which two last are courts of equity as well as law.) 9. The courts of exchequer chamber. 10. The house of peers. To which may be added, as auxiliaries, 11. The courts of assize and nisi prius.

OF COURTS ECCLESIASTICAL, MILITARY, AND MARITIME.

1. Ecclesiastical courts (which were separated from the temporal by William the Conqueror,) or courts Christian, are, 1. The court of the archdeacon. 2. The court of the bishop's consistory. 3. The court of arches. 4. The court of peculiars. 5. The prerogative court. 6. The court of delegates. 7. The court of review.
2. The only permanent military court is that of chivalry; the

courts martial, annually established by act of parliament, being only temporary.

3. Maritime courts are, 1. The court of admiralty and vice-admiralty. 2. The court of delegates. 3. The lords of the privy council, and others, authorised by the king's commission for appeals in prize-causes.

OF COURTS OF A SPECIAL JURISDICTION.

Courts of a special or private jurisdiction are, 1. The forest courts; including the courts of attachments, regard, swiennote, and justice seat. 2. The court of commissioners of sewers. 3. The court of policies of assurance. 4. The court of the marshal-sea and the palace-court. 5. The courts of the principality of Wales. 6. The court of the duchy chamber of Lancaster. 7. The courts of the counties palatine, and other royal franchises. 8. The stannery courts. 9. The courts of London, and other corporations:—to which may be referred the courts of requests, or courts of conscience; and the modern regulations of certain courts baron and county courts. 10. The courts of the two universities.

OF THE COGNISANCE OF PRIVATE WRONGS.

1. All private wrongs or civil injuries are cognisable either in the courts ecclesiastical, military, maritime, or those of common law.
2. Injuries cognisable in the ecclesiastical courts are, 1. Pecuniary. 2. Matrimonial. 3. Testamentary.
3. Pecuniary injuries, here cognisable, are, 1. Subtraction of tithes. For which the remedy is by suit to compel their payment, or an equivalent; and also their double value. 2. Nonpayment of ecclesiastical dues. Remedy: by suit for payment. 3. Spoliation. Remedy: by suit for restitution. 4. Dilapidations. Remedy: by suit for damages. 5. Nonrepair of the church, &c. and nonpayment of church-rates. Remedy: by suit to compel them.
4. Matrimonial injuries are, 1. Jactitation of marriage. Remedy: by suit for perpetual silence. 2. Subtraction of conjugal rights. Remedy: by suit for restitution. 3. Inability for the marriage-state. Remedy: by suit for divorce. 4. Refusal of decent maintenance to the wife. Remedy: by suit for alimony.
5. Testamentary injuries are, 1. Disputing the validity of wills. Remedy: by suit to establish them. 2. Obstructing of administrations. Remedy: by suit for the granting them. 3. Subtraction of legacies. Remedy: by suit for the payment.
6. The course of proceedings herein is much conformed to the civil and canon law: but their only compulsive process is that of excommunication; which is enforced by the temporal writ of significavit, or de excommunicato capiendo.
7. Civil injuries, cognisable in the court military, or court of chivalry, are, 1. Injuries in point of honour. Remedy: by suit for honourable amends. 2. Encroachments in coat armour, &c. Remedy: by suit to remove them. The proceedings are in a summary method.
8. Civil injuries cognisable in the courts maritime, are injuries, in their nature of common law cognisance, but arising wholly upon the sea, and not within the precincts of any county. The proceedings are herein also much conformed to the civil law.
9. All other injuries are cognisable only in the courts of common law: of which in what follows.
10. Two of them are, however, commisable by these and other inferior courts; viz. 1. Refusal, or neglect of justice. Remedies: by writ of procedendo, or mandamus. 2. Encroachment of jurisdiction. Remedy: by writ of prohibition.

OF WRONGS, AND THEIR REMEDIES, RESPECTING THE RIGHTS OF PERSONS.

1. In treating of the cognisance of injuries by the courts of common law, may be considered, 1. The injuries themselves, and their respective remedies. 2. The pursuit of those remedies in the several courts.
2. Injuries between subject and subject, cognisable by the courts of common law, are in general remedied by putting the party injured into possession of that right whereof he is unjustly deprived.

3. This

3. This is effected, 1. By delivery of the thing detained to the rightful owner. 2. Where that remedy is either impossible or inadequate, by giving the party injured a satisfaction in damages.

4. The instruments, by which these remedies may be obtained, are suits or actions; which are defined to be legal demand of one's right: and these are, 1. Personal. 2. Real. 3. Mixed.

5. Injuries (whereof some are with, others without, force,) are, 1. Injuries to the rights of persons. 2. Injuries to the rights of property. And the former are, 1. Injuries to the absolute. 2. Injuries to the relative, rights of persons.

6. The absolute rights of individuals are, 1. Personal security. 2. Personal liberty. 3. Private property. To which the injuries must be correspondent.

7. Injuries to personal security are, 1. Against a man's life. 2. Against his limbs. 3. Against his body. 4. Against his health. 5. Against his reputation.—The first will be considered in the following sections.

8. Injuries to the limbs and body are, 1. Threats. 2. Assault. 3. Battery. 4. Wounding. 5. Mayhem. Remedy: by action of trespass, *vi et armis*; for damages.

9. Injuries to health, by any unwholesome practices, are remedied a special action of trespass, on the case; for damages.

10. Injuries to reputation are, 1. Slanderous and malicious words. Remedy: by action on the case; for damages. 2. Libels. Remedy: the same. 3. Malicious prosecutions. Remedy: by action of conspiracy, or on the case; for damages.

11. The sole injury to personal liberty is false imprisonment. Remedies: 1. By writ of, 1st. *Mainprize*; 2dly. *Ollo et alia*; 3dly. *Homine replegiando*; 4thly. *Habeas corpus*; to remove the wrong. 2. By action of trespass; to recover damages.

12. For injuries to private property, see the next section.

13. Injuries to relative rights affect, 1. Husbands. 2. Parents. 3. Guardians. 4. Masters.

14. Injuries to an husband are, 1. Abduction, or taking away his wife. Remedy: by action of trespass, *de uxore rapta et abducta*; to recover possession of his wife and damages. 2. Criminal conversation with her. Remedy: by action on the case; for damages. 3. Beating her. Remedy: by action on the case, *per quod consortium amisit*; for damages.

15. The only injury to a parent or guardian is the abduction of their children or wards. Remedy: by action of trespass, *de filiis, vel custodiis, raptis vel abductis*; to recover possession of them, and damages.

16. Injuries to a master are, 1. Retaining his servants. Remedy: by action on the case; for damages. 2. Beating them. Remedy: by action on the case, *per quod servitium amisit*; for damages.

OF INJURIES TO PERSONAL PROPERTY.

1. Injuries to the rights of property are either those of personal or real property.

2. Personal property is either in possession or in action.

3. Injuries to personal property in possession are, 1. By dispossession. 2. By damage, while the owner remains in possession.

4. Dispossession may be effected, 1. By an unlawful taking. 2. By an unlawful detaining.

5. For the unlawful taking of goods and chattels personal, the remedy is, 1. Actual restitution, which (in case of a wrongful distress,) is obtained by action of replevin. 2. Satisfaction in damages: 1st, in case of *rescous*, by action of rescous, poundbreach, or on the case; 2dly, in case of other unlawful takings, by action of trespass or trover.

6. For the unlawful detaining of goods lawfully taken, the remedy is also, 1. Actual restitution; by action of replevin or detinue. 2. Satisfaction in damages: by action on the case, for trover and conversion.

7. For damage to personal property, while in the owner's possession, the remedy is in damages; by action of trespass *vi et armis*, in case the act be immediately injurious; or by action of trespass on the case, to redress consequential damage.

8. Injuries to personal property, in action, arise by breach of contracts, 1. Express. 2. Implied.

9. Breaches of express contracts are, 1. By nonpayment of

debts. Remedy: 1st, Specific payment; recoverable by action of debt. 2dly, Damages for nonpayment; recoverable by action on the case. 2. By nonperformance of covenants. Remedy: by action of covenant, 1st, To recover damages, in covenant's personal; 2dly, To compel performance, in covenant's real. 3. By nonperformance of promises, or assumpsits. Remedy: by action on the case; for damages.

10. Implied contracts are such as arise, 1. From the nature and constitution of government. 2. From reason and the construction of law.

11. Breaches of contracts, implied in the nature of government, are by the nonpayment of money which the laws have directed to be paid. Remedy: by action of debt (which, in such cases, is frequently a popular, frequently a *qui tam*, action;) to compel the specific payment;—or, sometimes, by action on the case; for damages.

12. Breaches of contracts, implied in reason and construction of law, are by the nonperformance of legal presumptive assumpsits: for which the remedy is in damages; by an action on the case on the implied assumpsits. 1. Of a quantum meruit. 2. Of a quantum valebat. 3. Of money expended for another. 4. Of receiving money to another's use. 5. Of an insimul computassent, on an account stated (the remedy on an account unstated being by action of account). 6. Of performing one's duty, in any employment, with integrity, diligence, and skill. In some of which cases an action of deceit (or on the case, in nature of deceit,) will lie.

OF INJURIES TO REAL PROPERTY; AND, FIRST, OF DISPOSSESSION, OR OUSTER, OF THE FREEHOLD.

1. Injuries affecting real property are, 1. Ouster. 2. Trespass. 3. Nuisance. 4. Waste. 5. Subtraction. 6. Disturbance.

2. Ouster is the amotion of possession; and is, 1. From freeholds. 2. From chattels real.

3. Ouster from freeholds is effected by, 1. Abatement. 2. Intrusion. 3. Disseisin. 4. Discontinuance. 5. Deforcement.

4. Abatement is the entry of a stranger, after the death of the ancestor, before the heir.

5. Intrusion is the entry of a stranger, after a particular estate of freehold is determined, before him in remainder or reversion.

6. Disseisin is a wrongful putting out of him that is seised of the freehold.

7. Discontinuance is where the tenant in tail, or the husband of a tenant in fee, makes a larger estate of the land than the law alloweth.

8. Deforcement is any other detainer of the freehold from him who hath the property, but who never had the possession.

9. The universal remedy for all these is restitution or delivery of possession: and, sometimes, damages for the detention. This is effected, 1. By mere entry. 2. By action possessory. 3. By writ of right.

10. Mere entry, on lands, by him who hath the apparent right of possession, will (if peaceable) divest the mere possession of a wrong doer. But forcible entries are remedied by immediate restitution, to be given by a justice of the peace.

11. Where the wrong doer hath not only mere possession, but also an apparent right of possession, this may be divested by him who hath the actual right of possession, by means of the possessory actions of writ of entry or assise.

12. A writ of entry is a real action, which disproves the title of the tenant, by shewing the unlawful means under which he gained or continues possession. And it may be brought either against the wrong doer himself, or in the degrees called the *per*, the *per* and *cui*, and the *post*.

13. An assise is a real action, which proves the title of the demandant, by shewing his own or his ancestor's possession. And it may be brought either to remedy abatements; viz. the assise of *mort d'ancestor*, &c. or to remedy recent disseisins; viz. the assise of novel disseisin.

14. Where the wrong doer hath gained the actual right of possession, he who hath the right of property can only be remedied by a writ of right, or some writ of a similar nature. As, 1. Where such right of possession is gained by the discontinuance of tenant

in tail. Remedy, for the right of property: by writ of formedon. 2. Where gained by recovery in a possessory action, had against tenants of particular estates by their own default. Remedy: by writ of quod ei forfeceat. 3. Where gained by recovery in a possessory action, had upon the merits. 4. Where gained by the statute of limitations. Remedy, in both cases: by a mere writ of right, the highest writ in the law.

OF DISPOSSESSION, OR OUSTER, OF CHATTELS REAL.

1. Ouster from chattels real is, 1. From estates by statute and elegit. 2. From an estate for years. 3. Ouster from estates by statute or elegit, is effected by a kind of disseisin. Remedy: restitution, and damages; by assise of novel disseisin.

4. A writ of ejectione firmæ, or action of trespass in ejectment, lieth where lands, &c. are let for a term of years, and the lessee is ousted or ejected from his term; in which case he shall recover possession of his term, and damages.

5. This is now the usual method of trying titles to land, instead of an action real: viz. By, 1. The claimant's making an actual (or supposed) lease upon the land to the plaintiff. 2. The plaintiff's actual (or supposed) entry thereupon. 3. His actual (or supposed) ouster and ejectment by the defendant. For which injury this action is brought either against the tenant, or (more usually) against some casual or fictitious ejector; in whose stead the tenant may be admitted defendant, on condition that the lease, entry, and ouster, be confessed, and that nothing else be disputed but the merits of the title claimed by the lessor of the plaintiff.

6. A writ of quare ejectionem infra terminum is an action of a similar nature; only not brought against the wrong doer or ejector himself, but such as are in possession under his title.

OF TRESPASS.

Trespass is an entry upon, and damage done to, another's lands, by one's self, or by one's cattle; without any lawful authority, or cause of justification: which is called a breach of his closs. Remedy: damages; by action of trespass, quare clausum fregit: besides that of distress, damage feasant. But, unless the title to the land came chiefly in question, or the trespass was wilful or malicious, the plaintiff (if the damages be under forty shillings,) shall recover no more costs than damages.

OF NUSANCE.

1. Nuisance, or annoyance, is any thing that worketh damage or inconvenience: and it is either a public and common nuisance, of which we treat by and bye; or, a private nuisance, which is any thing done to the hurt or annoyance of, 1. The corporeal. 2. The incorporeal, hereditaments of another.

2. The remedies for a private nuisance (besides that of abatement,) are, 1. Damages; by action on the case; (which also lies for special prejudice by a public nuisance). 2. Removal thereof, and damages; by assise of nuisance. 3. Like removal, and damages; by writ of quod permittat prosterne.

OF WASTE.

1. Waste is a spoil and destruction in lands and tenements, to the injury of him who hath, 1. An immediate interest, (as, by right of common) in the lands. 2. The remainder or reversion of the inheritance.

2. The remedies, for a commoner, are restitution, and damages; by assise of common: or, damages only; by action on the case.

3. The remedy, for him in remainder, or reversion, is, 1. Preventive: by writ of estrepement at law, or injunction out of chancery; to stay waste. 2. Corrective: by action of waste; to recover the place wasted, and damages.

OF SUBTRACTION.

1. Subtraction is when one, who owes services to another, withdraws or neglects to perform them. This may be, 1. Of

rents, and other services, due by tenure. 2. Of those due by custom.

2. For subtraction of rents and services, due by tenure, the remedy is, 1. By distress; to compel the payment or performance. 2. By action of debt. 3. By assise. 4. By writ de consuetudinibus et servitiis;—to compel the payment. 5. By writ of cessavit;—and, 6. By writ of right sur disclaimer;—to recover the land itself.

3. To remedy the oppression of the lord, the law has also given, 1. The writ of Ne injuste vexes. 2. The writ of mesne.

4. For subtraction of services, due by custom, the remedy is, 1. By writ of Secta ad molendinum, furnum, torrale, &c. to compel the performance, and recover damages. 2. By action on the case; for damages only.

OF DISTURBANCE.

1. Disturbance is the hindering, or disquieting, the owners of an incorporeal hereditament, in their regular and lawful enjoyment of it.

2. Disturbances are, 1. Of franchises. 2. Of commons. 3. Of ways. 4. Of tenure. 5. Of patronage.

3. Disturbance of franchises, is remedied by a special action on the case; for damages.

4. Disturbance of common is, 1. Intercommoning without right. Remedy: damages; by an action on the case, or of trespass: besides distress, damage feasant: to compel satisfaction. 2. Surcharging the common. Remedies: distress, damage feasant; to compel satisfaction. Action on the case; for damages; or, writ of admeasurement of pasture; to apportion the common; and writ de secunda superoneratione; for the supernumerary cattle, and damages. 3. Inclosure, or obstruction. Remedies: restitution of common, and damages; by assise of novel disseisin, and by writ of quod permittat: or, damages only; by action on the case.

5. Disturbance of ways, is the obstruction, 1. Of a way in gross, by the owner of the land. 2. Of a way appendant, by a stranger. Remedy, for both: damages; by action on the case.

6. Disturbance of tenure, by driving away tenants, is remedied by a special action on the case; for damages.

7. Disturbance of patronage, is the hindrance of a patron to present his clerk to a benefice; whereof usurpation, within six months, is now become a species.

8. Disturbances may be, 1. The pseudo-patron, by his wrongful presentation. 2. His clerk, by demanding institution. 3. The ordinary, by refusing the clerk of the true patron.

9. The remedies are, 1. By assise of darrein presentment. 2. By writ of quare impedit;—to compel institution and recover damages: consequent to which are the writs of quare incumbavit, and quare non admisit; for subsequent damages. 3. By writ of right of advowson: to compel institution, or establish the permanent right.

OF INJURIES PROCEEDING FROM, OR AFFECTING, THE CROWN.

1. Injuries to which the crown is a party are, 1. Where the crown is the aggressor. 2. Where the crown is the sufferer.

2. The crown is the aggressor, whenever it is in possession of any property to which the subject hath a right.

3. This is remedied, 1. By petition of right; where the right is grounded on facts disclosed in the petition itself. 2. By monstrans de droit; where the claim is grounded on facts, already appearing on record. The effect of both which is to remove the hands (or possession) of the king.

4. Where the crown is the sufferer, the king's remedies are, 1. By such common law actions as are consistent with the royal dignity. 2. By inquest of office, to recover possession: which, when found, gives the king his right by solemn matter of record; but may afterwards be traversed by the subject. 3. By writ of scire facias, to repel the king's patent or grant. 4. By information of intrusion, to give damages for any trespass on the lands of the crown; or of debt, to recover monies due upon contract, or forfeited by the breach of any penal statute; or sometimes (in the latter case) by information in rem: all filed in the exchequer ex officio by the king's attorney-general. 5. By writ of quo warranto,

ranto, or information in the nature of such writ; to seize into the king's hands any franchise usurped by the subject, or to oust an usurper from any public office. 6. By writ of mandamus, unless cause; to admit or restore any person entitled to a franchise or office: to which if a false cause be returned, the remedy is by traverse, or by action on the case for damages; and, in consequence, a peremptory mandamus, or writ of restitution.

OF THE PURSUIT OF REMEDIES BY ACTION; AND, FIRST OF THE ORIGINAL WRIT.

1. The pursuit of the several remedies furnished by the laws of England, is, 1. By action in the courts of common law. 2. By proceedings in the courts of equity.

2. Of an action in the court of common pleas, (originally the proper court for prosecuting civil suits,) the orderly parts are, 1. The original writ. 2. The process. 3. The pleadings. 4. The issue, or demurrer. 5. The trial. 6. The judgement. 7. The proceedings in nature of appeal. 8. The execution.

3. The original writ is the beginning or foundation of a suit, and is either optional (called a *præcipe*), commanding the defendant to do something in certain, or otherwise shew cause to the contrary; or peremptory (called a *si fecerit te securum*), commanding, upon security given by the plaintiff, the defendant to appear in court, to shew wherefore he hath injured the plaintiff: both issuing out of chancery under the king's great seal, and returnable in bank during term time.

OF PROCESS.

1. Process is the means of compelling the defendant to appear in court.

2. This includes, 1. Summons. 2. The writ of attachment, or *pone*; which is sometimes the first or original process. 3. The writ of *distringas*, or distress infinite. 4. The writs of *capias ad respondendum*, and *testatum capias*; or, instead of these, in the king's bench, the bill of Middlesex, and writ of *latitat*:—and, in the exchequer, the writ of *quo minus*. 5. The *alias* and *pluries* writs. 6. The *exigent*, or writ of *exigis facias*, proclamations, and outlawry. 7. Appearance, and common bail. 8. The arrest. 9. Special bail, first to the sheriff, and then to the action.

OF PLEADINGS.

Pleadings are the mutual altercations of the plaintiff and defendant in writing; under which are comprised, 1. The declaration or count; (wherein, incidentally, of the *visne*, nonsuit, *retraxit*, and discontinuance). 2. The defence, claim of cognizance, imparlance, view,oyer, aid-prayer, voucher, or age. 3. The plea: which is either a dilatory plea, (1st, to the jurisdiction; 2dly, in disability of the plaintiff; 3dly, in abatement;) or it is a plea to the action; sometimes confessing the action either in whole or in part; (wherein of a tender, paying money into court, and set off): but usually denying the complaint, by pleading, either, 1st, the general issue; or, 2dly, a special bar, (wherein of justifications, the statutes of limitation, &c.) 4. Replication, rejoinder, surrejoinder, rebutter, surrebutter, &c. Therein of estoppels, colour, duplicity, departure, new assignment, protestation, averment, and other incidents of pleading.

OF ISSUE AND DEMURRER.

1. Issue is where the parties, in a course of pleading, come to a point affirmed on one side and denied on the other; which, if it be a matter of law, is called a demurrer; if it be a matter of fact, still retains the name of an issue, of fact.

2. Continuance is the detaining of the parties in court from time to time, by giving them a day certain to appear upon. And, if any new matter arises since the last continuance or adjournment, the defendant may take advantage of it, even after demurrer or issue, by alleging it in a plea *puis darrien continuance*.

3. The determination of an issue in law, or demurrer, is by the opinion of the judges of the court; which is afterwards entered on record.

OF THE SEVERAL SPECIES OF TRIAL.

1. Trial is the examination of the matter of fact put in issue.

2. The species of trials are, 1. By the record. 2. By inspection. 3. By certificate. 4. By witnesses. 5. By wager of battel. 6. By wager of law. 7. By jury.

3. Trial by the record is had, when the existence of such record is the point in issue.

4. Trial by inspection or examination is had by the court, principally when the matter in issue is the evident object of the senses.

5. Trial by certificate is had in those cases, where such certificate must have been conclusive to a jury.

6. Trial by witnesses (the regular method in the civil law) is only used in writ of dower, when the death of the husband is in issue.

7. Trial by wager of battel, in civil cases, is only had on writ of right; but, in lieu thereof, the tenant may have, at his option, the trial by the grand assise.

8. Trial by wager of law is only had, where the matter in issue may be supposed to have been privily transacted between the parties themselves, without the intervention of other witnesses.

OF THE TRIAL BY JURY.

1. Trial by jury is, 1. Extraordinary; as, by the grand assise, in writs of right; and by the grand jury, in writs of attain. 2. Ordinary.

2. The method and process of the ordinary trial by jury is, 1. The writ of *venire facias* to the sheriff, coroners, or *elisors*; with the subsequent compulsive process of *habeas corpora*, or *distringas*. 2. The carrying down of the record to the court of *nisi prius*. 3. The sheriff's return; or panel of, 1st, special; 2dly, common jurors. 4. The challenges; 1st, to the array; 2dly, to the polls of the jurors; either, *propter honoris respectus*, *propter defectum*, *propter affectum*, (which is sometimes a principal challenge, sometimes to the favour,) or *propter delictum*. 5. The *tales de circumstantibus*. 6. The oath of the jury. 7. The evidence; which is either by proofs, 1st, written; 2dly, parole:—or by the private knowledge of the jurors. 6. The verdict; which may be, 1st, *privy*; 2dly, *public*; 3dly, *special*.

OF JUDGEMENT, AND ITS INCIDENTS.

1. Whatever is transacted at the trial, in the court of *nisi prius*, is added to the record under the name of a *postea*: consequent upon which is the judgement.

2. Judgement may be arrested or stayed for causes, 1. *Extrinsic* or *dehors* the record; as in the case of new trials. 2. *Intrinsic*, or within it; as where the declaration varies from the writ, or the verdict from the pleadings, and issue; or where the case, laid in the declaration, is not sufficient to support the action in point of law.

3. Where the issue is immaterial, or insufficient, the court may award a *repleader*.

4. Judgement is the sentence of the law, pronounced by the court, upon the matter contained in the record.

5. Judgements are, 1. *Interlocutory*; which are incomplete till perfected by a writ of inquiry. 2. *Final*.

6. Costs, or expences of suit, are now the necessary consequences of obtaining judgement.

OF PROCEEDINGS, IN THE NATURE OF APPEALS.

1. Proceedings, in the nature of appeals from judgement, are, 1. A writ of attain; to impeach the verdict of a jury; which of late has been superseded by new trials. 2. A writ of *audita querela*; to discharge a judgement by matter that has since happened. 3. A writ of error from one court of record to another; to correct judgements, erroneous in point of law, and not helped by the statutes of amendment and *jeo-fails*.

2. Writs of error lie, 1. To the court of king's bench, from all inferior courts of record; from the court of common pleas at Westminster; and from the court of king's bench in Ireland. 2. To the courts of exchequer chamber, from the law side of the court of exchequer; and from proceedings in the court of king's bench by bill. 3. To the house of peers, from proceedings in the court of king's bench by original, and on writs of error; and from the several courts of exchequer chamber.

OF EXECUTION.

Execution is the putting in force of the sentence or judgement of the law. Which is effected, 1. Where possession of any hereditament is recovered: by writ of habere facias seisinam, possessionem, &c. 2. Where any thing is awarded to be done or rendered, by a special writ for that purpose: as, by writ of abatement, in case of nuisance; *retorna habendo*, and *capias* in *withernam*, in *replevin*; *disti-gas* and *scire facias*, in *detinue*. 3. Where money only is recovered; by writ of, 1st, *capias ad satisfaciendum*, against the body of the defendant; or in default thereof, *scire facias* against his bail. 2dly, *Fieri facias*, against his goods and chattels. 3dly, *Lev. ri facias*, against his goods and the profits of his lands. 4thly, *Elegit*, against his goods, and the possession of his lands. 5thly, *Extendi facias*, and other process, on statutes, recognizances, &c. against his body, lands, and goods.

OF PROCEEDINGS IN THE COURTS OF EQUITY.

1. Matters of equity which belong to the peculiar jurisdiction of the court of chancery, are, 1. The guardianship of infants. 2. The custody of idiots and lunatics. 3. The superintendence of charities. 4. Commissions of bankrupt.

2. The court of exchequer, and the duchy court of Lancaster, have also some peculiar causes, in which the interest of the king is more immediately concerned.

3. Equity is the true sense and sound interpretation of the rules of law; and, as such, is equally attended to by the judges of the courts both of common law and equity.

4. The essential differences, whereby the English courts of equity are distinguished from the courts of law are, 1. The mode of proof, by a discovery on the oath of the party; which gives a jurisdiction in matters of account, and fraud. 2. The mode of trial; by depositions taken in any part of the world. 3. The mode of relief; by giving a more specific and extensive remedy than can be had in the courts of law; as, by carrying agreements into execution, staying waste or other injuries by injunction, directing the sale of incumbered lands, &c. 4. The true construction of securities for money, by considering them merely as a pledge. 5. The execution of trusts, or second uses, in a manner analogous to the law of legal estates.

5. The proceedings in the court of chancery (to which those in the exchequer, &c. very nearly conform) are, 1. Bill. 2. Writ of subpoena; and perhaps, injunction. 3. Process of contempt; viz. (ordinarily) attachment, attachment with proclamations, commissions of rebellion, serjeant at arms, and sequestrations. 4. Appearance. 5. Demurrer. 6. Plea. 7. Answer. 8. Exceptions; amendments; cross, or supplemental, bills; bills of revivor, interpleader, &c. 9. Replication. 10. Issue. 11. Depositions, taken upon interrogatories; and subsequent publication thereof. 12. Hearing. 13. Interlocutory decree; feigned issue, and trial; reference to the master, and report, &c. 14. Final decree. 15. Rehearing, or bill of review. 16. Appeal to parliament.

OF PUBLIC WRONGS.

OF THE NATURE OF CRIMES, AND THEIR PUNISHMENT.

1. In treating of public wrongs may be considered, 1. The general nature of crimes and punishments. 2. The persons capable of committing crimes. 3. The several degrees of guilt. 4. The several species of crime, and their respective punishments. 5. The means of prevention. 6. The method of punishment.

2. A crime, or misdemeanor, is an act committed, or omitted, in violation of a public law either forbidding or commanding it.

3. Crimes are distinguished from civil injuries, that they are a breach and violation of the public rights, due to the whole community, considered as a community.

4. Punishments may be considered with regard to, 1. The power. 2. The end. 3. The measure;—of their infliction.

5. The power, or right, of inflicting human punishments for natural crimes, or such as are mala in se, was by the law of nature vested in every individual: but, by the fundamental contract of

society, is now transferred to the sovereign power; in which also is vested, by the same contract, the right of punishing positive offences, or such as are mala prohibita.

6. The end of human punishments is to prevent future offences, 1. By amending the offender himself. 2. By deterring others through his example. 3. By depriving him of the power to do future mischief.

7. The measure of human punishments must be determined by the wisdom of the sovereign power, and not by any uniform universal rule: though that wisdom may be regulated, and assisted, by certain general, equitable, principles.

OF THE PERSONS CAPABLE OF COMMITTING CRIMES.

1. All persons are capable of committing crimes, unless there be in them a defect of will: for, to constitute a legal crime, there must be both a vitious will, and a vitious act.

2. The will does not concur with the act, 1. Where there is a defect of understanding. 2. Where no will is exerted. 3. Where the act is constrained by force and violence.

3. A vitious will may therefore be wanting, in the cases of, 1. Infancy. 2. Idiocy, or lunacy. 3. Drunkenness; which doth not, however, excuse. 4. Misfortune. 5. Ignorance, or mistake of fact. 6. Compulsion, or necessity; which is, 1st, that of civil subjection; 2dly, that of duress per minas; 3dly, that of choosing the least pernicious of two evils, where one is unavoidable; 4thly, that of want, or hunger; which is no legitimate excuse.

4. The king, from his excellence and dignity, is also incapable of doing wrong.

OF PRINCIPALS AND ACCESSORIES.

1. The different degrees of guilt in criminals are, 1. As principals. 2. As accessories.

2. The principal in a crime is, 1. He who commits the fact. 2. He who is present at, aiding, and abetting, the commission.

3. An accessory is he who doth not commit the fact nor is present at the commission: but is in some sort concerned therein, either before or after.

4. Accessories can only be in petit treason, and felony: in high treason, and misdemeanors, all are principals.

5. An accessory, before the fact, is one who being absent when the crime is committed, hath procured, counselled, or commanded, another to commit it.

6. An accessory after the fact, is where a person, knowing a felony to have been committed, receives, relieves, comforts, or assists, the felon. Such accessory is usually entitled to the benefit of clergy; where the principal, and accessory before the fact, are excluded from it.

OF OFFENCES AGAINST GOD AND RELIGION.

1. Crimes and misdemeanors cognizable by the laws of England are such as more immediately offend, 1. God, and his holy religion. 2. The law of nations. 3. The king, and his government. 4. The public, or commonwealth. 5. Individuals.

2. Crimes more immediately offending God and religion are, 1. Apostacy. For which the penalty is incapacity, and imprisonment. 2. Heresy. Penalty, for one species thereof: the same. 3. Offences against the established church:—Either, by reviling its ordinances: Penalties: fine; deprivation; imprisonment; forfeiture.—Or, by non-conformity to its worship: 1st, Through total irreligion. Penalty: fine. 2dly, Through Protestant dissenting. Penalty abolished by the toleration act. 3dly, Through popery, either in professors of the popish religion, popish recusants convict, or popish priests. The penalties were, incapacity; double taxes; imprisonment; fines; forfeitures; abjuration of the realm; judgement of felony, without clergy; and judgement of high treason. But the greater part of these barbarous and intolerant statutes were repealed in 1779, by the famous popish bull. 4. Blasphemy. Penalty: fine, imprisonment, and corporal punishment. 5. Profane swearing and cursing. Penalty: one, or house of correction. 6. Witchcraft; or at least, the pretence thereto. Penalty: imprisonment, and pillory. 7. Religious impostures. Penalty: fine, imprisonment, and corporal punishment. 8. Simony. Penalties: forfeiture of double value; incapacity. 9. Sabbath-breaking. Penalty: fine. 10. Drunken

ness. Penalty: fine, or stocks. 11. Lewdness. Penalties: fine; imprisonment; house of correction.

OF OFFENCES AGAINST THE LAW OF NATIONS.

1. The law of nations is a system of rules, deducible by natural reason, and established by universal consent, to regulate the intercourse between independent states.

2. In England, the law of nations is adopted in its full extent, as part of the law of the land.

3. Offences against this law are principally incident to whole states or nations; but, when committed by private subjects, are then the objects of the municipal law.

4. Crimes against the law of nations, animadverted on by the laws of England, are, 1. Violation of safe-conducts. 2. Infringement of the rights of ambassadors. Penalty, in both; arbitrary. 3. Piracy. Penalty: judgement of felony, without clergy.

OF HIGH TREASON.

1. Crimes and misdemeanors more peculiarly offending the king and his government are, 1. High treason. 2. Felonies injurious to the prerogative. 3. Præmunire. 4. Other misprisions and contempts.

2. High treason may, according to the statute of Edward III. be committed, 1. By compassing or imagining the death of the king, or queen-consort, or their eldest son and heir; demonstrated by some overt act. 2. By violating the king's companion, his eldest daughter, or the wife of his eldest son. 3. By some overt act of levying war against the king in his realm. 4. By adherence to the king's enemies. 5. Counterfeiting the king's great or privy seal. 6. By counterfeiting the king's money, or importing counterfeit money. 7. By killing the chancellor, treasurer, or king's justices, in the execution of their offices.

3. High treasons, created by subsequent statutes, are such as relate, 1. To papists: as, the repeated defence of the pope's jurisdiction: the coming from beyond sea of a natural-born popish priest; the renouncing of allegiance, and reconciliation to the pope or other foreign power. 2. To the coinage, or other signatures of the king: as, counterfeiting (or, importing and uttering counterfeit) foreign coin, here current; forging the sign manual, privy signet, or privy seal; falsifying, &c. the current coin. 3. To the Protestant succession: as, corresponding with, or remitting to, the late Pretender's sons; endeavouring to impede the succession: writing or printing, in defence of any pretender's title, or derogation of the act of settlement, or of the power of parliament to limit the descent of the crown.

4. The punishment of high treason, in males, is (generally) to be, 1. Drawn. 2. Hanged. 3. Embowelled alive. 4. Beheaded. 5. Quartered. 6. The head and quarters to be at the king's disposal. But, in treasons relating to the coin, only to be drawn, and hanged till dead. Females, in both cases, were formerly drawn and burned alive; but this last barbarous punishment was abolished by act of parliament, about 1790.

OF FELONIES INJURIOUS TO THE KING'S PREROGATIVE.

1. Felony is that offence which occasions the total forfeiture of lands or goods at common law; now usually also punishable with death, by hanging; unless through the benefit of clergy.

2. Felonies injurious to the king's prerogative (of which some are within, others without, clergy) are, 1. Such as relate to the coin: as, the wilful uttering of counterfeit money, &c.; (to which head some inferior misdemeanors affecting the coinage may be also referred). 2. Conspiring or attempting to kill a privy counsellor. 3. Serving foreign states, or enlisting soldiers for foreign service. 4. Embezzling the king's armour or stores. 5. Desertion from the king's armies, by land or sea.

OF PRÆMUNIRE.

1. Præmunire, in its original sense, is the offence of adhering to the temporal power of the Pope, in derogation of the regal authority. Penalty: outlawry, forfeiture, and imprisonment: which hath since been extended to some offences of a different nature.

2. Among these are, 1. Importing Popish trinkets. 2. Contributing to the maintenance of Popish seminaries abroad, or popish priests in England. 3. Molesting the professors of abbeys.

lands. 4. Acting as broker in an usurious contract, for more than ten per cent. 5. Obtaining any stay of proceedings in suits for monopolies. 6. Obtaining an exclusive patent for gunpowder or arms. 7. Exertion of purveyance or pre-emption. 8. Asserting a legislative authority in both or either house of parliament. 9. Sending any subject a prisoner beyond sea. 10. Refusing the oaths of allegiance and supremacy. 11. Preaching, teaching, or advised speaking, in defence of the right of any pretender to the crown, or in derogation of the power of parliament to limit the succession. 12. Treating of our matters by the assembly of Scotland, convened for electing their representatives in parliament. 15. Unwarrantable undertakings by unlawful subscriptions to public funds.

OF MISPRISIONS AND CONTEMPTS AFFECTING THE KING AND GOVERNMENT.

1. Misprisions and contempts are all such high offences as are under the degree of capital.

2. These are, 1. Negative, in concealing what ought to be revealed. 2. Positive, in committing what ought not to be done.

3. Negative misprisions are, 1. Misprision of treason. Penalty: forfeiture and imprisonment. 2. Misprision of felony. Penalty: fine and imprisonment. 3. Concealment of treasure trove. Penalty: fine and imprisonment.

4. Positive misprisions or high misdemeanors and contempts, are, 1. Mal-administration of public trusts, which includes the crime of peculation. Usual penalties: banishment; fines; imprisonment; disability. 2. Contempts against the king's prerogative. Penalty: fine and imprisonment. 3. Contempt against his person and government. Penalty: fine, imprisonment, and infamous corporal punishment. 4. Contempts against his title. Penalties: fine and imprisonment; or fine, and disability. 5. Contempts against his palaces, or courts of justice. Penalties: fine; imprisonment; corporal punishment; loss of right hand; forfeiture.

OF OFFENCES AGAINST PUBLIC JUSTICE.

1. Crimes especially affecting the commonwealth are offences, 1. Against the public justice. 2. Against the public peace. 3. Against the public trade. 4. Against the public health. 5. Against the public police or economy.

2. Offences against the public justice, are, 1. Embezzling or vacating records, and personating others in courts of justice. Penalty: judgement of felony, usually without clergy. 2. Compelling prisoners to become approvers. Penalty: judgement of felony. 3. Obstructing the execution of process. 4. Escapes. 5. Breach of prison. 6. Rescue. Which four may (according to the circumstances) be either felonies, or misdemeanors punishable by fine and imprisonment. 7. Returning from transportation. This is felony, without clergy. 8. Taking rewards to help one to his stolen goods. Penalty, the same as for the theft. 9. Receiving stolen goods. Penalties: transportation; fine; and imprisonment.—10. Theftbote. 11. Common barratry and suing in a feigned name. 12. Maintenance. 13. Champerty. Penalty, in these four: fine, and imprisonment. 14. Compounding prosecutions on penal statutes. Penalty: fine, pillory, and disability. 15. Conspiracy; and threats of accusation in order to extort money, &c. Penalties: the villainous judgement; fine; imprisonment; pillory; whipping; transportation. 16. Perjury, and subornation thereof. Penalties: infamy; imprisonment; fine, or pillory; and, sometimes, transportation or house of correction. 17. Bribery. Penalty: fine, and imprisonment. 18. Embracery. Penalty: infamy, fine, and imprisonment. 19. False verdict. Penalty: the judgement in attain. 20. Negligence of public officers, &c. Penalty: fine, and forfeiture of the office. 21. Oppression by magistrates. 22. Extortion of officers. Penalty in both: imprisonment, fine, and sometimes forfeiture of the office.

OF OFFENCES AGAINST THE PUBLIC PEACE.

Offences against the public peace are, 1. Riotous assemblies to the number of twelve. 2. Appearing armed, or hunting in disguise. 3. Threatening, or demanding any valuable thing, by letter.—All these are felonies, without clergy. 4. Destroying of turnpikes.

turnpikes, &c. Penalties: whipping; imprisonment; judgement of felony, with and without clergy.—5. Affrays. 6. Riots, routs, and unlawful assemblies. 7. Tumultuous petitioning. 8. Forcible entry, and detainer. Penalty, in all four: fine, and imprisonment. 9. Going unusually armed. Penalty: forfeiture of arms, and imprisonment. 10. Spreading false news. Penalty: fine, and imprisonment. 11. Pretended prophecies. Penalties: fine; imprisonment; and forfeiture. 12. Challenges to fight. Penalty: fine, imprisonment, and sometimes forfeiture. 13. Libels. Penalty: fine, imprisonment, and corporal punishment.

OF OFFENCES AGAINST PUBLIC TRADE.

Offences against the public trade, are, 1. Owling. Penalties: fines; forfeiture; imprisonment; loss of left hand, transportation; judgement of felony. 2. Smuggling. Penalties: fines; loss of goods; judgement of felony, without clergy. 3. Fraudulent bankruptcy. Penalty: judgement of felony, without clergy. 4. Usury. Penalty: fine, and imprisonment. 5. Cheating. Penalties: fine; imprisonment; pillory; tumbrel; whipping, or other corporal punishment, transportation.—6. Forestalling. 7. Regrating. 8. Engrossing. Penalties, for all three: loss of goods; fine; imprisonment; pillory. 9. Monopolies, and combinations to raise the price of commodities. Penalties: fines; imprisonment; pillory; loss of ear; infamy; and, sometimes, the pains of premunire. 10. Exercising a trade, not having served as an apprentice. Penalty: fine. 11. Transporting, or residing abroad, of artificers. Penalties: fine; imprisonment; forfeiture; incapacity; becoming aliens.

OF OFFENCES AGAINST THE PUBLIC HEALTH, AND PUBLIC POLICE OR ECONOMY.

1. Offences against the public health are, 1. Irregularity, in the time of the plague, or of quarantine. Penalties: whipping; judgement of felony, with and without clergy. 2. Selling unwholesome provisions. Penalties: amercement; pillory; fine; imprisonment; abjuration of the town.

2. Offences against the public police and economy or domestic order of the kingdom, are, 1. Those relating to clandestine and irregular marriages. Penalties: judgement of felony, with and without clergy. 2. Bigamy, or (more properly) polygamy. Penalty: judgement of felony.—3. Wandering, by soldiers or mariners. 4. Remaining in England, by Egyptians; or being in their fellowship one month. Both these are felonies, without clergy. 5. Common nuisances, 1st, by annoyances or purprestures in highways, bridges, and rivers; 2dly, by offensive trades and manufactures; 3dly, by disorderly houses; 4thly, by lotteries; 5thly, by cottages; 6thly, by fireworks; 7thly, by evesdropping. Penalty, in all; fine.—8thly, By common scolding. Penalty: the cucking-stool. 6. Idleness, disorders, vagrancy, and incorrigible roguery. Penalties: imprisonment; whipping; judgement of felony. 7. Luxury, in diet. Penalty, discretionary. 8. Gaming. Penalties: to gentlemen, fines; to others, fine and imprisonment; to cheating gamblers, fine, infamy, and the corporal pains of perjury. 9. Destroying the game. Penalties: fines, and corporal punishment.

OF HOMICIDE.

1. Crimes especially affecting individuals, are, 1. Against their persons. 2. Against their habitations. 3. Against their property.

2. Crimes against the persons of individuals, are, 1. By homicide, or destroying life. 2. By other corporal injuries.

3. Homicide is, 1. Justifiable. 2. Excusable. 3. Felonious.

4. Homicide is justifiable, 1. By necessity, and command of law. 2. By permission of law; 1st, for the furtherance of public justice; 2dly, for prevention of some forcible felony.

5. Homicide is excusable. 1. Per intortunium, or misadventure. 2. Se defendendo, or in self-defence, by chance medley. Penalty, in both: forfeiture of goods; which however is pardoned of course.

6. Felonious homicide is the killing of a human creature without justification or excuse. This is, 1. Killing one's self. 2. Killing another.

7. Killing one's self, or self-murder, is where one deliberately, or by any unlawful malicious act, puts an end to his own life.

This is felony; punished by ignominious burial, and forfeiture of goods and chattels.

8. Killing another is, 1. Manslaughter. 2. Murder.

9. Manslaughter is the unlawful killing of another, without malice, express or implied. This is either, 1. Voluntary, upon a sudden heat. 2. Involuntary, in the commission of some unlawful act. Both are felony, but within clergy; except in the case of stabbing.

10. Murder is when a person, of sound memory and discretion, unlawfully killeth any reasonable creature, in being, and under the king's peace; with malice aforethought, either express or implied. This is felony, without clergy; punished with speedy death and hanging in chains, or dissection.

11. Petit treason (being an aggravated degree of murder) is where the servant kills his master, the wife her husband, or the ecclesiastic his superior. Penalty: in men, to be drawn and hanged; in women, to be drawn and burned.

OF OFFENCES AGAINST THE PERSONS OF INDIVIDUALS.

Crimes affecting the persons of individuals, by other corporal injuries, not amounting to homicide, are, 1. Mayhem; and also shooting at another. Penalties: fine; imprisonment; judgement of felony, without clergy. 2. Forcible abduction, and marriage or defilement, of an heiress; which is felony: also, stealing, and deflowering or marrying, any woman-child under the age of sixteen years; for which the penalty is imprisonment, fine, and temporary forfeiture of her lands. 3. Rape, and also carnal knowledge of a woman-child under the age of ten years. 4. Buggery, with man or beast. Both these are felonies, without clergy.—5. Assault. 6. Battery; especially of clergymen. 7. Wounding. Penalties, in all three: fine; imprisonment; and other corporal punishment. 8. False imprisonment. Penalties: fine; imprisonment; and (in some atrocious cases) the pains of premunire, and incapacity of office or pardon. 9. Kidnapping, or forcibly stealing away the king's subjects. Penalty: fine; imprisonment; and pillory.

OF OFFENCES AGAINST THE HABITATIONS OF INDIVIDUALS.

1. Crimes, affecting the habitations of individuals are, 1. Arson. 2. Burglary.

2. Arson is the malicious and wilful burning of the house, or out-house, of another man. This is felony; in some cases within, in others without, clergy.

3. Burglary is the breaking and entering, by night, into a mansion-house, with intent to commit a felony. This is felony, without clergy.

OF OFFENCES AGAINST PRIVATE PROPERTY.

1. Crimes affecting the private property of individuals are, 1. Larceny. 2. Malicious mischief. 3. Forgery.

2. Larceny is, 1. Simple. 2. Mixed, or compound.

3. Simple larceny is the felonious taking, and carrying away, of the personal goods of another. And it is, 1. Grand larceny; being above the value of twelve-pence. Which is felony; in some cases within, others without, in clergy. 2. Petit larceny; to the value of twelve-pence, or under. Which is also felony, but not capital; being punished with whipping, or transportation.

4. Mixed, or compound, larceny is that wherein the taking is accompanied with the aggravation of being, 1. From the house. 2. From the person.

5. Larcenies from the house, by day or night, are felonies without clergy, when they are, 1. Larcenies, above twelve-pence, from a church; or by breaking a tent or booth in a market or fair by day or night, the owner or his family being therein: or by breaking a dwelling-house by day, any person being therein; or from a dwelling-house by day, without breaking, any person therein being put in fear; or from a dwelling-house by night, without breaking, the owner, or his family being therein, and put in fear. 2. Larcenies, of five shillings, by breaking the dwelling-house, shop, or warehouse, by day, though no person be therein; or, by privately stealing in any shop, warehouse, coach-house, or stable, by day or night, without breaking, and though no person be therein. 3. Larcenies, of forty shillings, from a dwelling-house, or its out-houses, without breaking, and though no person be therein.

6. Larceny

6. Larceny from the person is, 1. By privately stealing, from the person of another, above the value of twelve-pence. 2. By robbery; or the felonious and forcible taking, from the person of another, in or near the highway goods or money of any value, by putting him in fear. These are both felonies without clergy. An attempt to rob is also felony.

7. Malicious mischief, by destroying dikes, goods, cattle, ships, garments, fish-ponds, trees, woods, churches, chapels, meeting-houses, houses, out-houses, corn, hay, straw, sea or river banks, hop-binds, coal-mines (or engines thereunto belonging), or any fences for inclosures by act of parliament, is felony; and, in most cases, without benefit of clergy.

8. Forgery is the fraudulent making or alteration of a writing, in prejudice of another's right. Penalties; fine; imprisonment; pillory; loss of nose and ears; forfeiture; judgement of felony, without clergy.

OF THE MEANS OF PREVENTING OFFENCES.

1. Crimes and misdemeanors may be prevented, by compelling suspected persons to give security: which is effected by binding them in a conditional recognizance to the king, taken in court, or by a magistrate.

2. These recognizances may be conditioned, 1. To keep the peace. 2. To be of good behaviour.

3. They may be taken by any justice or conservator of the peace, at his own discretion; or, at the request of such as are entitled to demand the same.

4. All persons, who have given sufficient cause to apprehend an intended breach of the peace, may be bound over to keep the peace; and all those, that be not of good fame, may be bound to good behaviour; and may, upon refusal in either case, be committed to gaol.

OF COURTS OF CRIMINAL JURISDICTION.

1. In the method of punishment may be considered, 1. The several courts of criminal jurisdiction. 2. The several proceedings therein.

2. The criminal courts are, 1. Those of a public and general jurisdiction throughout the realm. 2. Those of a private and special jurisdiction.

3. Public criminal courts are, 1. The high court of parliament; which proceeds by impeachment. 2. The court of the lord high steward; and the court of the king in full parliament: for the trial of capitally indicted peers. 3. The court of king's bench. 4. The court of chivalry. 5. The court of admiralty, under the king's commission. 6. The courts of oyer and terminer, and general gaol-delivery. 7. The court of quarter-sessions of the peace, 8. The court of the coroner. 9. The court of the clerk of the market.

4. Private criminal courts are, 1. The court of the lord steward, &c. by statute of Henry VII. 2. The court of the lord steward, &c. by statute of Henry VIII. 3. The university courts.

OF SUMMARY CONVICTIONS.

1. Proceedings in criminal courts are, 1. Summary. 2. Regular.

2. Summary proceedings are such, whereby a man may be convicted of divers offences, without any formal process or jury, at the discretion of the judge or judges appointed by act of parliament, or common law.

3. Such are, 1. The trials of offences and frauds against the laws of excise and other branches of the king's revenue. 2. Convictions before justices of the peace upon a variety of minute offences, chiefly against the public police. 3. Attachments for contempts to superior courts of justice.

OF ARRESTS.

1. Regular proceedings in the courts of common law are, 1. Arrest. 2. Commitment and bail. 3. Prosecution. 4. Process. 5. Arraignment, and its incidents. 6. Plea and issue. 7. Trial and conviction. 8. Clergy. 9. Judgement, and its consequence. 10. Reversal of judgement. 11. Reprieve, or pardon. 12. Execution.

2. An arrest is the apprehending, or restraining, of one's person; in order to be forthcoming to answer a crime whereof one accused or suspected.

3. This may be done, 1. By warrant. 2. By an officer, without warrant. 3. By a private person, without warrant. 4. By hue and cry.

OF COMMITMENT AND BAIL.

1. Commitment is the confinement of one's person in prison, for safe custody, by warrant from proper authority; unless, in bailable offences, he puts in sufficient bail, or security for his future appearance.

2. The magistrate is bound to take reasonable bail, if offered; unless the offender be not bailable.

3. Such are, 1. Persons accused of treason; or, 2. Of murder; or, 3. Of manslaughter, by indictment; or if the prisoner was clearly the slayer. 4. Prison-breakers, when committed for felony. 5. Out-laws. 6. Those who have abjured the realm. 7. Approvers, and appellees. 8. Persons taken with the mainour. 9. Persons accused of arson. 10. Excommunicated persons.

4. The magistrate may, at his discretion, admit to bail, or otherwise, persons not of good fame, charged with other felonies, whether as principals or as accessories.

5. If they be of good fame, he is bound to admit them to bail.

6. The court of king's bench, or its judges in time of vacation, may bail in any case whatsoever.

OF THE SEVERAL MODES OF PROSECUTION.

1. Prosecution, or the manner of accusing offenders, is either by a previous finding of a grand jury; as, 1. By presentment. 2. By indictment. Or, without such finding. 3. By information. 4. By appeal.

2. A presentment is the notice taken by a grand jury of any offence, from their own knowledge or observation.

3. An indictment is a written accusation of one or more persons of a crime or misdemeanor, preferred to, and presented on oath by, a grand jury; expressing, with sufficient certainty, the person, time, place, and offence.

4. An information is, 1. At the suit of the king and a subject, upon penal statutes. 2. At the suit of the king only. Either, 1. Filed by the attorney-general ex officio, for such misdemeanors as affect the king's person or government; or, 2. Filed by the master of the crown-office (with leave of the court of king's bench) at the relation of some private subject, for other gross and notorious misdemeanors. All differing from indictments in this; that they are exhibited by the informer, or the king's officer; and not on the oath of a grand jury.

5. An appeal is an accusation or suit, brought by one private subject against another, for larceny, rape, mayhem, arson, or homicide; which the king cannot discharge or pardon, but the party alone can release.

OF PROCESS UPON AN INDICTMENT.

1. Process to bring in an offender, when indicted in his absence, is, in misdemeanors, by venire facias, distress infinite, and capias; in capital crimes, by capias only; and, in both, by outlawry.

2. During this stage of proceedings, the indictment may be removed into the court of king's bench from any inferior jurisdiction, by writ of certiorari facias; and cognizance must be claimed in places of exclusive jurisdiction.

OF ARRAIGNMENT AND ITS INCIDENTS.

1. Arraignment is the calling of the prisoner to the bar of the court, to answer the matter of the indictment.

2. Incident hereunto are, 1. The standing mute of the prisoner; for which, in petit treason, and felonies of death, he shall undergo the peine fort and dure. 2. His confession; which is either simple, or by way of approvement.

OF PLEA, AND ISSUE.

1. The plea, or defensive matter alleged by the prisoner, may be, 1. A plea to the jurisdiction. 2. A demurrer in point of law. 3. A plea in abatement. 4. A special plea in bar; which is, 1st, Auterfoits acquit; 2dly, Auterfoits convict; 3dly, Auterfoits attain; 4thly, A pardon. 5. The general issue, not guilty.

2. Hereupon issue is joined by the clerk of the arraigns, on behalf of the king.

OF TRIAL, AND CONVICTION.

1. Trials of offences, by the laws of England, were and are, 1. By ordeal, of either fire or water. 2. By the corsned. Both these have been long abolished. 3. By battel, in appeals and improvements. 4. By the peers of Great Britain. 5. By jury.

2. The method and process of trial by jury is, 1. The impanelling of the jury. 2. Challenges; 1st, for cause; 2dly, peremptory. 3. Tales de circumstantibus. 4. The oath of the jury. 5. The evidence. 6. The verdict, either general or special.

3. Conviction is when the prisoner pleads, or is found guilty: whereupon, in felonies, the prosecutor is entitled to, 1. His expenses. 2. Restitution of his goods.

OF THE BENEFIT OF CLERGY.

1. Clergy, or the benefit thereof, was originally derived from the usurped jurisdiction of the popish ecclesiastics; but hath since been new-modelled by several statutes.

2. It is an exemption of the clergy from any other secular punishment for felony, than imprisonment for a year, at the court's discretion; and it is extended likewise, absolutely, to lay-peers, for the first offence; and to all lay-commoners, for the first offence also, upon condition of branding, imprisonment, or transportation.

3. All felonies are entitled to the benefit of clergy, except such as are now ousted by particular statutes.

4. Felons, on receiving the benefit of clergy, (though they forfeit their goods to the crown), are discharged of all clergyable felonies before committed, and restored in all capacities and credits.

OF JUDGEMENT, AND ITS CONSEQUENCES.

1. Judgement (unless any matter be offered in arrest thereof) follows upon conviction; being the pronouncing of that punishment which is expressly ordained by law.

2. Attainder of a criminal is the immediate consequence, 1. Of having judgement of death pronounced upon him. 2. Of outlawry for a capital offence.

3. The consequences of attainder are, 1. Forfeiture to the king. 2. Corruption of blood.

4. Forfeiture to the king is, 1. Of real estates, upon attainder: in high treason, absolutely, till the death of the late Pretender's sons; in felonies, for the king's year, day, and waste; in misprision of treason, assaults on a judge, or battery sitting the courts; during the life of the offender. 2. Of personal estates, upon con-

viction; in all treason, misprision of treason, felony, excusable homicide, petit larceny, standing mute upon arraignment, the above-named contempt of the king's courts, and flight.

5. Corruption of blood is an utter extinction of all inheritable quality therein: so that, after the king's forfeiture is first satisfied, the criminal's lands escheat to the lord of the fee; and he can never afterwards inherit, be inherited, or have any inheritance, derived through him.

OF REVERSAL OF JUDGEMENT.

1. Judgements, and their consequences, may be avoided, 1. By falsifying, or reversing, the attainder. 2. By reprieve, or pardon.

2. Attainders may be falsified, or reversed, 1. Without a writ of error; for matter dehors the record. 2. By writ of error; for mistakes in the judgement, or record. 3. By act of parliament; for favour.

3. When an outlawry is reversed, the party is restored to the same plight as if he had appeared upon the capias. When a judgement, on conviction, is reversed, the party stands as if never accused.

OF REPRIEVE, AND PARDON.

1. A reprieve is a temporary suspension of the judgement, 1. Ex arbitrio judicis. 2. Ex necessitate legis; for pregnancy, insanity, or the trial of identity of person, which must always be tried instantler.

2. A pardon is a permanent avoider of the judgement by the king's majesty, in offences against his crown and dignity; drawn in due form of law, allowed in open court, and thereby making the offender a new man.

3. The king cannot pardon, 1. Imprisonment of the subject beyond the seas. 2. Offences prosecuted by appeal. 3. Common nuisances. 4. Offences against popular or penal statutes, after information brought by a subject. Nor is his pardon pleadable to an impeachment by the commons in parliament.

OF EXECUTION.

1. Execution is the completion of human punishment, and must be strictly performed in the manner which the law directs.

2. The warrant for execution is sometimes under the hand and seal of the judge; sometimes by writ from the king; sometimes by rule of court; but commonly by the judge's signing the calendar of prisoners, with their separate judgements in the margin.

LAW is also used in many places of Scotland, for a bill or mountain; the courts of law having been anciently held on these eminences.

LAW, CANON. See CANON, and LAW.

LAW, CIVIL. See CIVIL, and LAW.

LAWs RESPECTING GAME, or GAME-LAWS. See GAME. Sir William Blackstone, treating of the alterations in these laws, and mentioning franchises granted of chase and free warren, as well to preserve the breed of animals, as to indulge the subject, adds, "from a similar principle to which, though the forest-laws are now mitigated, and by degrees grown entirely obsolete; yet from this root has sprung a bastard slip, known by the name of the game-law, now arrived to and wanting in its highest vigour. both founded upon the same unreasonable notion of permanent property in wild creatures; and both productive of the same tyranny to the commons; but with this difference, that the forest-laws established only one mighty hunter throughout the land; the game laws have raised a little Nimrod in every manor. And, in one respect, the ancient law was much less unreasonable than the modern; for the king's grantee of a chase or free warren, might kill game in every part of his franchise; but now, though a freeholder of less than 100*l.* a-year is forbidden to kill partridge upon his own estate, yet nobody else (not even the lord of the manor, unless he hath a grant of free warren) can do it without committing a trespass, and subjecting himself to an action. Under the article GAME, the destroying such beasts and fowls as are ranked under that denomi-

nation, was observed (upon the old principles of the forest-law) to be a trespass and offence in all persons alike, who have not authority from the crown to kill game (which is royal property) by the grant of either a free warren, or at least a manor of their own. But the laws called the game-laws have also inflicted additional punishments (chiefly pecuniary) on persons guilty of this general offence, unless they be people of such rank or fortune as is therein particularly specified. All persons, therefore, of what property or distinction soever, that kill game out of their own territories, or even upon their own estates, without the king's licence expressed by the grant of a franchise, are guilty of the first original offence, or encroaching on the royal prerogative. And those indigent persons who do so, without having such rank or fortune as is generally called a qualification, are guilty, not only of the original offence, but of the aggravations also created by the statutes for preserving the game: which aggravations are so severely punished, and those punishments so implacably inflicted, that the offence against the king is seldom thought of, provided the miserable delinquent can make his peace with the lord of the manor. The only rational footing upon which this offence, thus aggravated, can be considered as a crime, is, that in low and indigent persons it promotes idleness, and takes them away from their proper employments and callings: which is an offence against the public police, and economy of the commonwealth. The statutes for preserving the game are many and various, and not a little obscure and intricate; it being remarked, that in one statute only, 5 Ann.

c. 14, there is false grammar in no fewer than six places, besides other mistakes: the occasion of which, or what denomination of persons, were probably the penners of these statutes, it is unnecessary here to inquire. It may be, in general, sufficient to observe, that the qualifications for killing game, as they are usually called, or more properly the exemptions from the penalties inflicted by the statute-law, are, 1. The having a freehold estate of 100*l.* per annum; there being fifty times the property required to enable the man to kill a partridge, as to vote for a knight of the shire. 2. A leasehold for ninety-nine years of 150*l.* per annum. 3. Being the son and heir apparent of an esquire, (a very loose and vague description) or person of superior degree. 4. Being the owner or keeper of a forest, park, chase, or warren. For unqualified persons transgressing these laws, by killing game, keeping engines for that purpose, or even having game in their custody, or for persons (however qualified) that kill game, or have it in possession, at unseasonable times of the year, or unseasonable hours of the day or night, on Sundays, or on Christmas-day, there are various penalties assigned, corporal and pecuniary, by different statutes (after mentioned), on any of which, but only on one at a time, the justices may convict in a summary way, or (in most of them) prosecutions may be carried on at the assizes. And, lastly, by 28 Geo. II. c. 12, no person, however qualified to kill, may make merchandise of this valuable privilege, by selling, or exposing to sale, any game, on pain of like forfeiture as if he had no qualification. The statutes above referred to are as follow. No person shall take pheasants or partridges with engines in another man's ground, without licence, on pain of 10*l.* stat. 11 Hen. VII. c. 13. If any person shall take or kill any pheasants or partridges with any net in the night-time, they shall forfeit 20*s.* for every pheasant, and 10*s.* for every partridge taken; and hunting with spaniels in standing corn, incurs a forfeiture of 40*s.* 23 Eliz. c. 10. Those who kill any pheasant, partridge, duck, heron, hare, or other game, are liable to a forfeiture of 20*s.* for every fowl and hare; and selling, or buying to sell again, any hare, pheasant, &c. the forfeiture is 10*s.* for each hare, &c. 1 Jac. I. c. 17. Also pheasants or partridges are not to be taken between the first of July and the last of August, on pain of imprisonment for a month, unless the offenders pay 20*s.* for every pheasant, &c. killed: and constables having a justice of peace's warrant, may search for game and nets, in the possession of persons not qualified by law to kill game or to keep such nets, 7 Jac. I. c. 11. Constables, by a warrant of a justice of peace, are to search houses of suspected persons for game: and if any game be found upon them, and they do not give a good account how they came by the same, they shall forfeit for every hare, pheasant, or partridge, not under 5*s.* nor exceeding 20*s.* And inferior tradesmen hunting, &c. are subject to the penalties of the act, and may likewise be sued for trespass. If officers of the army or soldiers kill game without leave, they forfeit 5*l.* an officer, and 10*s.* a soldier; 4 & 5 W. and M. c. 23. Higgles, chapmen, carriers, inn-keepers, victuallers, &c. having in their custody hare, pheasant, partridge, heath-game, &c. (except sent by some person qualified to kill game), shall forfeit for every hare and fowl 5*l.* to be levied by distress and sale of their goods, being proved by one witness, before a justice; and for want of distress shall be committed to the house of correction for three months: one moiety of the forfeiture to the informer, and the other to the poor. And selling game, or offering the same to sale, incurs the like penalty; wherein hare and other game found in a shop, &c. is adjudged an exposing to sale: killing hares in the night is liable to the same penalties: and if any persons shall drive wild-fowls with nets, between the first day of July and the 1st of Sept. they shall forfeit 5*s.* for every fowl; 5 Ann. c. 14, 9 Ann. c. 25. If any unqualified person shall keep a gun, he shall forfeit 10*l.*; and persons being qualified may take guns from those that are not, and break them; 21 & 22 Car. II. c. 25, and 33 H. VIII. c. 6. One justice of peace, upon examination and proof of the offence, may commit the offender till he hath paid the forfeiture of 10*l.* And persons, not qualified by law, keeping dogs, nets, or other engines, to kill game, being convicted thereof before a justice of peace, shall forfeit 5*l.* or be sent to the house of correction for three months: and the dogs, game, &c. shall be taken from them, by the statute 5 Ann. If a person hunt upon the ground of another, such other person cannot justify killing of his dogs, as appears by 2 Roll. Abr. 567. But it was

otherwise adjudged Mich. 33 Car. II. in C. B. 2 Cro. 44, and see 3. Lev. xxvii. In actions of debt, *quidam*, &c. by a common informer on the statute 5 Ann. for 5*l.* wherein the plaintiff declared on two several accounts, one for 10*l.* for killing two partridges, the other for 5*l.* for keeping an engine to destroy the game, not being qualified, &c. the plaintiff had a verdict for 5*l.* only: this action was brought by virtue of the stat. 8 Geo. I. See stat. 9 Geo. I. c. 22. See likewise 24 Geo. II. c. 34, for the better preservation of the game in Scotland. By the stat. 26 Geo. II. c. 2, all suits and actions brought by virtue of stat. 8 Geo. I. c. —for the recovery of any pecuniary penalty, or sum of money, for offences committed against any law for the better preservation of the game, shall be brought before the end of the second term after the offence committed. By 28 Geo. II. c. 12, persons selling, or exposing to sale, any game, are liable to the penalties inflicted by 5 Ann. c. 14, on higgles, &c. offering game to sale: and game found in the house or possession of a poulterer, salesman, fishmonger, cook, or pastry-cook, is deemed exposing thereof to sale. By 2 Geo. III. c. 19, after the first of June 1762, no person may take, kill, buy or sell, or have in his custody, any partridge, between the 12th Feb. and 1st September, or pheasant between 1st Feb. and 1st Oct. or heath-fowl between 1st Jan. and 20th Aug. or grouse between 1st Dec. and 25th July, in any year; pheasants taken in their proper season, and kept in mews, or breeding-places, excepted; and persons offending in any of the cases aforesaid, forfeit 5*l.* per bird, to the prosecutor, to be recovered, with full costs, in any of the courts at Westminster. By this act, likewise, the whole of the pecuniary penalties under the 8 Geo. I. c. 19, may be sued for, and recovered to the sole use of the prosecutor, with double costs; and no part thereof to go to the poor of the parish. By 5 Geo. III. c. 14, persons convicted of entering warrens in the night-time, and taking or killing of coney there, or aiding or assisting therein, may be punished by transportation, or by whipping, fine, or imprisonment. Persons convicted on this act, not liable to be convicted under any former act: This act does not extend to the destroying coney in the day-time, on the sea and riverbanks in the county of Lincoln, &c. No satisfaction to be made for damages occasioned by entry, unless they exceed 1*s.* By 10 Geo. III. c. 19, it is enacted, That if any person kill any hare, &c. between sun-setting and sun-rising, or use any gun, &c. for destroying game, he shall for the first offence be imprisoned for any time not exceeding six nor less than three months: if guilty of a second offence, after conviction of a first, to be imprisoned for any time not exceeding 12 months nor less than six; and shall also, within three days after the time of his commitment, either for the first or for any other offence, be once publicly whipped. By 25 Geo. III. c. 50, and 31 Geo. III. c. 21, every person in Great Britain (the royal family excepted), who shall, after July 1, 1785, use any dog, gun, net, or other engine, for the taking or destruction of game (not acting as gamekeeper), shall deliver in a paper or account in writing, containing his name and place of abode, to the clerk of the peace or his deputy, and annually take out a certificate thereof; and every such certificate shall be charged with a stamp-duty of 2*l.* 2*s.* (and an additional 1*l.* 1*s.* by 31 Geo. III. c. 21.) making in the whole 3*l.* 3*s.*—Every deputation of a gamekeeper shall be registered with the clerk of the peace, and such gamekeeper shall annually take out a certificate thereof; which certificate shall be charged with a stamp-duty of 10*s.* 6*d.* (and an additional 10*s.* 6*d.* by 31 Geo. III. c. 21.) making in the whole 1*l.* 1*s.*—The duties to be under the management of the commissioners of the stamp-office. From and after 1st July, 1785, the clerk of the peace shall annually deliver to persons requiring the same, duly stamped, a certificate or licence according to the form therein mentioned, for which he shall be entitled to demand 1*s.* for his trouble; and on refusal or neglect to deliver the same, forfeit 20*l.*—Every certificate to bear date the day when issued, and to continue in force until the 1st of July following, on penalty of 20*l.* After the 1st of July, 1785, any person that shall use any greyhound, hound, pointer, setting dog, spaniel, or other dog, or any gun, net, or engine, for taking or killing of game, without a certificate, is liable to the penalty of 20*l.* And if any gamekeeper shall, for the space of 20 days after the said 1st of July, or if any gamekeeper thereafter to be appointed shall, for the space of 20 days next after such appointment, neglect or refuse to register his deputation, and take out a certificate thereof, he is

liable to the penalty of 20*l*. The clerks of the peace are to transmit to the stamp-office in London alphabetical lists of the certificates granted in every year before the 1st of August, under penalty of 20*l*. These lists are to be kept at the stamp-office in London, and there to be inspected on payment of 1*s*. And the commissioners of the stamp-duties are, once or oftener in every year, as soon as such lists are transmitted to them, to cause the same to be published in the newspapers circulating in each county, or such public paper as they shall think most proper. If any gamekeeper, who shall have registered his deputation, and taken out a certificate thereof, shall be changed, and a new gamekeeper appointed in his stead, the first certificate is declared null and void, and the person acting under the same, after notice, is liable to the penalty of 20*l*. And any person in pursuit of game, who shall refuse to produce his certificate, or to tell his name and place of abode, or shall give any false or fictitious name or place of abode to any person requiring the same, who shall have obtained a certificate, is liable to the penalty of 50*l*. The certificates are not to authorise persons to kill game at any time prohibited by law, nor to give any person any right to kill game, unless such person shall be qualified so to do by the laws now in being, but shall be liable to the same penalties as if this act had not passed. So that though by this act qualified and unqualified persons are equally included, yet having a certificate does not give an unqualified person a right to kill game: the point of right still stands upon the former acts of parliament; and any unqualified person killing game without a certificate, is not only liable to the penalty inflicted by this act, but also to all the former penalties relating to the killing of game, &c. Witnesses refusing to appear on justices' summons, or appearing and refusing to give evidence, forfeit 10*l*. The certificates obtained under deputations, not to be given in evidence for the killing of game by a gamekeeper out of the manor, in respect of which such deputation or appointment was given and made. Persons counterfeiting stamps to suffer death as felons. Penalties exceeding 20*l*. are to be recovered in any of his majesty's courts of record at Westminster; and penalties not exceeding 20*l*. are recoverable before two justices, and may be levied by distress. The whole of the penalties go to the informer.

LAW, TRIAL BY WAGER OF, [*validatio legis*], a species of trial in the English law, so called, as another species is styled Wager of Battel, *validatio duelli*, (see **BATTEL**): because as in the wager of battel, the defendant gave *vadium*, i.e. pledge, or gage, to try the cause by battle; so here he was put in *vadios*, or sureties, that at such a day he would make his law, i.e. take the benefit which the law allowed him. For our ancestors considered, that there were many cases where an innocent man, of good credit, might be overborn by a multitude of false witnesses; and therefore established this species of trial, by the oath of the defendant himself: for if he will absolutely swear himself not chargeable, and appears to be a person of reputation, he shall go free, and for ever acquitted of the debt, or other cause of action. The manner of waging law is this. He that has waged or given security, to make his law, brings with him into court 11 of his neighbours: a custom which we find described so early as in the league between Alfred and Guthran the Dane; for by the old Saxon constitution every man's credit in courts of law depended upon the opinion which his neighbours had of his veracity. The defendant then, standing at the end of the bar, is admonished by the judges of the nature and danger of a false oath. And if he still persists, he is to repeat this oath: "Hear this, ye justices, that I do not owe unto Richard Jones the sum of ten pounds nor any penny thereof, in manner and form as the said Richard hath declared against me. So help me God." And thereupon his 11 neighbours or compurgators shall avow upon their oaths, that they believe in their consciences that he saith the truth; so that himself must be sworn de fidelitate, and they de credulitate. In the old Swedish or Gothic constitution, wager of law was not only permitted, as in criminal cases, unless the fact be extremely clear against the prisoner; but was absolutely required, in many civil cases: which Sternhook, a Swedish author, justly reckons a source of frequent perjury. This, he tells us, was owing to the Popish ecclesiastics, who introduced this method of purgation from their canon law; and, having sown a plentiful crop of oaths in all judicial proceedings, reaped afterwards an ample harvest of perjuries: for perjuries were punished in part by pecuniary fines, payable to the

church. But in England wager of law is never required; and only admitted, where an action is brought upon matters privately transacted between the parties, and wherein the defendant may be presumed to have made satisfaction, without being able to prove it. Therefore it is only in action of debt upon simple contract, or for amercement, in actions of detinue, and of account, where the debt may have been paid, the goods restored, or the account balanced, without any evidence of either. And by such wager of law the plaintiff is perpetually barred; for in the simplicity of ancient times it was presumed, that no one would perjure himself for any worldly thing. Wager of law, however, lieth in a real action, where the tenant alleges he was not legally summoned to appear, as well as in mere personal contracts. But it was never permitted, unless the defendant bore a fair character; and it was confined to cases where a debt might be supposed to be discharged, or satisfaction made in private, without witnesses. At length it was considered, that (even under all its restrictions,) wager of law threw too great a temptation in the way of indigent or profligate men: and therefore new remedies were devised, and new forms of action were introduced, wherein no defendant is at liberty to wage his law. So that wager of law is now quite out of use, being avoided by the mode of bringing the action; but still it is not out of force. And therefore, when a new statute inflicts a penalty, and gives an action of debts for recovering it, it is usual to add, "in which no wager of law shall be allowed;" otherwise an hardy delinquent might escape any penalty of the law, by swearing he had never incurred it, or else had discharged it.

LAWA, a town in the island of Borneo, seated on the river.

LAWA, a river of Borneo, which runs into the sea, in Lon. 109. 30. E. Lat. 0. 30. N.

LAWENBURG, a duchy of Lower Saxony, South of Holstein, about 85 miles long, and 20 broad. The chief towns are Lawenburg, Mollen, Wittenburg, and Ratzeburg.

LAWENBURG, the capital of the above duchy. Lon. 10. 51. E. Lat. 53. 36. N.

LAWINGEN, a town of Germany, in Suabia. Lon. 10. 29. E. Lat. 38. 32. N.

LAWN, a spacious plain in a park, or adjoining to a noble seat. The dimensions of a lawn, in a large park, should be as extensive as the ground will permit; and never less than fifty acres: but in gardens of a moderate extent, a lawn of ten acres is sufficient; and in those of the largest size, fifteen acres. The best situation for a lawn is in the front of the house: and here, if the house front the east, it will be extremely convenient; but the most desirable aspect for a lawn is that of the south-east. As to the figure of the lawn, some recommend an exact square, others an oblong square, some an oval, and others a circular figure: but none of these are to be regarded. It ought to be so contrived as to suit the ground; and there should be trees planted for shade on the boundaries of the lawn; so that the sides may be broken by irregular plantations of trees, which, if there are not some good prospects beyond the lawn, should bound it on every side, and be brought round pretty near to each end of the house.

LAWSONIA, **EGYPTIAN PRIVET**; a genus of the monogynia order, and octandria class of plants. Calyx four-cleft; petals four; stamina four in pairs; capsule four-celled; seeds many. There are four species natives of warm countries.

LAWYER. See **ADVOCATE**, **BARRISTER**, **COUNSEL**, **COUNSELLOR**, and **SERGEANT**.

LAXATIVE, a medicine slightly purgative; a medicine that relaxes the bowels without stimulation.

LAXEMBERG, or **LAXEMBURG**, a town of Austria, 10 miles S. of Vienna.

LAXFORD, a river of Scotland, in Sutherland.

LAXIANA, a river of Spain, which runs into the Xalon.

LAXMANNIA, in botany, a genus of the hexandria monogynia class and order. Calyx one-leafed, four-toothed, inferior; corolla four-petaled; berry four-celled; seeds solitary.

LAY, a kind of ancient poem among the French, consisting of very short verses. There are two sorts of lays; the great and the little. The former consisted of twelve couplets of verses, of different measures; the latter of sixteen or twenty verses, divided into four couplets. These lays were the lyric poetry of the old French poets, who were imitated by some among the English. They are

† said

said to have been formed on the model of the trochaic verses of the Greek and Latin tragedies.

LAY BROTHERS, among the Romanists, pious but illiterate persons who devote themselves in some convent to the service of the religious. They wear a different habit from that of the religious; but never enter into the choir, nor are present at the chapters: nor do they make any other vow except of constancy and obedience. In the nunneries there are also lay-sisters.

LAYAU, a town, river, and bay, of St. Vincents, on the west coast. Lon. 61. 18. W. Lat. 13. 8. N.

LAYBACH, a navigable river of Germany, in Carniola.

LAYERS, in gardening, tender shoots or twigs of trees, laid in the ground, till, having struck root, they are separated from the parent-tree, and become distinct plants. The method of propagating trees by layers is the following: The branches of the trees are to be slit a little way, laid under the mould about half a foot, and gently watered. If they will not remain easily in the position they are put in, they must be pegged down with wooden hooks: the best season for doing this is, for evergreens, towards the end of August; and, for other trees, in the beginning of February. If they have taken root, they are to be cut off from the main plant the succeeding winter, and planted out. If the branch is too high from the ground, a tub of earth is to be raised to a proper height for it. Some pare off the rind, and others twist the branch before they lay it, but this is not necessary. The end of the layer should be about a foot out of the ground; and the branch may be either tied tight round with a wire, or cut upwards from a joint, or cut round for an inch or two at the place, and it is a good method to pierce several holes through it with an awl above the part tied with the wire.

LAYING THE LAND, in navigation, the state of motion which increases the distance from the coast, so as to make it appear lower and smaller, a circumstance which evidently arises from the intervening convexity of the surface of the sea. It is used in contradiction to raising the land, which is produced by the opposite motion of approach towards it.

LAZARETTO, or **LAZAR-HOUSE**, [from *Lazarus*, in the gospel,] a house for the reception of the diseased; an hospital. Lazarettoes, or Lazar-houses, are chiefly intended for those afflicted with contagious distempers; and are particularly appointed for the performance of quarantine, by those who are suspected to have come from places infected with the plague.

LAZARUS, [לעזר, Heb. *z.* *e.* the Lord's help,] a Jew of Bethany, whom our Saviour raised from the dead, after having been four days in the grave. This miracle, with many peculiarly affecting circumstances attending it, is recorded in John xi. Lazarus, from the uncommon attention paid to his sisters by the Jews, upon his death, is supposed to have been a man of considerable property. He and his sisters, Martha and Mary, are recorded to have been among the peculiarly beloved friends of our Lord.

LAZAR-WORT. See **LASERFITIUM**.

LAZULITE, in mineralogy, a substance of a deep smalt blue: it occurs disseminated in fine grains, or masses of the size of a hazel-nut. Its fracture is uneven, with a glimmering lustre. It is brittle, easily frangible: infusible before the blow-pipe, but with borax runs into a clear yellow glass. Its component parts are silice, alumina, and oxide of iron.

LAZURSTEIN, in mineralogy, called also **AZURE-STONE**, a species of the flint genus; colour, a perfect azure-blue, which in some varieties passes into sky blue: it is found massive, disseminated, and in rolled pieces: hard, brittle, and not heavy: specific gravity about 2.8. It melts into a white enamel before the blow-pipe: it is composed of

Silica.....	46.0
Alumina.....	14.5
Carbonate of lime.....	28.0
Sulphate of lime.....	6.5
Oxide of iron.....	3.0
Water.....	2.0
	100.0

This stone is found in many parts of the world; but that of Asia and Africa is much superior both in beauty and real value to

the Bohemian and German kinds, which are frequently sold in its place. It is used in various articles of ornamental dress, and in Mosaic and Florentine work.

LEA, a river of England, which rises near Luton in Bedfordshire, and falls into the Thames below Blackwall.

LEACHLADE, a town of Gloucestershire, 12 miles E. of Choucester, 29 from Gloucester, and 70 from London.

LEAD, a white metal, with a blue tinge, very soft, flexible, not very tenacious, somewhat heavier than silver, and having very little elasticity. Long before ignition, namely, at about the 540th degree of Fahrenheit's thermometer, it melts: and then begins to be oxydized if respirable air be present. In a strong heat it boils, and emits fumes; during which time, if exposed to the air, its oxidation proceeds with considerable rapidity. Four different combinations of lead with oxygen are at present known, though some of them have not been examined with much attention. 1. The protoxide, or first oxide of lead, may be obtained by dissolving lead in nitric acid, and boiling the crystals which that solution yields by concentration along with pieces of metallic lead. The consequence is the formation of scaly crystals of a yellow colour, brilliant, and very soluble in water. These crystals are composed of the protoxide of lead combined with nitric acid. The protoxide may be precipitated by means of potass. 2. The deutoxide of lead may be formed by dissolving the metal in nitric acid, and pouring potass into the solution. A yellow-coloured powder is obtained, which is the deutoxide of lead. This oxide is composed of 91 parts of lead, and 9 of oxygen. When lead is kept melted in an open vessel, its surface is soon covered with a grey-coloured pellicle. When this pellicle is removed, another succeeds it; and by continuing the heat, the whole of the lead may soon be converted into this substance. If these pellicles are heated and agitated for a short time in an open vessel, they assume the form of a greenish-grey powder. Mr. Proust has shewn that this powder is a mixture of deutoxide, and a portion of lead in the metallic state. It owes its green colour to the blue and yellow powders which are mixed in it. If we continue to expose this powder to heat for some time longer in an open vessel, it absorbs more oxygen, assumes a yellow colour, and is then known in commerce by the name of massicot. The reason of this change is obvious. The metallic portion of the powder gradually absorbs oxygen, and the whole of course is converted into deutoxide.

When thin plates of lead are exposed to the vapour of warm vinegar, they are gradually corroded, and converted into a heavy white powder, used as a paint, and called white-lead or ceruse. This powder used formerly to be considered as a peculiar oxide of lead: but it is now known that it is a compound of the deutoxide and carbonic acid. 3. If massicot ground to a fine powder is put into a furnace, and constantly stirred while the flame of the burning coals plays against its surface, it is in about 48 hours converted into a beautiful red powder, known by the name of minium, or red lead. This powder, which is likewise used as a paint, and for various other purposes, is the tritoxide or red oxide of lead. 4. If nitric acid, of the specific gravity 1.260, be poured upon the red-coloured oxide of lead, 185 parts of the oxide are dissolved; but 15 parts remain in the state of a black, or rather deep-brown, powder. This is the peroxide, or brown oxide of lead, first discovered by Scheele. The best method of preparing it is the following, which was pointed out by Proust, and afterwards still farther improved by Vauquelin. Put a quantity of red oxide of lead into a vessel partly filled with water, and make oxymuriatic acid gas pass into it. The oxide becomes deeper coloured, and is at last dissolved. Pour potass into the solution, and the brown oxide of lead precipitates. By this process 68 parts of brown oxide may be obtained for every 100 of red oxide employed. This oxide is composed of about 79 parts of lead and 21 of oxygen. It is of a brilliant flea-brown colour. When heated it emits oxygen gas, becomes yellow, and melts into a kind of glass. When rubbed along with sulphur in a mortar, it sets the sulphur on fire, and causes it to burn with a brilliant flame. When heated on burning coals the lead is reduced. The oxide of lead is a principal ingredient in most of the modern fine white glasses. It is more particularly calculated to form the dense glass used to correct the aberration arising from colour in those telescopes which are known by the name of achromatic, because it communicates the property of separating the coloured rays from each other in greater angles than is obtained in alkaline glasses at equal angles of mean refraction.

tion. Lead is not subject to much variation from exposure to air or water. All the oxides of lead are very easily reduced. Minium, when exposed to strong heat, gives out part of the oxygen it absorbed during its oxidation; but, like the other oxides of this metal, it requires the addition of some combustible substance for its complete revival: a familiar instance of this revival is seen by exposing the common wafers to the flame of a candle. The wafers are coloured with minium, which is revived by the heat and inflammable substance of the wafer, so that it falls down in metallic globules. Lead is sometimes found native. It also frequently occurs in the form of an oxide, called native ceruse, or lead ochre, or lead spar of various colours, red, brown, yellow, green, bluish, and black. Sulphates and phosphates of lead are also found in great plenty. The combinations of this metal and sulphur are very common. From this combination, called galena almost all the lead of commerce is extracted. There are also lead pyrites, which contain a considerable proportion of iron and sulphur; and red lead spar, which consists of lead mineralized by sulphur and arsenic: this occurs but seldom. If sulphuretted lead be boiled in nitric or muriatic acid of a moderate strength, the sulphur may be obtained pure, and collected on a filter. When iron or stony particles are contained among the undissolved part, the sulphur may be separated by digestion in a solution of pure fixed alkali, which converts it into sulphuret, and leaves the other insoluble matters behind. If the first solution be made with nitric acid, it may contain silver and lead, which after precipitation by carbonate of soda, may be separated by ammonia, as is seen in the humid analysis of the calciform ores; when the muriatic acid is used for the solution of the ore, a large quantity of muriate of lead separates, for want of a sufficient quantity of water to dissolve it. This requisite quantity of water must be added to dissolve the salt, before the precipitate is made by the fixed alkali. All the ores of lead, except the phosphoric, are reducible to the metallic state by dissipating their volatile contents by the blow-pipe on a piece of charcoal. In the large way, they are reduced by fusion with charcoal. The uses of lead are very extensive and generally known. Most of the acids act upon lead. The sulphuric acid, very feebly, unless it be concentrated and boiling. Sulphurous acid escapes during the process, the acid being decomposed. Nitric acid acts strongly on lead, and converts it into a white oxide if the acid be concentrated; but if it be more diluted, the oxide is dissolved, and forms nitrate of lead which is crystallizable, and does not afford a precipitate by cooling. It detonates on ignited coals. Lime and alkalies decompose the nitrous solution of lead. The sulphuric acid added to this solution combines with the metallic oxide, and falls down. The muriatic acid in the same manner carries down the lead, and forms a combination which is more soluble in water than the muriate of silver. Muriatic acid acts directly, but sparingly, on lead by heat, which it oxidizes, and dissolves in part. The muriate of lead is crystallizable. The acetic acid dissolves lead and its oxides; though the access of air or oxygen seems necessary for the solution of the metal itself in this acid. Lead will combine with most of the metals so as to form alloys, some of which are of considerable use in the arts. For the affinities of lead, see **CHEMISTRY**. Lead, when taken or inhaled into the human body, is productive of various fatal disorders, to which miners, potters, and all other persons concerned in its manufacture, are peculiarly subject. Hence culinary vessels, or other domestic utensils made of this metal, are highly objectionable, especially if they be intended to contain cyder or other acid liquor. To this cause the Devonshire colic is justly attributed; for great quantities of cyder are, in that county, kept in vessels, consisting either wholly of lead, or such as are soldered with this pernicious metal. The dry belly-ach of the West Indies is of the same origin, and is occasioned by distilling rum through leaden worms. In these dreadful complaints, the patient is seized with an acute spasmodic pain in the stomach, which extends gradually to the whole intestinal canal: the bowels are frequently inverted and drawn towards the spine, so as to render the application of clysters impracticable. At the same time, a most obstinate costiveness prevails; and the affection at length terminates in palsy, or in fixed contractions of the limbs. For the cure of this painful malady, gentle clysters and laxatives may at first be administered; but, if these are not attended with beneficial consequences, Dr. Percival decidedly recommends the

internal use of alum; which, in slight cases of the Devonshire colic, has generally effected a cure, when used to the extent of 15 or 20 grains every fourth, fifth, or sixth hour. Balsam of Peru, in doses of 40 drops, to be taken two or three times in the course of the day, has also been advantageously prescribed; at the same time, castor oil, or other mild laxatives, conjoined with gentle opiates, have greatly contributed to afford relief.—The patient's diet ought to consist of nourishing broths, panada, and gruel, or similar light dishes. In whatever form lead may be introduced into the human body, it is equally deleterious and fatal, whether its vapours be inhaled through the lungs, absorbed through the pores of the skin, or particles of the metal be taken into the stomach. The only effectual antidotes to this insidious poison are, antimonial emetics; and, after them, the internal use of liver of sulphur, together with vegetable oils, both externally and internally, should be liberally continued.

LEAD-BRASIL, a disease incident to brutes, inhabiting Lead-hills, occasioned by the poisonous qualities of lead and other minerals.

LEADER, or **LEADER WATER**, a river of Scotland in Berwickshire.

LEADHILLS, mountains of Scotland, in the county of Lanark, and district of Clidesdale, remarkable for their ancient lead-mines.

LEAF, [*leaf*, Sax.] in botany, a very essential and ornamental part of plants, serving many important purposes in vegetation. See **BOTANY**.

LEAF-GOLD, or **GOLD-LEAF**, fine gold beaten into plates of extreme thinness, for the purpose of gilding, &c. The preparation of gold-leaf, according to Dr. Lewis, is as follows: "The gold is melted in a black lead crucible, with some borax, in a wind-furnace, called by the workmen a wind-hole: as soon as it appears in perfect fusion, it is poured out into an iron ingot mould, six or eight inches long, and three quarters of an inch wide, previously greased, and heated, so as to make the tallow run and smoke, but not to take flame. The bar of gold is made red hot, to burn off the unctuous matter, and forged on an anvil into a long plate, which is further extended, by being passed repeatedly between polished steel-rollers, till it becomes a ribbon as thin as paper. Formerly the whole of this extension was procured by means of the hammer, and some of the French workmen are still said to follow the same practice: but the flattening-mill both abridges the operation, and renders the plate of more uniform thickness. The ribbon is divided by compasses, and cut with sheers into equal pieces, which consequently are of equal weights: these are forged on an anvil till they are an inch square; and afterwards well nealed, to remove the rigidity which the metal has contracted in the hammering and flattening. Two ounces of gold, or 960 grains, the quantity which the workmen usually melt at a time, make 150 of these squares, when each of them weighs six grains and two-fifths; and as 902 grains of gold make a cubic inch, the thickness of the square plates is about the 760th part of an inch. In order to the further extension of these pieces into fine leaves, it is necessary to interpose some smooth body between them and the hammer, for softening its blow, and defending them from the rudeness of its immediate action: as also to place between every two of the pieces some proper intermedium, which, while it prevents their uniting together, or injuring one another, may suffer them freely to extend. Both these ends are answered by certain animal membranes. The gold-beaters use three kinds of membranes: for the outside cover, common parchment made of sheep-skin; for interlaying with the gold, first the smoothest and closest vellum, made of calf-skin; and afterwards the much finer skins of ox-gut, stript off from the large straight gut slit open, curiously prepared on purpose for this use, and hence called gold-beater's skin. The beating of the gold is performed on a smooth block of black marble, weighing from 200 to 600 pounds, the heavier the better; about nine inches square on the upper surface, and sometimes less, fitted into the middle of a wooden frame, about two feet square, so as that the surface of the marble and the frame form one continuous plane. Three of the sides are furnished with a high ledge; and the front, which is open, has a leather-slap fastened to it, which the gold-beater takes before him as an apron, for preserving the fragments of gold that fall off. Three hammers are employed, all of them with two round and somewhat convex faces, though commonly the workman uses only one

of the faces: the first, called the cutch-hammer, is about four inches in diameter, and weighs 15 or 16 lb. and sometimes 20, though few workmen can manage those of this last size: the second called the shoddering hammer, weighs about 12 lb. and is about the same diameter: the third called the gold-hammer, or finishing hammer, weighs 10 or 11 lb. and is nearly of the same width. The French use four hammers, differing both in size and shape from those of our workmen. A hundred and fifty of the pieces of gold are interlaid with leaves of vellum, three or four inches square, the vellum leaf being placed between every two of the pieces, and about 20 more of the vellum leaves on the outside; over these is drawn a parchment case, open at both ends, and over this another in a contrary direction, so that the assemblage of gold and vellum leaves is kept tight and close on all sides. The whole is beaten with the heaviest hammer, and every now and then turned upside down, till the gold is stretched to the extent of the vellum; the case being from time to time opened for discovering how the extension goes on, and the packet, at times, bent and rolled as it were between the hands, for procuring sufficient freedom to the gold, or, as the workmen say, to make the gold work. The pieces, taken out from between the vellum leaves, are cut in four with a steel knife; and the 600 divisions, hence resulting, are interlaid, in the same manner, with pieces of the ox-gut-skins five inches square. The beating being repeated with a lighter hammer till the golden plates have again acquired the extent of the skins, they are a second time divided in four: the instrument used for this division is a piece of cane cut to an edge, the leaves being now so light, that the moisture of the air or breath condensing on a metalline knife would occasion them to stick to it. These last divisions being so numerous, that the skins necessary for interposing between them would make the packet too thick to be beaten at once, they are parted into three parcels, which are beaten separately, with the smallest hammer, till they are stretched for the third time to the size of the skins: they are now found to be reduced to the greatest thinness they will admit of. In the beating, however simple the process appears to be, a good deal of address is requisite, for applying the hammers so as to extend the metal uniformly from the middle to the sides: one improper blow is apt not only to break the gold-leaves, but to cut the skins. After the last beating, the leaves are taken up by the end of a cane-instrument, and, being blown flat on a leather-cushion, are cut to a size, one by one, with a square frame of cane made of a proper sharpness, or with a frame of wood edged with cane: they are then fitted into books of 25 leaves each, the paper of which is well smoothed, and rubbed with red bole to prevent their sticking to it.

LEAF, in architecture, the representation of the leaf of the acanthus on the capital of the Corinthian and Composite orders. See **ARCHITECTURE**.

LEAF, in clocks and watches, an appellation given to the notches of their pinions.

LEAGUE, a measure which contains more or fewer geometrical paces, according to the different usages and customs of countries. A league at sea, where it is chiefly used by us, being a land-measure mostly peculiar to the French and Germans, contains 3000 geometrical paces, or three English miles. The French league sometimes contains the same measure, and in some parts of France it consists of 3500 paces: the mean or common league consists of 2400 paces, and the little league of 2000. The Spanish leagues are longer than the French, 17 Spanish leagues making a degree, or 20 French leagues, or 69½ English statute miles. The Dutch and German leagues contain each four geographical miles. The Persian leagues are pretty near of the same extent with the Spanish; that is, they are equal to four Italian miles; which is pretty near to what Herodotus calls the length of the Persian parasang, which contained 30 stadia, 8 whereof, according to Strabo, make a mile. The word comes from *leuca*, or *leuga*, an ancient Gaulish word for an itinerary measure, and retained in that sense by the Romans. Some derive the word *leuca* from λευκος, white; as the Gauls, in imitation of the Romans, marked the distances in their roads with white stones.

LEAGUE, denotes also an alliance between princes and states for their mutual aid, either in attacking some common enemy, or in defending themselves.

LEAK, [*leke*, Dutch,] at sea, a hole in the ship, through

which the water comes in. A ship is said to spring a leak when she begins to leak, or to let in the water. The manner of stopping a leak is to put into it a plug wrapped in oakum and well tarred, or in a tawpawling clout, which keeps out the water, or nailing a piece of sheet lead on the place. A ready way to find a leak in a ship is to apply the narrower end of a speaking trumpet to the ear, and the other to the side of a ship where the leak is supposed to be; then the noise of the water issuing in at the leak will be heard distinctly, whereby it may be discovered.

LEAKAGE, in commerce, an allowance of 12 per cent in the customs, granted to importers of wines for the waste or damage it is supposed to have received in the passage; an allowance of two barrels in 22 is also made to the brewers of ale and beer by the excise-office.

LEAKAGE signifies also the state of a vessel that leaks.

LEAP, in music, is when the song does not proceed by conjoint degrees, as when between each note there is an interval of a third, a fourth, a fifth, &c.

LEAPING, or **VAULTING**, an exercise much used both among the Greeks and Romans. The Grecians called it *ἀλμα*, and performed it with weights upon their heads and shoulders. Sometimes they carried the weights in their hands, which were of different figures, but generally oval, and made with holes, or covered with thongs, through which the contenders put their fingers. These weights were called *ἀλμας*. The contest was who could leap the highest and farthest. The place from whence they jumped was called *βλήνη*, and that to which they leaped, *εὐκαταβήνη*, because the ground was there dug up. This exercise was performed in the same manner by the Romans.

LEAP-YEAR, the same with bissextile. See **BISSEXTILE**. Every centesimal, or hundredth year, is a leap-year, according to the Julian account, but according to the Gregorian, it is always a common year, except when the number of centuries can be divided by four without a remainder, for then it is a leap-year; but the intermediate centesimal years are common ones: hence, to know if it be leap-year, the rule is, If the year consists of complete centuries, and can be divided by 4, it is leap-year; as it is also, when the intermediate years can be divided by 4: thus the year 1812, will be a leap-year; for 12 may be divided by 4, without a remainder. If the intermediate years cannot be divided by 4, the remainder shews the number of years over leap-year. See **CHRONOLOGY**, and **YEAR**.

LEASE, [*laisser*, Fr.] a conveyance of lands, or tenements, for a term of years, or during the continuance of a life or lives, in consideration of a stipulated rent or other recompence. The purchaser of a lease may be considered as the purchaser of an annuity equal to the rack-rent, for whether he possesses the estate himself, or lets it out to another, he has an interest in the same equal to the annual rent thereof; therefore, from the principles on which the present value of annuities is ascertained, the value of leases is likewise found. See **ANNUITIES**.

LEASE, in law, otherwise called a Demise, is a conveyance or letting of lands or tenements, in consideration of rent, or other annual recompence made for life, for years, or at will; but always for a less time than the interest of the lessor in the premises; for if it were of the whole interest, it would be more properly an assignment. He that demises or lets, is the lessor; and he to whom it is demised or let, is the lessee. A lease may either be made by writing or word of mouth, called in law, a lease by parol. The former is most usual; but by the statute of lands, 29 Charles II. c. 3, all leases of land, excepting leases not exceeding three years; must be made in writing, and signed by the parties themselves, or their agents duly authorized, otherwise they will operate only as leases at will. If a lease is but for half a year, or a quarter, or less time, the lessee is respected as a tenant for years; a year being the shortest term of which the law, in this case, takes notice: that is, he is entitled to the general privileges of a tenant for years, and is classed as such, though his term lasts only for the time specified. To constitute a good lease, there must be a lessor not restrained from making the lease to the extent for which it is granted; a lessee capable of receiving it; and the interest demised must be a demisable interest, and be sufficiently and properly described. If it is for years, it must have a certain commencement and determination; it is to have all the usual ceremonies, as sealing, delivery, &c.; and there must be an acceptance of the thing demised. Leases for life must

not be made to commence at a future day, and there must be a livery of seisin. They must now be stamped as a lease, to be valid; and any form of writing will constitute a lease, provided it contains words of present demise, or actual letting; but if it be only an agreement to let, it conveys no immediate title in law, but only an equitable right to have a lease, or to sue at law for not making one. If a lease be made to one for years, and at the same time to another for a longer time, the last lease is not void, but shall take effect after the first expires. A tenant for life can, in general, only grant a lease to continue during his life; but sometimes a power is annexed to such an estate, to grant leases for a specified time, and under particular limitations, all which must be strictly complied with, or the lease is void; and instances have happened, where building-leases have been set aside, and persons ruined by having granted under-leases. An infant may make a lease; but may set it aside when he comes of age; and the Court of Chancery is empowered to grant leases for idiots, lunatics, infants, and married women.

LEASE AND RELEASE, a species of conveyance used in the English law, first invented by Serjeant Moore, soon after the statute of uses, and now the most common of any, and therefore not to be shaken; though very great lawyers (particularly Mr. Noy) have formerly doubted its validity. It is thus contrived: A lease, or rather bargain and sale, upon some pecuniary consideration, for one year, is made by the tenant of the freehold to the lessee or bargainee. Now this, without any inrolment, makes the bargainor stand seised to the use of the then bargainee, and vests in the bargainee the use of the term for a year; and the then statute immediately annexes the possession. He therefore, being thus in possession, is capable of receiving a release of the freehold and reversion, which must be made to a tenant in possession: and accordingly the next day, a release is granted to him. This is held to supply the place of livery of seisin: and so a conveyance by lease and release is said to amount to a feoffment.

LEASH, among sportsmen, denotes three creatures of any kind; but chiefly greyhounds, foxes, bucks, and hares.

LEATHER, [*lether*, Sax.] the skins of various quadrupeds dressed in a particular manner, for the use of manufactures. See **TANNING**.

LEATHER, DYEING OF. Different colours may be imparted to leather, according to the uses for which it is designed. Thus, a blue is given by immersing the piece for the space of twenty-four hours in urine and indigo, after which it is boiled in alum; or this colour may be communicated by tempering the indigo with red wine, and steeping the skins in the mixture. A red colour is obtained, by first washing the skins, which are then soaked for the space of two hours in galls, wrung out, and immersed in a liquor prepared by a solution of *Ligustrum vulgare*, or privet, alum, and verdigrease, in water; when they are steeped in a dye made of Brazil-wood boiled with ley. In order to communicate a purple, the skins are wetted with a solution of Roman alum in warm water; and when dry, they are rubbed by the hand with a decoction of logwood in cold water. Leather acquires a light green tinge, by applying to it sap-green diluted with boiled alum-water:—a dark green cast is communicated by means of steel-filings and sal ammoniac, steeped in urine for a considerable time, and well rubbed into the skin, which is then to be dried in the shade. A yellow colour is given, by anointing the skin with a decoction of aloes and linseed-oil, previously strained; or, by immersing it in a solution of dyer's-green weed. Lastly, if fustic-berries be boiled in alum-water, and the skins dipped in the liquor, they will acquire a light orange shade; but, if a deeper hue be required, it will be necessary to substitute turmeric for the berries. In the tanning of leather it is so much impregnated with the astringent parts of oak-bark, or with that matter which strikes a black with green vitriol, that rubbing it over three or four times with a solution of the vitriol, or with a solution of iron in vegetable acids, is sufficient for staining it black. This operation is performed by the currier, who, after the colouring, gives a gloss to the leather with a solution of gum-arabic and size made in vinegar. Where the previous astringent impregnation is not sufficient to give due colour, and for those sorts of leather which have not been tanned, some galls or other astringents are added to the solution of iron. In many cases, particularly for the finer sorts of leather, and for renewing the blackness, lamp or ivory-black are used. A mixture of either of

these with linseed-oil makes the common oil-blackening. For a shining blacking, small beer or water are taken instead of oil, in the quantity of about a pint to an ounce of the ivory-black, with the addition of half an ounce of brown sugar and as much gum-arabic.

LEATHER, GILDING OF. Take glair of the whites of eggs, or gum-water, and with a brush rub over the leather with either of them: then lay on the gold or silver, and, letting them dry, burnish them. See **GILDING**.

LEAVEN, [from *levare*, to make a thing light, Lat.] strictly signifies sour dough, which acquires its acidity, from being preserved after kneading flour with yeast, in order to ferment a larger quantity of paste. It is a very imperfect substitute for yeast; and, as it communicates to the bread an astringent taste which few persons relish, it ought to be used only where barm cannot be procured. Leaven was strictly forbidden by the law of Moses during the seven days of the passover; and the Jews in obedience to this law, very carefully purified their houses from all leaven as soon as the vigil of the feast began. Nothing of honey or leaven was to have place in any thing presented upon the altar, during this solemnity. If, during the feast, the least particle of leaven was found in their houses, the whole was polluted. Leaven, in its figurative sense, signifies the bad passions of envy, malice, and rancour, which sour the temper, and extend their ferment over the social affections: whereas unleavened bread implies sincerity, truth, and meekness. It is frequently used for any kind of moral contagion.

LEAWAVA, a sea-port on the E. coast of Ceylon, famous for salt. Lon. 83. 15. E. Lat. 6. 40. N.

LEBADIA, or **LEBADEA**, an ancient town of Bœotia, on the borders of Phocis, situated between Helicon and Chæronea, near Coronæa.

LEBANON, a celebrated mountain in the S. of Syria and N. of Canaan. See **LIBANUS**.

LEBEDA, or **LEBIDA**, an ancient sea-port town of Tripoli, with a good harbour, on the Mediterranean. Lon. 14. 50. E. Lat. 32. 50. N.

LEBEDOS, one of the twelve ancient cities of Ionia, situated S. of Smyrna.

LEBRIZA, or **LEBRIXA**, a town of Spain, in Andalusia. Lon. 5. 32. W. Lat. 36. 52. N.

LEBUS, a town of Brandenburg. Lon. 14. 55. E. Lat. 52. 28. N.

LECCE, a rich, populous, and beautiful town of Naples, in the province of Otranto, anciently called Aletium. Lon. 18. 20. E. Lat. 40. 38. N.

LECCO, a district of the late Italian republic, in the department of the Lario, and late duchy of Milan. It is now included in the kingdom of Italy.

Lecco, the capital of the above district, is seated on the S. E. arm of lake Como. Lon. 9. 40. E. Lat. 45. 45. N.

LECH, or **LECK**, a river of Batavia, which runs into the Maese at Krimpe.

LECH, or **LECHE**, a river of France which rises in the department of Forêts, late duchy of Luxemburg, and falls into the Meuse near Dinant.

LECHNEA, a genus of the triandria trigynia class and order. Calyx three-leaved: petals three, linear: capsules, three-celled, three-valved, seeds solitary. There are three species, herbaceous plants of America and China.

LECHNICH, a town of France in the department of the Roer, and late electorate of Cologne. Lon. 6. 35. E. Lat. 50. 40. N.

LECK, a town of Denmark, in Sleswick.

LECTI, beds or couches, were of two kinds, amongst the Romans, being destined to two different uses, to lie upon at entertainments, and to repose on for sleep. The former were called *lecticlinares*, the latter *lecti cubicularii*.

LECTICA, was a litter or vehicle, in which the Romans were carried. It was of two kinds, covered and uncovered. The covered lectica is called by Pliny *cubiculum viatorum*, a traveller's bed-chamber.

LECTICARII, among the Romans, servants who carried the Lectica.

LECTICARIUS was also an officer in the Greek church, whose business it was to bear off the bodies of those who died, and

and to bury them. These were otherwise denominated decani and copiatæ.

LECTISTERNIUM, a solemn ceremony observed by the Romans in times of public danger, wherein an entertainment was prepared with great magnificence, and served up in the temples. The gods were invited to partake of the good cheer, and their statues placed upon couches round the table, in the same manner as men used to sit at meat. The first lectisternium held at Rome was in honour of Apollo, Latona, Diana, Hercules, Mercury, and Neptune, to put a stop to a contagious distemper which raged amongst the cattle, A. U. C. 354. At these feasts the Epulones presided, and the sacred banquet was called epulum. See **EPULUM**, &c. Something like the lectisternium was occasionally observed among the Greeks, according to Casaubon.

LECTORES, among the ancient Romans, servants in great men's houses, who read while their masters were at supper. They were called by the Greeks *Anagnostæ*.

LECTOURE, a town of France, in the department of Gers, and late province of Gascony. Lon. 42. E. Lat. 43. 56. N.

LECTURERS, in the church of England, an order of preachers, distinct from the rector, vicar, and curate. They are chosen by the vestry, or chief inhabitants, supported by voluntary subscriptions and legacies, and usually preach on the Sunday afternoon. But the term is most generally applied to those who preach on any stated day. By 13 and 14 Car. II. cap. 4, lecturers in churches, unlicensed, and not conforming to the liturgy, shall be disabled, and shall suffer three months imprisonment in the common gaol: and two justices, or the mayor in a town corporate, shall, upon certificate from the ordinary, commit them. Where there are lectures founded by the donations of pious persons, (such as that of lady Mayer's at St. Paul's) the lecturers are appointed by the founders, without any interposition of rectors, &c. only with the leave of the bishop. But the lecturer is not entitled to the pulpit, without the consent of the rector or vicar, who is possessed of the freehold of the church.

LECYTHIS, a genus of the polyandria monogynia class and order. Calyx six-leaved; corolla, six-petaled; nectarine, lingulate, stamiferous; pericarpium, circumscised, many-seeded. There are six species, trees or shrubs of Guiana.

LEDA, in fabulous history, a daughter of king Thespius and Eurythemis, who married Tyndarus king of Sparta. Jupiter saw her bathing in the Eurotas, when she was some few days advanced in pregnancy, and struck with her beauty, resolved to deceive her. He persuaded Venus to change herself into an eagle, while he assumed the form of a swan, and after this metamorphosis Jupiter, as if fearful of the bird of prey, fled through the air into the arms of Leda, who willingly sheltered the trembling swan from the assaults of his superior enemy.

LEDUM, **MARSH CISTUS**, or **WILD ROSEMARY**; a genus of the monogynia order, and decandria class of plants; natural order, Bicornes. Calyx five-cleft: corolla flat, five-parted; capsule five-celled, gaping at the base. There are three species, shrubs growing on mosses or bogs, in the North of Europe.

LEE, [*lie*, Fr.] a term used by seamen to distinguish that part of the hemisphere to which the wind is directed, from the other part whence it arises: which last is called to windward. This expression is chiefly used when the wind crosses the line of a ship's course, so that all on that side of her is called to windward, and all on the opposite side to leeward. Hence, Under the Lee, implies farther to the leeward, or farther from that part of the horizon whence the wind blows. Under the Lee of the shore; i. e. at a short distance from the shore which lies to windward. This phrase is commonly understood to express the situation of a vessel anchored, sailing under the weather-shore, where there is always smoother water, and less danger of heavy seas, than at a great distance from it.

LEE-SIDE, all that part of a ship or boat which lies between the mast and the side farthest from the direction of the wind; or otherwise, the half a ship, which is pressed down towards the water by the effort of the sails, as separated from the other half by a line drawn through the middle of her length. That part of the ship which lies to windward of this line is accordingly called the weather-side. Thus admit a ship to be sailing southward, with the wind at east, then is her starboard or right side the lee-side; and the larboard, or left, the weatherside.

LEE-LARCH, the sudden and violent roll which a ship often

takes to the leeward in a high sea, particularly when a large wave strikes her on the weatherside.

LEE-WAY, or **LEEWARD-WAY**, is the lateral movement of a ship to the leeward of her course, or the angle which the line of her way makes with her keel when she is close-hauled. This movement is produced by the mutual effort of the wind and sea upon her side, forcing her to leeward of the line upon which she appears to sail, and in this situation her course is necessarily a compound of the two motions by which she is impelled. All ships are apt to make some lee-way; so that in casting up the log-book something must be allowed for lee-way. But the lee-way made by different ships, under the same circumstances, will be different: and even the same ship, with different lading, and having more or less sail on board, will make more or less lee-way. However, the common allowances made for lee-way, are these: 1. If the ship be close-hauled, has all her sails set, the water smooth, and a moderate gale of wind, she is supposed to make little or no lee-way. 2. If it blow so fresh, as to cause the small sails to be handed, it is usual to allow one point. 3. If it blow so hard, that the tops must be close-reefed, the ship then makes about two points lee-way. 4. If one topsail must be handed, it is common to allow two and three quarters, or three points lee-way. 5. When both topsails must be handed, they allow about four points lee-way. 6. When it blows so hard, as to occasion the fore-course to be handed, the allowance is between five and a half and six points. 7. When both main and fore-courses must be handed, then six, or six and a half points must be allowed for her lee-way. 8. When the mizen is handed, and the ship is trying a hull, she then makes her way good about one point before the beam, that is, about seven points lee-way. Though these rules are such as are generally used, yet as the lee-way depends much upon the mould and trim of the ship, we shall here give the method of ascertaining it by observation. Thus, let the ship's wake be set by a compass in the poop, and the opposite rhumb is the true course made good by the ship; then the difference between this and the course given by the compass in the binnacle, is the lee-way required. If the ship be within sight of land, the lee-way may be exactly found by observing a point on the land which continues to bear the same way; for the distance between the point of the compass it lies on, and the point the ship capes at, will be the lee-way.

LEEA, in botany, a genus of the pentandria monogynia class and order; natural order, Trihiatæ. Corolla one-petaled; nectary on the tube of the corolla, upright, five-cleft; berry five-seeded. It has three species.

LEECH. See **HIRUDO**.

LEECHES, in a ship, the borders or edges of a sail which are either sloping or perpendicular. The leeches of all sails whose tops and bottoms are parallel to the deck, or at right angles to the mast, are denominated from the ship's side, and the sail to which they belong; as the starboard leech of the main-sail, the lee-leech of the fore-topsail, &c. But the sails which are fixed obliquely on the masts have their leeches named from their situation with respect to the ship's length; as the fore-leech of the mizen, the after-leech of the jib or fore-stay-sail, &c.

LEECH-LINES, certain ropes fastened to the middle of the leeches of the main-sail and fore-sail, and communicating with blocks on the opposite side of the top, whence they pass downwards to the deck, serving to truss up those sails to the yard as occasion requires. See **BRAILS**.

LEECH-ROPE, a name given to that part of the bolt-rope to which the border or skirt of a sail is sewed. In all sails whose opposite leeches are of the same length, it is terminated above the earing and below the clue.

LEEDS, a town of Yorkshire, in the W. Riding. It was incorporated by Charles I. with a chief alderman, nine burgesses, and 20 assistants; and by Charles II. with a mayor, 12 aldermen, and 24 assistants. It has been long famous for its woollen manufacture, and is one of the largest and most flourishing towns in the county. It is 22 miles W. S. W. of York, and 192 N. by W. of London. Lon. 1. 29. W. Lat. 53. 48. N.

LEEDS, a town of Virginia, in Richmond county, fourteen miles S. by E. of Port Royal. Lon. 77. 3. W. Lat. 38. 10. N.

LEEK, in botany. See **ALLIUM**.

LEEK, in geography, a town of Staffordshire, eighteen miles N. of Stafford, and 144 N. N. W. of London.

LEERDAM, a town of Batavia in the department of Delft, and

and late province of South Holland; 11 miles S. of Utrecht, and 20 N. E. of Dort.

LEERS, or LIERS a town of France in the department of the Ourte, and late bishopric of Liege, four miles N. of Liege.

LEERSIA, a genus of the class and order triandria digynia. Calyx none; glume, two-valved, closed. There are three species, grasses of America.

LEES, the grossest and most ponderous parts of liquors, which, being separated by fermentation, fall to the bottom. The vinegar-makers make a great trade of the lees of wine dried and made into cakes, after having squeezed out the remains of the liquor in presses.

LEESBURG, a town of Virginia, capital of London county, 46 miles N. W. of Alexandria. Lon. 77. 33. W. Lat. 39. 10. N.

LEET, or COURT LEET, [*leta visus francii*, Lat.] is a court of record, ordained for punishing offences against the crown; and is said to be the ancient court of the land. It inquires of all offences under high treason; but those who are to be punished with loss of life or member, are only inquirable and presentable here, and to be certified over to the justices of assise. Stat. 1, Edw. III. And this court is called the view of frank pledge, because the king is to be there certified by the view of the steward, how many people are within every leet, and have an account of their good manners and government: and every person of the age of twelve years, who hath remained there for a year and a day, may be sworn to be faithful to the king, and the people to be kept in peace, &c. A leet is incident to a hundred, as a court baron to a manor: for by grant of a hundred, a leet passeth: and a hundred cannot be without a leet. The usual method of punishment in the court-leet, is by fine and amercement; the former assessed by the steward, and the latter by the jury.

LEETS, in the Scottish borough-politics, are those lists of names made out previous to the day of election, out of which, the magistrates, counsellors, corporations, &c. annually elect the lord provost, bailies, deacons, and other office-bearers, for the subsequent year.

LEEUEWE, or LEEUWEN, a town of France, in the department of the Dyle, and late province of Austrian Brabant, 20 miles N. W. of Liege.

LEEWARD, denotes towards that part of the horizon which lies under the lee whither the wind bloweth. Thus, "We saw a fleet under the lee," and, "We saw a fleet to leeward," are synonymous.

LEEWARD ISLANDS, that part of the Caribbee Islands, which extend from Dominica to Porto Rico. See CARIBBEE ISLANDS.

LEEWARD SHIP, is a vessel that falls much to leeward of her course, when sailing close-hauled, and consequently loses much ground.

LEEWARDEN. See LEWARDEN.

LEE-WAY. See NAVIGATION.

LEFOOGA, one of the Friendly Islands, in the Cluster called Hapaees; about seven miles long, and three broad. Lon. 149. 40. E. Lat. 19. 49. S.

LEG, in anatomy, the whole lower extremity from the acetabula of the ossa innominata, is commonly divided into three parts, viz. the thigh, the leg properly so called, and the foot. See ANATOMY.

LEGACY, [*legatum*, Lat.] a bequest of a sum of money, or any perpetual effects of a testator: and these are to be paid by his representative, after all the debts of the deceased are discharged, as far as the assets will extend. All the goods and chattels of the deceased, are by law vested in the representative, who is bound to see whether there be left a sufficient fund to pay the debts of the testator, and if it should prove inadequate, the pecuniary legacies must proportionately abate; a specific legacy, however, is not to abate unless there be insufficient without it. If the legatee die before the testator, such will in general be termed a lapsed legacy, and fall into the general fund; where however, from the general import of the will, it can be collected that the testator intended such a vested legacy, it will in such case go to the representative of the deceased legatee. If a bequest be made to a person, when he attains a certain age, the legacy will be lapsed, if he die before he attain that age: but if such legacy may be made payable at that age, and the legatee die before that age, such legacy will be vested in his representative. If in the latter case, the testa-

tor devise interest to be paid in the mean time, it will nevertheless be a vested legacy. Where a legacy is bequeathed over to another, in case the first legatee die under a certain age, or the like, the legacy will be payable immediately on the death of the first legatee; and though such legacy be not bequeathed over, yet if it carry interest, the representative will become immediately entitled to it. In case of a vested legacy due immediately, and charged on land, or money in the funds which yields an immediate profit, interest shall be payable from the death of the testator; but if it be charged on the personal estate only of the testator, which cannot be collected in, it will carry interest only from the end of the year after the death of the testator. If a bequest be for necessities, and of small amount, the executor will be justified in advancing a part of the principal; but this should be done under very particular circumspection, as the executor may be compelled to pay the full legacy on the infant's attaining his majority, without deducting the sum previously advanced. When all the debts and particular legacies are discharged, the residue or surplus must be paid to the residuary legatee, if any be so appointed in the will; but if there be none appointed or intended, it will go to the executor or next of kin. When this residue does not go to the executor, it is to be distributed among the intestate's next of kin, according to the statute of distributions; except the same is otherwise disposable by particular customs, as those of London, York, &c. See EXECUTOR.

LEGATE, [*legatus*, Lat.] a deputy, an ambassador. A kind of spiritual ambassador from the pope, generally a cardinal or bishop, whom the pope sends to sovereign princes. There are three kinds of legates, viz. legates a latere, legates de latere, and legates by office, or legati nati: of these the most considerable are the legates a latere, the next are the legates de latere.

LEGATIO LIBERA, was a privilege frequently obtained of the state, by senators of Rome, for going into any province or country, upon their own private business, in the quality of legati, or envoys from the senate, that the dignity of this nominal office might secure them a good reception, and have an influence on the management of their concerns. The cities and towns through which they passed were obliged to defray their expences. It was called libera legatio, because they might lay aside the office as soon as they pleased, and were not encumbered with any actual trust.

LEGATUS, a military officer among the ancient Romans, who commanded as deputy of the commander-in-chief. The legati, at their first institution, were not so much to command as to advise. They were generally chosen by the consuls, with the approbation of the senate.

LEGEND, originally a book used in the old Romish churches, containing the lessons to be read at divine service; hence the lives of the saints and martyrs came to be called legends, because chapters were read out of them at matins, and at the refectories of religious houses. Among these the golden legend, which is a collection of the lives of the saints, was received in the church with great applause, which it maintained for 200 years; though it is full of ridiculous and romantic stories, that the Romanists themselves are now ashamed of it.

LEGEND, is also used to signify the words engraven on the margins, &c. of coins. Thus the legend of a French crown, before the revolution was SIT NOMEN DOMINI BENEDICTVM; that of a moidore, IN HOC SIGNO VINCES: on those of the last emperors of Constantinople, we find IESVS CHRISTVS BASILEVS BASILEON, IHS XPS NIKA, &c. IESVS CHRISTVS VINCIT. It is also applied to the inscription of medals, which serves to explain the figures or devices represented on them. In strictness, the legend differs from the inscription; this last properly signifying words placed on the reverse of a medal, in lieu of figures. It seems the ancients had intended their medals to serve both as images and as emblems; the former for the common people, and the other for persons of taste; the images to represent the faces of princes; emblems their virtues and great actions. Every medal has properly two legends; that on the front, and that on the reverse. The first generally serves only to distinguish the person by his name, titles, offices, &c. the latter is intended to express his noble sentiments, his good deeds, and the advantages the public has reaped by him.

LEGER. See BOOK-KEEPING.

LEGER-LINE, in music, one added to the staff of five lines, when the ascending or descending notes run very high or low: there are sometimes many of these lines both above and below the staff to the number of four or five.

LEGERDEMAIN, [contracted perhaps from *legereté de main*, French,] a denomination given to certain deceptive performances, which either depend altogether on dexterity and address, or derive a small degree of aid from philosophical principles. The former class, though they may be styled arts in one sense of the word, yet depend so entirely upon trick and deception, and have so little connection with real science, that we are persuaded none of our readers will regret our omitting them. Of the latter class, sufficient specimens of entertaining experiments, illusions, &c. of a philosophical nature, will be found in the philosophical part of this work.

LEGHORN, a handsome town of Etruria, anciently called *Liburnus Portus*, but by the modern Italians *Livorno*, about 30 miles S. W. of Florence, in the territory of Pisa. Lon. 11. 0. E. Lat. 43. 50. N.

LEGION, in Roman antiquity, consisted of different numbers at different periods. The word comes from *legere*, (Lat.) to choose; because, when the legions were raised, they chose such of their youth as were most proper to bear arms. In the time of Romulus the legion consisted of 3000 foot and 300 horse; though, after the reception of the Sabines, it was augmented to 4000. In the war with Hannibal, it was raised to 5000, after this it sunk to 4000 or 4500; this was the number in the time of Polybius. The number of legions kept in pay, differed according to circumstances.

LEGISLATOR, [*legislator*, Latin,] a lawgiver; one who makes laws for any community. The most celebrated ancient legislators were Moses among the Jews; Theseus, Draco, and Solon, among the Athenians; Lycurgus among the Lacedæmonians; Numa among the Romans, &c. See these articles. The first laws amongst the Athenians seem to have been those of Theseus. After him came Draco, whose laws were said, for their severity, to have been written with blood; by them every offence was punished with death; so that stealing an apple, and betraying one's country, were treated as equal crimes. These were repealed by Solon, except such as related to murder. By way of distinction, Draco's laws were called *δρακον*, and Solon's *σολων*. At Rome the people were in a great measure their own legislators; though Solon may be said, in some sense, to have been their legislator, as the decemviri, who were created for the making of laws, borrowed a great number from those of Solon. With us the legislative power is lodged in the king, lords, and commons, assembled in parliament. See **LAW**, and **PARLIAMENT**.

LEGITIMATION. See **BASTARD**, and **LAW**.

LEGITIME, in Scots law, that share of the moveable effects belonging to a husband and wife, which upon the husband's death falls to the children.

LEGNAGO, or **LEGNANO**, formerly a district of the province of Veronese, anciently called *Linias*, afterwards included in the Italian republic, and department of the *Mincio*, but now forming a part of the kingdom of Italy. The soil is fertile, and it abounds in rice, maize, fruits, flax, hemp, silk, honey, &c.

LEGNANO, a town of the above territory, 28 miles N. N. W. of Ferrara.

LEGNANO, PORTO, a town of Italy, on the N. E. side of the Adige, opposite to Legnano.

LEGNOTIS, in botany, a genus of the monogynia order, and polyandria class of plants. Calyx five-cleft; petals five, jagged, inserted into the receptacle; capsule three-celled. It has two species.

LEGUME, [*legumen*, Lat.] among botanists, a pericarpium of an oblong, compressed figure, formed of two valves, joined by a visible suture both on the upper and under parts, and having the seeds affixed to the upper limbs of the two valves, in an alternate order. See **BOTANY**.

LEGUMINOUS, an appellation given to all plants whose fruit is a legume. See **BOTANY**.

LEIBNITZ, GODFREY WILLIAM DE, an eminent mathematician and philosopher, born at Leipsic in Saxony, in 1646. In 1663, he maintained a thesis de Principiis Individuationis. In 1664, he was admitted M. A. He endeavoured to reconcile Plato with

Aristotle, as he afterwards did Aristotle with Des Cartes. But the study of the law was his principal object, and he was admitted L. L. B. in 1665. In 1666 he would have taken the degree of doctor; but was refused it, on pretence that he was too young, though in reality because he had rejected the principles of Aristotle and the schoolmen. Upon this he went to Altorf, where he maintained a thesis de Casibus Perplexis, with such applause, that he had the degree of LL. D. conferred on him. He might have settled to great advantage at Paris; but his aversion to the Roman Catholic religion, made him refuse all offers. In 1673, he went to England; where he became acquainted with John Collins, F. R. S. and Mr. Oldenburg, the Secretary. In 1676, he returned to England, and thence went into Holland, in order to proceed to Hanover, where he proposed to settle. Upon his arrival there, he applied himself to enrich the duke's library with the best books of all kinds. The duke dying in 1679, his successor Ernest Augustus continued to patronize him, and employed him to write the history of the house of Brunswick. He travelled over Germany and Italy to collect materials. Frederic I. king of Prussia, then elector of Brandenburg, founded an academy at Berlin by his advice; and appointed him perpetual president, though he could not reside constantly at Berlin. He projected an academy of the same kind at Dresden, but the execution of this design was prevented by the confusions in Poland. He likewise proposed a scheme of an universal language. His writings had long before made him famous over all Europe. Besides the office of privy-counsellor of justice, which king George I. then elector of Hanover had given him, the emperor appointed him in 1711 aulic counsellor; and Peter the Great made him privy counsellor of justice, with a pension of 1000 ducats. He undertook the establishment of an academy of sciences at Vienna; but the plague prevented the execution of it. However the emperor, as a mark of his favour, settled a pension on him of 2000 florins, and promised him another of 4000 if he would come and reside at Vienna, but he was prevented by death in 1716. His memory was so strong, that to fix any thing in it, he had only to write it once; and he could even in his old age repeat Virgil exactly. He professed the Lutheran religion, but never went to church; and upon his death-bed, his favourite servant, desiring him to send for a minister, he replied, he had no need of one. Foreigners for some time ascribed to him the invention of Fluxions, which had been previously discovered by Sir Isaac Newton.

LEIBNITZIAN PHILOSOPHY, or the **PHILOSOPHY** of **LEIBNITZ**, is a system formed and published by its author in the 17th century, partly in emendation of the Cartesian, and partly in opposition to the Newtonian. The basis of Mr. Leibnitz's philosophy was that of Des Cartes, though in some things he differed from him; for he retained the Cartesian subtle matter, with the universal plenitude and vortices; and represented the universe as a machine, that should proceed for ever by the laws of mechanism, in the most perfect state, by an absolute inviolable necessity. After Sir Isaac Newton's philosophy was published in 1687, he printed an essay on the celestial motions, Act. Erud. 1689, where he admits of the circulation of ether with Des Cartes, and of gravity with Sir Isaac Newton; though he has not reconciled these principles, nor shewn how gravity arose from the impulse of this ether, nor how to account for the planetary revolutions, and the laws of the planetary motions in their respective orbits. That which he calls the harmonical circulation, is the angular velocity of any one planet which decreases from the perihelium to the aphelium in the same proportion as its distance from the sun increases; but this law does not apply to the motions of the different planets compared together; because the velocities of the planets, at their mean distances, decrease in the same proportion as the square roots of the numbers expressing those distances. Besides, his system is defective, as it does not reconcile the circulation of the ether with the free motions of the comets in all directions, or with the obliquity of the planes of the planetary orbits; nor resolve other objections to which the hypothesis of the plenum and vortices is liable. Soon after this period, the dispute commenced concerning the invention of the method of fluxions, which led Mr. Leibnitz to take a very decided part in opposition to the philosophy of Sir Isaac Newton. From the wisdom and goodness of the Deity, and his principle of a sufficient reason, he concluded that the universe was a perfect work, or the best that could pos- sibly

bly have been made; and that other things, which were incommensurable and evil, were permitted as necessary consequences of what was best: the material system, considered as a perfect machine, can never fall into disorder, or require to be set right; and to suppose that God interposes in it, is to lessen the skill of the author, and the perfection of his work. He expressly charges an impious tendency on the philosophy of Sir Isaac Newton, because he asserts, that the fabric of the universe and course of nature could not continue for ever in its present state, but would require, in process of time, to be re-established or renewed by the hand of its Former. The perfection of the universe, by reason of which it is capable of continuing for ever by mechanical laws in its present state, led Mr. Leibnitz to distinguish between the quantity of motion and the force of bodies; and, whilst he owns, in opposition to Des Cartes, that the former varies, to maintain that the quantity of force is for ever the same in the universe, and to measure the forces of bodies by the squares of their velocities. This system also requires the utter exclusion of atoms, or of any perfectly hard and inflexible bodies. The advocates of it allege: that according to the law of continuity, (as they call a law of nature invented for the sake of the theory,) all changes in nature are produced by insensible and infinitely small degrees; so that no body can, in any case, pass from motion to rest, or from rest to motion, without passing through all possible intermediate degrees of motion: whence they conclude, that atoms or perfectly hard bodies are impossible: because if two of them should meet with equal motions, in contrary directions, they would necessarily stop at once, in violation of the law of continuity. Mr. Leibnitz proposes two principles as the foundation of all our knowledge: the first, that it is impossible for a thing to be and not to be at the same time, which, he says, is the foundation of speculative truth: the other is, that nothing is without a sufficient reason why it should be so rather than otherwise; and by this principle, according to him, we make a transition from abstracted truths to natural philosophy. Hence he concludes, that the mind is naturally determined, in its volitions and elections, by the greatest apparent good, and that it is impossible to make a choice between things perfectly like, which he calls indiscernibles; whence he infers, that two things perfectly like could not have been produced even by the Deity: and he rejects a vacuum, partly because the parts of it must be supposed perfectly like to each other. For the same reason he also rejects atoms, and all similar particles of matter, to each of which, though divisible in infinitum, he ascribes a monad, (Act. Lipsiæ, 1698, p. 435,) or active kind of principle, endued, as he says, with perception and appetite. The essence of substance he places in action or activity, or, as he expresses it, in something that is between acting and the faculty of acting. He affirms absolute rest to be impossible, and holds motion, or a sort of *nîsus*, to be essential to all material substances. Each monad he describes as representatives of the whole universe from its point of sight; and after all, in one of his letters he tells us, that matter is not a substance, but a *substantiatum* or *phenomène bien fondé*. He frequently urges the comparison between the effects of opposite motives on the mind, and of weights placed in the scales of a balance, or of powers acting upon the same body with contrary directions. His learned antagonist, Dr. Clarke, denies that there is a similitude between a balance moved by weights, and a mind acting upon the view of certain motives; because the one is entirely passive, and the other not only is acted upon, but acts also. The mind, he owns, is purely passive in receiving the impression of the motive, which is only a perception, and is not to be confounded with the power of acting after, or in consequence of, that perception. The difference between a man and a machine does not consist only in sensation and intelligence, but in this power of acting also. The balance, for want of this power, cannot move at all when the weights are equal; but a free agent, he says, when there appear two perfectly alike reasonable ways of acting, has still within itself a power of choosing; and it may have strong and very good reasons not to forbear.

LEICESTER, or **LEICESTERSHIRE**, an inland county of England, about 170 miles in circumference, and in form almost circular. It has Nottinghamshire and Derbyshire on the N. Rutlandshire and Lincolnshire on the E. Warwickshire on the W. from which it is parted by the Roman military way called Watling-street; and by Northamptonshire on the S. It is a cham-

paign country, and fertile in corn and grass, being watered by several rivers, as the Soar, which passes through it, and abounds in excellent salmon, &c. the Wreke, Trent, Eye, Sense, Auker, and Aven. These rivers, being mostly navigable, greatly facilitate trade.

LEICESTER, the capital of the above county, 27 miles N.N.E. of Coventry, and 98 N. N. W. of London. Lon. 1. 3. W. Lat. 52. 38. N.

LEICESTER, a town of Massachusetts, 55 miles W. by S. of Boston.

LEIGH, a sea-port of Essex, on a creek in the mouth of the Thames, 15 miles S. S. E. of Chelmsford, and 24 E. of London.

LEIGH, a town of Lancashire, 7 miles N. of Warrington.

LEIGHLIN, a borough of Ireland, in the county of Carlow, Leinster; about 43 miles from Dublin, near the river Barrow.

LEIGHTON, ROBERT, D. D. archbishop of Glasgow, was born at Edinburgh. During Cromwell's usurpation, he was minister of a church near Edinburgh, and distinguished himself by his charity, and his aversion to religious and political disputes. The ministers were then called over yearly in the synod; and were commonly asked, Whether they had preached to the times? "For God's sake (answered Leighton,) when all my brethren preach to the times, suffer me to preach about eternity." His moderation, however, giving offence, he retired to a life of privacy. But soon after, he was called by the unanimous voice of the magistrates, to preside over the college of Edinburgh; where, during ten years, he displayed all the talents of a prudent, wise, and learned governor. In 1662, when the ill-judged affair of introducing episcopacy into Scotland was resolved on, Leighton was consecrated bishop of Dunblane, and immediately gave an instance of his moderation: for when Sharpe and the other bishops proposed to enter Edinburgh in a pompous manner, Leighton remonstrated against it; but finding that what he said had no weight, he left them, and went to Edinburgh alone. Leighton, in his own diocese, set such a remarkable example of moderation, that he was revered even by the most rigid Presbyterians. He went about preaching without any pomp; gave liberally to the poor; and removed none of the ministers, however exceptionable he might think their political principles. Finding it was not in his power to stem the violence of the times, he resigned his archbishopric, in 1675, and retired into Sussex, where he devoted himself to acts of piety. He died at London, in 1684. He was of a most amiable disposition; strict in his life, polite, cheerful, engaging in his manners, and profoundly learned. He wrote a "Commentary on St. Peter;" besides many sermons and useful tracts, which are greatly esteemed. He bequeathed his library to the church and clergy of Dunblane; and sunk about 840*l.* for bursaries and other charitable purposes in the colleges of Edinburgh and Glasgow, and parish of Dunblane.

LEIGHTON, or **LEIGHTON-BUZZARD**, a large town of Bedfordshire, $7\frac{1}{2}$ miles W. N. W. of Dunstable, and 41 N. W. of London.

LEININGEN, or **LINANGE**, a late county of Germany, in the palatinate of the Rhine, now included in the department of Mont Tonnere. It is fertile in corn, wine, and fruits.

LEININGEN, **NEW**, the capital of the above county, 11 miles S. W. of Worms, and 30 S. of Mentz.

LEINSTER, the eastern province of Ireland, bounded by Ulster on the N.; St. George's, or the Irish Channel, on the E. and S.; and by the provinces of Connaught and Munster on the W. The capital of this province and of the kingdom is Dublin. It contains twelve counties, viz. Carlow, Dublin, Kildare, Kilkenny, King's-county, Longford, Louth, Meath, Queen's-county, West Meath, Wexford, and Wicklow. It is the most level, fertile, and best cultivated province in the kingdom. It is about 124 miles long, and 74 broad, and extends from $51^{\circ} 45'$ to $53^{\circ} 45'$ Lat. N.

LEIPHEIM, a town of Suabia, 11 miles N. E. of Ulm.

LEIPSIK, or **LEIPZIG**, a large, strong, and populous town of Misnia, with a castle, and a famous university. Lon. 12. 21. E. Lat. 51. 22. N.

LEYTH, anciently called Inverleith, the port of Edinburgh, is seated on the banks of the Forth, about two miles from the capital.

LEITMERITZ,

LEITMERITZ, a town of Bohemia, 28 miles N. N. W. of Prague, and 34 S. S. E. of Dresden.

LEITRIM, a county of Ireland in the province of Connaught, bounded on the N. by the bay of Donnegal and part of Fermanagh, on the S. and W. by Sligo and Roscommon, and on the E. by Fermanagh and Cavan.

LEITRIM, the capital of the above county, 80 miles N. W. of Dublin. Lon. 8. 9. W. Lat. 53. 46. N.

LEIXLIP, or **LEINSLIP**, a town of Ireland in Kildare, Leinster, about 8 miles W. of Dublin.

LELAND, **JOHN**, the great English antiquary, was born in London about the year 1507. Having lost his parents when a child, he found a friend and patron in Mr. Thomas Miles, who placed him in St. Paul's school, of which the grammarian Lilye was master. From that school, he was sent to Cambridge, and after some years, to Oxford. From Oxford he went to Paris, chiefly with a design to study the Greek language, which was then but little understood in this kingdom. On his return to England he took orders, and was appointed chaplain to Henry VIII. who also gave him the rectory of Poppeling, in the marshes of Calais, appointed him his librarian, and in 1533 made him king's antiquary; an office never borne by any other person before or since. By this commission he was empowered to search for ancient writings in all the libraries of colleges, abbeys, priories, &c. in his majesty's dominions. It is said, that he renounced popery soon after his return to England. In 1536, he obtained a dispensation to keep a curate at Poppeling, and set out on his journey in search of antiquities. In this employment he spent six years, during which time he visited every part of England, where monuments of antiquity were to be expected. After his return, in 1542, the king gave him the rich rectory of Haseley in Oxfordshire; and in 1545, a prebend of King's College, now Christ's church, in Oxford, besides that of East and West Knowle, in Salisbury. Being thus amply provided for, he retired to a house of his own in the parish of St. Michael le Querne in London, where he spent six years in digesting the materials he had collected. Henry VIII. died in 1547; and not long after, Leland lost his senses. In this dreadful state he continued till 1552, when he died. He was a man of great learning, an universal linguist, an excellent Latin poet, and a most indefatigable and skilful antiquary. On his death, Edward VI. gave all his papers to Sir John Checke, his tutor and Latin secretary of state. The king dying, and Sir John being obliged to leave the kingdom, he gave four folio volumes of Leland's collections to Humphrey Purefoy, Esq. which, in 1612, were by his son given to William Burton, author of the History of Leicestershire. This gentleman also became possessed of the Itinerary in eight volumes folio, which, in 1632, he deposited in the Bodleian library. Many other of Leland's MSS. after the death of Sir John Checke, fell into the hands of Lord Paget, Sir William Cecil, and others, and at last fortunately came into the possession of Sir John Cotton. These MSS. were of great use to all our subsequent antiquarians, particularly Camden, Sir William Dugdale, Stowe, Lambard, Dr. Batteley, Ant. Wood, &c. His "Itinerary throughout most Parts of England and Wales," was published by Mr. Hearne, in nine volumes, octavo, in 1710-11; as was also his "Collectanea de rebus Britannicis," in six vols. 8vo. in 1715.

LELAND, **JOHN**, an eminent writer in defence of Christianity, born at Wigan in Lancashire in 1691, of pious and virtuous parents. They took the earliest care to season his mind with proper instructions; but, in his sixth year, the small pox deprived him of his understanding and memory, and expunged all his former ideas. He continued in this deplorable state near a year, when his faculties seemed to spring up anew; and though he did not retain the least trace of any impressions made on him before the distemper, he now discovered a quick apprehension and strong memory. In a few years after, his parents settled in Dublin, which gave him an easy introduction to learning and the sciences. When properly qualified, he was called to be pastor to a congregation of Protestant dissenters in that city. He was an able preacher, but his labours were not confined to the pulpit. The many attacks made on Christianity, and by some writers of no contemptible abilities, led him to examine the subject with the strictest care. Upon the most deliberate inquiry, the truth and divine original, as well as the excellence and importance of Chris-

tianity, appearing to him with great lustre, he published answers to several authors who successively appeared in that cause. His was indeed a master in this controversy; and his history of it, entitled, "A View of the Deistical Writers, that have appeared in England, in the last and present Century, &c." is highly and justly esteemed. In the decline of life he published another laborious work, entitled, "The Advantage and Necessity of the Christian Revelation, shewn from the State of Religion in the ancient Heathen World, especially with respect to the Knowledge and Worship of the One true God; a Rule of moral Duty, and a State of future Rewards and Punishments; to which is prefixed, a long preliminary Discourse on Natural and Revealed Religion;" two vols. 4to. This noble and extensive subject, the several parts of which have been slightly and occasionally handled by other writers, Leland has treated at large with the greatest care, accuracy, and candor. And, in his "View of the Deistical Writers," his cool and dispassionate manner of treating their arguments, and his solid confutation of them, have contributed more to depress the cause of atheism and infidelity, than the angry zeal of warm disputants. But not only his learning and abilities, but also his amiable temper, great modesty, and exemplary life, recommended him to general esteem and affection. He died in 1760, or in 1761, according to Dr. Watkins.

LELEGEIS, the ancient name of Miletus, from the Leleges, the first inhabitants of it.

LELEGES, an ancient people of Asia, of Greek original; the name denoting a collection of people. They first occupied the islands; then passing over to the continent, they settled partly in Mysia on the Sinus Adramyttenus, and partly in that part of Ionia next to Caria.

LELEGES, a people of Laconia, who went to the Trojan war with Altes their king. Achilles plundered their country, and obliged them to retire to the neighbourhood of Halicarnassus, where they fixed their habitation.

LELEGES, a name given to the inhabitants of Megara for some time, from Lelex, one of their kings.

LELEX, an Egyptian, who came with a colony to Megara, where he reigned about two hundred years before the Trojan war.

LELEX, the first king of Laconia, in Peloponnesus. His subjects were called Leleges, and the country where he reigned Lelegia.

LEMAN, or **LAC LEMAN**, a department of France, comprehending the late republic of Geneva; so named from Lemanus, the ancient name of the lake of Geneva.

LEMBERG, or **LEMBURG**, a late palatinate of Poland, in Red Russia, which now forms part of the modern kingdom of Galicia.

LEMBERG, a town of Poland, late capital of Red Russia, and of the late palatinate of Lemberg, on the Pelteu; and now the capital of the modern Austrian kingdom of Galicia. It is 150 miles E. of Cracow, and 212 S. of Warsaw. Lon. 24. 46. E. Lat. 49. 51. N.

LEMBRO, or **EMBRO**, an island of the Archipelago, on the coast of Romania, 22 miles in circumference; with a town, river, and harbour, of the same name, anciently called Imbros. Lon. 20. 0. E. Lat. 40. 25. N.

LEMERY, **NICHOLAS**, a celebrated chemist, born at Rouen in Normandy in 1645. After having made the tour of France, he, in 1672, commenced an acquaintance with M. Martyn apothecary to the prince; and performed several courses of chemistry in his laboratory at the Hotel de Condé; which brought him to the knowledge and esteem of the prince. Having procured a laboratory of his own, he gave lectures on chemistry, which were attended by such numbers of scholars as scarcely to allow him room to perform his operations. He was the first modern chemist, who abolished the senseless jargon of barbarous terms, reduced the science to clear and simple ideas, and promised nothing that he did not perform. In 1681, he was disturbed on account of his religion; and came to England, where he was well received by Charles II. but affairs not promising tranquillity, he returned to France, where the revocation of the edict of Nantz made him turn Catholic, to avoid persecution. He then became associate chemist and pensionary in the Royal Academy of Sciences, and died in 1715. He wrote, 1. A Course of Chemistry. 2. Au Universel Pharmacopœie

Pharmacopœia. 3. An Universal Treatise of Drugs; and 4. A Treatise on Antimony.

LEMMA, [of *suppono*, I assume,] in mathematics, denotes a proposition, laid down to clear the way for some following demonstration; and prefixed either to theorems, to render their demonstrations less intricate; or to problems to make their resolution more easy.

LEMNA, DUCK'S MEAT; in botany, a genus of the diandria order, and monocœcia class of plants; natural order, Miscellanæa. Male, calyx one-leaved; corolla none; female, calyx one-leaved; corolla none; style one; capsule one-celled. There are six species, growing in ditches and stagnant waters in most parts of Europe; all acceptable food for ducks and geese.

LEMNIAN EARTH, or LEMNIA TERRA, a medicinal, astringent sort of earth, or chalk, of a fatty consistence and reddish colour; used in the same cases as bole. It has its name from the island of Lemnos, whence it is chiefly brought.

LEMNISCIA, a genus of the class and order polyandria monogynia. Calyx five-toothed; corolla six-petaled, recurved; nectary cap-shaped, girding; the germ; pericarpium five-celled; seeds solitary. There is one species, a tree of Guiana.

LEMNOS, in ancient geography, an island in the Ægean sea, near Thrace, called also Dipolis, from its consisting of two towns. It is now called Stalimeue.

LEMON, [*limonium*, low Lat.] in botany, the fruit of the lemon-tree. See CITRUS.

LEMONS, SALT OF, used to remove ink stains from linen, is the native salt of sorrel, the super-oxalate of potass. The effect is produced by the oxalic acid dissolving with facility the oxide of iron in the ink, on the combination of which with the tannin and gallic acid the colour depends; while, at the same time, it can be used without any risk of injury to the cloth, on which it has no effect. See ONALATE.

LEMONADE, a liquor prepared of water, sugar, and lemon or citron juice. It is very cooling and grateful. Lemon-juice is one of the most cooling and antiseptic vegetable productions; it ought to form an article of the side-board, as well as the medicine-chest; for it improves the taste, and corrects the putrid tendency of animal food in the summer. Hence lemonade affords a grateful and cooling beverage for febrile patients; but it should be remarked, that the acid of lemons must never be freely given to persons, whose breast or respiration is affected.

LEMOVICES, a people of Aquitania, situated between the Bituriges Cubi on the N. the Arverni on the E. the Cadurci on the S. and the Pictones on the W. Before the revolution, this country was called Limosin and La Marche.

LEMPTA, a desert country of Africa, inhabited by a fierce people who rob the caravans, between Constantina and Nubia. Lon. 9. 0. E. Lat. 26. 30. N.

LEMUR, the MAUCAUCO, in zoology, a genus of the mammalia class of quadrupeds, and of the order primates. Generic character: in the upper jaw four front-teeth, the intermediate ones remote; in the lower jaw six, longer, extended forwards, compressed, parallel, and approximated; tusks solitary and approximated; grinders several, and sometimes many, sublobated, the foremost somewhat longer and sharper. This genus of animals is very similar to that of monkeys in the structure of the feet. Some species have no tails, and others have tails of an extraordinary length. There are thirteen species, all of which differ much from the monkeys in their manners.

L. CATTa, the RING-TAILED MAUCAUCO, inhabits Madagascar, Mauritius, Joanna, and the neighbouring African continent. It is of the size of a cat; has the hair on the top and hind part of the head of a deep ash-colour, the back and sides reddish, the belly and insides of the limbs white; all its hair is very soft, close, and fine, and erect like the pile of velvet; the tail is twice the length of the body. It is very good-natured, and has all the life of a monkey, without its mischievous disposition; it is very cleanly, and has a weak cry. In a wild state they go in troops of thirty or forty, but are easily tamed when taken young.

L. ECAUDATUS, the TAIL-LESS MAUCAUCO, a small animal found in Bengal and the island of Ceylon. It is of a very singular construction, and perhaps longer in proportion to its thickness than any other quadruped. The head is roundish, with a sharp-pointed nose, and small ears: the body is covered with short,

soft, and silky ash-coloured and reddish fur: the toes are naked, and the nails flat; excepting those of the inner toe on each hind-foot, which are long, crooked, and sharp. Its length from the nose to the rump is sixteen inches. It lives in the woods, and feeds on fruits. In a tame state, it appears to be fond of eggs, and devours small birds. This animal has the inactivity of the sloth, and creeps slowly along the ground: it is very tenacious of its hold, and makes a plaintive noise.

L. MACACO, or CAUDATUS, the RUFFED MAUCAUCO, or the VARI of Buffon, is an inhabitant of Madagascar. It is somewhat larger than the Catta, and has long hair standing out round the sides of the head like a ruff: a long tail; the colour of the whole animal generally black, but sometimes white spotted with black. In a wild state, it is a furious animal; and fills the woods with its cries. Mr. Ker distinguishes four varieties of this species: viz. Black, Brown, White, and Pied Vari. See Plate C.

L. PODJI, the TARSIER of Buffon, has a pointed visage; slender nose, bilobated at the end: eyes large and prominent: ears erect, broad, naked, semitransparent, an inch and a half long with a tuft of hair between them on the top of the head, and long hairs on each side of the nose, and on the upper eye-brow.

L. VOLANS; the FLYING MAUCAUCO, the COLUGO of Pallas, or FLYING CAT of TERNATE, resembles a bat; being furnished with a strong membrane like that animal, by which it is enabled to fly. It inhabits the country about Guzarat, the Molucca isles, and the Philippines; feeds on fruits, and is very distinct both from the bat and flying squirrel. Mr. Pennant says it is three feet long; nearly as broad when expanded; the tail one foot; the head long, mouth, teeth, and ears, small; the hair ash-coloured; the legs covered with yellow down; the paws five-toed; the claws crooked and very sharp. See Plate C.

LEMURES, in antiquity, sprites or hobgoblins; restless ghosts of departed persons, who were supposed to return to terrify and torment the living. These are the same with the larvæ, whom the ancients imagined to wander round the world, to frighten good people, and plague the bad. For which reason at Rome they had lemuria, or feasts instituted to appease the manes of the defunct. See LARES.

LEMURIA, or LEMURALIA, a feast solemnized at Rome on the 9th of May, to pacify the manes of the dead, or in honour of the lemures. It was instituted by Romulus, to appease the ghost of his murdered brother Remus, which he thought was continually pursuing him to revenge the horrid crime.

LENA, a great river of Asia, in Siberia, which rises in Lat. 52. 30. N. and Lon. 106. 44. E. of Ferro. After traversing a large tract of land, it divides into five branches, about Lat. 73°. Three of these run W. and two E. by which it runs into the Icy Sea. In its course to the northern ocean, sixteen large rivers fall into it.

LENÆA, [from *λινος*, a wine-press,] a festival kept by the Greeks in honour of Bacchus, at which there was much feasting and Bacchanalian jollity.

LENCICIA, or LENCZICZ, a strong town of the late Polish Prussia, and present duchy of Warsaw, 60 miles S. W. of Warsaw.

LENGLET, NICHOLAS, DU FRESNOY, abbé, a celebrated French author, born at Beauvois, in 1674. He wrote on various subjects, historical, geographical, political, and philosophical. The following merit notice: 1. A Method of Studying History, with a Catalogue of the Principal Historians of every Age and Country; 1713. This work was translated into most modern languages, particularly our own, with improvements, by Richard Rawlinson, LL. D. and F. R. S. and published at London in 1730, in two vols. 8vo. 2. A copious Abridgment of Universal History and Biography, in Chronological Order, under the title of "Tablettes Chronologiques;" which first appeared at Paris in 1744, in two vols. 8vo. and was universally admired. In the subsequent editions he made several corrections and improvements; and from one of these, an English translation was published at London in 1762, in two vols. large 8vo. Another edition appeared in 1763, in which the general history was brought down to 1762. Du Fresnoy, however, loaded his work with catalogues of saints, martyrs, councils, synods, heresies, schisms, and other ecclesiastical matters, fit only for the libraries of Popish convents.

He was secretary to the French ambassador at Cologne in 1705, when he discovered a plot of delivering up Mons to the English. In 1721, he became librarian to Prince Eugene. He lived 82 years, but his end was tragical; for, falling asleep by the fire, he fell into it, and his head was nearly burnt off, before the accident was discovered. This happened in 1736.

LENHAM, a town of Kent, near the source of the Len, 9 miles E. of Maidstone, and 48 E. S. E. of London.

LENITIVE, [from *lenis*, gentle,] in medicine, gentle purgatives.

LENITIVE ELECTUARY, a preparation kept in the apothecaries' shops, and consisting generally of two parts of pulverized senna; one part of coriander-seeds in powder, incorporated with four parts of the pulp of tamarinds; a similar portion of prunes; and a sufficient quantity of simple syrup, so as to reduce the whole into an electuary. It is chiefly employed as a gentle aperient in doses of one tea-spoonful, taken frequently in the course of the day; but, as it is apt to become mouldy, and to lose its efficacy, if kept too long, it ought to be newly prepared, and may be more advantageously employed as a vehicle for administering the more active medicines. Nor should this compound be indiscriminately swallowed by the lower classes of people, who thus cloy their stomachs on every occasion, without knowing whether it be a proper medicine for their complaint.

LENNOX, or DUNBARTON-SHIRE, a county of Scotland, 24 miles long, and 20 broad, bounded on the S. by the river and frith of Clyde; on the W. by Lochlong and Argyllshire; on the N. by the Grampians, and on the E. by Monteith and Stirlingshire. Great part of it is fit for nothing but pasture and sport; even in the lower lands, the soil is not very fertile; yet the face of the country is agreeably diversified with hills, dales, mountains, heath, rivulets, rivers, lakes, woods, fields of corn, and gentlemen's seats and plantations.

LENS, [*lens*, a lentil, called from its resemblance to a lentil-seed,] a piece of glass, or any other transparent substance, the surfaces of which are so formed, that the rays of light, by passing through it, are made to change their direction, either tending to meet in a point beyond the lens, or made to become parallel after converging or diverging; or proceeding as if they had issued from a point before they fell upon the lens. See OPTICS.

LENS, in geography, a town of France, in the department of the Straits of Calais, and late province of Artois, $7\frac{1}{2}$ miles N. W. of Douay, and 95 N. E. of Paris.

LENT, [*lenten*, Sax. the spring,] a solemn time of fasting in the Christian church. Those of the Latin church, and some of the Protestant communion, maintain, that it was always a fast of forty days, and, as such, of apostolical institution. Others think it was only of ecclesiastical institution, and that it was variously observed in different churches, and grew by degrees from a fast of forty hours to a fast of forty days. This is the opinion of Morton, bishop Taylor, Du Moulin, Daille, and others. The ancient manner of observing lent, among those who were piously disposed, was to abstain from food till evening: their only refreshment was a supper; and it was indifferent whether it was flesh or any other food, provided it was used with sobriety and moderation. Lent was thought the proper time for exercising, more abundantly, every species of charity. Thus what they spared from their own bodies by abridging themselves of a meal, was usually given to the poor; they employed their vacant hours in visiting the sick, and those that were in prison; in entertaining strangers, and reconciling differences. The imperial laws forbade all prosecution of men in criminal actions, that might bring them to corporal punishment and torture, during the whole season. This was a time of more than ordinary strictness and devotion, and therefore in many of the great churches they had religious assemblies for prayer and preaching every day. All public games and stage-plays were prohibited; as well as the celebration of all festivals, birth-days, and marriages, as unsuitable to the occasion. The Christians of the Greek church observe four lents: the first commences on the 15th of November, the second is the same with that of the church of England; the third begins the week after Whitsuntide, and continues till the festival of St. Peter and St. Paul; and the fourth commences on the 1st of August, and lasts till the 15th. All these lents are observed with great strictness;

but on Saturdays and Sundays they drink wine and use oil, which are prohibited on other days.

LENTIL, in botany. See ERVUM.

LENTINI, a river of Sicily, in the valley of Noto, anciently called Terias. It runs into the Adriatic, five miles below.

LENTINI, a town of Sicily, seated on the above river, anciently called Leontium, 10 miles N. W. of Augusta, and 19 N. W. of Syracuse.

LEO, [*leu*, from לָאוּ, Heb.] in zoology. See FELIS.

LEO, in astronomy, the fifth sign of the ecliptic; also the fifth constellation in the zodiac. See ASTRONOMY.

LEO, a native of Byzantium, who flourished about B. C. 350, and wrote some treatises on physic and history, which are lost. His philosophy, patriotism, and political abilities, while they endeared him to his countrymen, who employed him as ambassador to Athens, Macedonia, &c. on their most important business, excited the jealousy of Philip III. of Macedon; who saw his ambitious designs would be frustrated while such a vigilant patriot lived. He therefore got a letter forged in Leo's name, offering to betray Byzantium to the king of Persia, which produced the desired villainous effect. The mob ran enraged to the house of the philosopher, who to avoid their fury killed himself.

LEO, the name of six emperors of the East.

LEO III. the ISAURIAN, was the son of a poor mechanic, but entering the army, became one of the body-guard to Justinian II. and was made a general by Anastasius II. who, in 717, made him his colleague in the empire. The Saracens having ravaged Thrace, besieged Constantinople, but Leo bravely defended it, and repulsed them. After this he proved a tyrant, and burnt the library of Constantinople, containing above 30,000 volumes, besides a vast quantity of medals and other antiquities. He died in 741, and was succeeded by his son Constantine V.

LEO is also the name, real or assumed, of eleven popes of Rome.

LEO X. whose proper name was John de Medicis, is ever to be remembered by Protestants, as having proved the cause of the reformation, begun by Martin Luther. He was made a cardinal at 14 years of age, and some years after a legate, by Julius II. He was in that quality in the army, which was defeated by the French near Ravenna, in 1512, where he was taken prisoner. The soldiers, who took him, humbly asked his pardon for gaining the victory, besought him to give them absolution for it, and promised never to bear arms against the pope. When Julius died, Medicis was very ill of the venereal disease at Florence, and was carried to Rome in a litter. Hurrying about every night to the cardinals of his faction, his ulcer broke, and the matter which ran from it exhaled such a stench, that all the air in the conclave was poisoned by it. Upon this the cardinals consulted the physicians, to know what the matter was. They, being bribed, said the cardinal de Medicis could not live a month; which occasioned his being chosen pope. Thus cardinal de Medicis, then not 30 years of age, was elected pope, in consequence of his debaucheries, upon a false information; and as joy is a sovereign remedy, he soon recovered his health. He was better calculated for a temporal, than a spiritual prince, being ambitious, politic, luxurious, a connoisseur in the fine arts, and an accomplished fine gentleman: thus qualified, it is no wonder that, neglecting the true interest of his church, he should avail himself of the folly of religious dupes, and publicly sell indulgences to support his prodigality; especially as he was known to disbelieve Christianity itself, which he called, a very profitable fable for him and his predecessors. In 1517, he published general indulgences throughout Europe (and ordered the priests to recommend them) in favour of those who would contribute any sum towards completing the church of St. Peter; and thus paved the way for the reformation. Leo died in 1521, aged 45. It is but justice to add, that this pope was principally owing the revival of literature in Italy. He spared neither pains nor expence to recover ancient MSS. and procured good editions of them; he favoured the arts and sciences: and gloried in being the patron of learned and ingenious men.

LEO, Sr. a small but strong town of Italy, in the duchy of Urbino. Lon. 12. 25. E. Lat. 43. 57. N.

LEOBEN, a town of Stiria, on the Muehr, 68 miles S. W. of Vienna.

LEOBSCHUZ, a town of Silesia, 27 miles W. N. W. of Ratibon.

LEOMINSTER, a large and populous borough of Herefordshire, seated on the Lug, 26 miles W. by N. of Worcester, and 137 W. N. W. of London.

LEON, an ancient town of France, in the department of Finisterre, and late province of Lower Bretagne, late capital of the Lenois.

LEON, a province of Spain, anciently a kingdom; bounded on the N. by Asturias; on the W. by Galicia and Portugal; and on the S. and E. by Estremadura and Castile. It is about 125 miles long, 100 broad, and is divided into two almost equal parts by the Duero. It produces all the necessaries of life, and was the first Christian kingdom in Spain.

LEON, an ancient and large episcopal town, capital of the above kingdom, 150 miles N. W. of Madrid. Lon. 5. 31. W. Lat. 42. 35. N.

LEON DE NICARAGUA, a town of New Spain, capital of the province of Nicaragua; the residence of the governor, and a bishop's sec. Lon. 86. 10. W. Lat. 12. 25. N.

LEONARD, **ST. LE NOBLET**, an ancient town of France, in the department of Upper Vienne, and late province of Guienne and territory of Lamosin, 12 miles N. E. of Limoges, and 195 S. of Paris.

LEONCLAVIUS, **JOHN**, one of the most learned men of the 16th century, was a native of Westphalia. He travelled into Turkey, and collected excellent materials for composing *The Ottoman History*; and it is to him the public is indebted for the best account we have of that empire. To his knowledge in the learned languages, he had added that of civil law; whereby he was very well qualified to translate the *Basilica*. His other versions were esteemed. He died in 1593, aged 60.

LEONHARD, or **LEONHART**, **ST.** a town of Carinthia, on the Levant, 104 miles W. S. W. of Vienna, and 42 E. of Claufenfurt. Lon. 15. 23. E. Lat. 46. 57. N.

LEONIDAS I. king of Sparta, a renowned warrior, slain in defending the straits of Thermopylae against Xerxes, 480. B. C. There were other two Spartan kings of this name.

LEONINE VERSES, those verses of which the end rhimes to the middle; as,

Gloria factorum temere conceditur horum.

Leonine Verses were much used in ancient hymns, epigrams, prophecies, &c. The origin of the word is uncertain: Pasquier derives it from *Leoninus* or *Leonius*, who excelled in this way; and dedicated several pieces to Pope Alexander III.; others derive it from Pope *Leo*; and others from *leo*, the lion, esteeming it the loftiest of all verses, as the lion is stiled the king of beasts.

LEONTEUKA, a town of Russia, in Novgorod.

LEONTICA, feasts or sacrifices celebrated among the ancients in honour of the sun. They were called Leontica, and the priests who officiated at them Leones, because they represented the sun under the figure of a lion radiant, bearing a tiara, and gripping in his two fore-paws the horns of a bull, who struggled with him in vain to disengage himself.

LEONTICE, **LION'S LEAF**; a genus of the monogynia order, and hexandria class of plants, natural order, Corydalis. Calyx six-leaved, deciduous; corolla six-petaled: nectary, six-leaved, placed on the claws of the corolla, spreading. There are three species.

LEONTINI, or **LEONTIUM**, a town of Sicily on the S. side of the river Terias, 20 miles N. W. of Syracuse. The territory, called Campi Leontini, was extremely fertile; anciently called Campi Lastrigoni, the seat of the Lastrigons, according to the commentators on the poets: the name Leontini from *Leo*, the impression on their coin being a lion. It is now called Lentini.

LEONTODON, **DANDELION**; a genus of the polygamia æqualis order, and syngenesia class of plants; natural order, Compositæ. Receptacle naked; calyx imbricate, with the scales somewhat loose; pappus feathery. There are four species.

LEONTODON TARAXACUM, the **COMMON DANDELION**, is found on the road-sides, in pastures, and on the banks of ditches, in most parts of Europe. Early in spring, the leaves, whilst yet

white, and hardly unfolded, are an excellent ingredient in salads. The French eat the roots and tender leaves with bread and butter.

LEONURUS, **LION'S TAIL**; a genus of the gymnospermia order, and didynamia class of plants; natural order, Verticillata. Anthere powdered with shining points, or small elevated globular particles. There are five species.

LEOPARD, [*λεων*, a lion, and *παρδος*, a panther,] in zoology. See **FELIS**.

LEOPARDALIS, in zoology. See **FELIS**.

LEOPARD'S BANE, in botany. See **DORONICUM**.

LEOTONG, an extensive country of Asia, bounded on the S. by the sea and a part of China; on the W. by part of Tartary; on the N. by Chinese Tartary, and on the E. by Korea. From this country the Tartars entered China, when they conquered it. The inhabitants are neither so polite nor so industrious as the Chinese.

LEPANTO, a very considerable town of European Turkey, in Livadia. Near this town Don John of Austria obtained the famous victory, over the Turkish fleet in 1571. Lon. 22. 13. E. Lat. 38. 34. N.

LEPAS, the **ACORN-SHELL**; in zoology, a genus belonging to the order of vermes testacea. Animal, a triton; shell multivalve, unequal, fixed by a stem, or sessile. There are above 30 species, of which the most remarkable is, the

L. ANATIBERA, consisting of five shells depressed, affixed to a pedicle, and in clusters. It adheres to the bottom of ships by its pedicles. The tentacula are feathered. See Plate **XCVIII**.

LEPERS, **ISLE OF**, one of the new Hebrides. The natives are partly blacks, partly mulattoes. They are much afflicted with the leprosy, which led M. Bougainville to give the island this name. Lon. 167. 58. E. Lat. 15. 23. S.

LEPIDIUM, **DITTANDER**, or **PEPPERWORT**; a genus of the siliculosæ order, and tetradynamia class of plants; natural order, Siliquosæ. Silicula emarginate, cordate, many-seeded; valves carinated, contrary or broader than the partition. There are 23 species.

LEPIDOPTERA, in zoology, an order of insects, with four wings, covered with imbricated squamulae. The genera are papilio, phalaena, and sphinx. See **ENTOMOLOGY**.

LEPISMA, in zoology, a genus of apterous insects, the characters of which are these: feet six, formed for running; mouth furnished with four palpi, two cetaceous, two capitated; the tail is terminated by extended bristles, and the body imbricated with scales. There are seven species.

L. SACCHARINA, is an American species, so called because mostly found among sugar; but is now common in Europe. It is of a leaden colour, rather inclining to that of silver, by the small silvery scales with which it is covered; in which circumstance it resembles the silver fish, especially in its under part. It is found in gardens, under boxes, and in the crevices of window-sashes in houses, where it is very common. It runs with great swiftness, and is difficult to catch. See Plate **LXXVI**.

LEPROSY, [*lepra*, Latin,] a foul cutaneous disease, appearing in dry, white, thin, scurfy scabs, either on the whole body, or part of it, and usually attended with a violent itching and other pains. See **MEDICINE**. The leprosy is of various kinds, but the Jews were particularly subject to that called **ELEPHANTIASIS**. The Jewish law excluded all lepers from communion with mankind, without excepting even kings. And various ceremonies were ordained to be performed by them after they were cleansed, previous to their re-admission into Society. See **LEV. xiii. 42—59. xiv. 1—57**.

LEPTOCEPHALUS, the **MORRIS**, in zoology, a genus of fishes of the order apodes. Head small, narrow; body exceedingly thin, compressed; pectoral fins, none. Mr. Morris first discovered this fish near the isle of Anglesea. It is four inches long, with an exceedingly small head, and a body so thin as to be nearly transparent.

LEPTOSPERMUM, in botany, a genus of the icosandria monogynia class and order. Natural order, Myrti. Calyx five-cleft, half superior; petals five, with claws, longer than the stamens; stigma capitate; capsule four or five-celled; seeds angular. It has eleven species.

L. SCOPARIUM is a small tree or shrub, growing to a moderate height, generally bare on the lower part, with a number of small branches

branches growing close together towards the top; the younger ones are silky: it grows commonly in dry places near the shores in New Zealand; the underwood in Adventure bay, Van Dieman's land, chiefly consists of shrub.

LEPTURA, in zoology, a genus of insects of the order Coleoptera. Antennæ setaceous; feelers four, filiform; shells tapering towards the tip; thorax slender, rounded. There are about one hundred and fifty species, in two divisions, viz. A. lip entire; B. lip bifid. The species are chiefly distinguished by their colour, and some of them are very beautiful.

LEPUS, the **HARE**, in astronomy, a constellation of the southern hemisphere. See **ASTRONOMY**.

LEPUS, the **HARE**, in zoology, a genus of the mammalia class of quadrupeds, and order glires. The characters are these: they have two fore-teeth in each jaw; the upper double, the interior ones being smallest; fore-feet have five toes each, hind-feet four. There are 15 species.

L. ALPINUS, the **MOUNTAIN HARE**, or **ALPINE RABBIT**, has short, broad, rounded ears; no tail; a long head, and very long whiskers, with two very long hairs above each eye: the colour of the fur at the bottom is dusky, towards the ends of a bright ferruginous colour; the tips white, and intermixed are several long dusky hairs, though on the first inspection the whole seems of a bright bay. The length of the animal is nine inches. This species is common in Siberia and the Fox islands. They inhabit always the middle region of the snowy mountains, in the rudest places, wooded, and abounding with herbs and moisture. They sometimes form burrows between the rocks, and often lodge in the crevices. They are generally found in pairs; but in cloudy weather they collect together, and lie on the rocks, and give a keen whistle, very like that of a sparrow. On the report of a gun, they run into their holes, but soon come out again. By wonderful instinct they provide against the rigorous season. A company of them, toward autumn, collect together vast heaps of herbs and grasses, nicely dried, which they place either beneath the over-hanging rock, or between the chasms, or round the trunks of trees. In many places the herbs appear scattered, as if to be dried in the sun. The heaps are formed of round or conoid ricks; and are of various sizes, according to the number of the society employed in forming them. They are sometimes of a man's height, and many feet in diameter, but usually about three feet. Without this provision of winter's stock they would perish during the storms of snow. They select the best of vegetables, and crop them when in the fullest vigour, which they make into excellent hay, by drying it. These ricks occasion fertility amidst the rocks; for the reliques, mixed with the dung of the animal, rot in the barren chasms, and form a soil productive of vegetables. These ricks are also of great service to those people who hunt sables; for their horses would often perish, if they had not the provision of these little industrious animals to support them; which is easily to be discovered by their height and form, even when covered with snow. The people of Jakutz feed both their horses and cattle, with the reliques of the winter-stock of these hares. See **PLATE C.**

L. CAPENSIS, the **CAPE HARE**, has long ears dilated in the middle; the outsides naked, and of a rose-colour, the inside and edges covered with short grey hairs: the crown and back are of a dusky colour, mixed with tawny; the cheeks and sides cinereous; the breast, belly, and legs, rust-coloured: the tail bushy, carried upwards; and of a pale ferruginous colour. This species is about the side of a rabbit. It inhabits the country three days journey N. of the Cape of Good Hope: where it is called the mountain-hare, for it lives only in the rocky mountains, and does not burrow. It is difficult to shoot it, as, on the sight of any one, it instantly runs into the fissures of the rocks.

L. CUNICULUS, the **COMMON RABBIT**, has a very short tail, and naked ears. The colour of the fur, in a wild state, is brown; the tail black above, white beneath; in a tame state the general colour varies; and the eyes are of a fine red. The original native country of this species is Spain, where they were formerly taken with ferrets, as is now practised here. They love a temperate or warm climate, and are incapable of bearing great cold. In Sweden they are kept in houses. They abound in Britain. Their furs make a considerable article in the hat-manufactories; and of late such part of the fur as is unfit for that purpose, has been found as good as feathers for stuffing beds and bolsters. Numbers of the

skins are annually exported to China. The English counties most noted for rabbits are Lincolnshire, Norfolk, and Cambridge-shire. Methwold is famous for the best kind for the table: the soil there is sandy, and full of mosses and the carex grass. Rabbits swarm in the Orkneys, where their skins form a considerable article of commerce. They are in general grey; those which inhabit the hill grow hoary in winter. Mr. Kerr enumerates five varieties; viz. the wild rabbit; the black, the white, the pied, and the silvery tame rabbit. The fecundity of the rabbit is greater than that of the hare. They breed seven times in the year, and the female sometimes brings eight young ones at a time. Supposing this to happen regularly for four years, the number of rabbits from a single pair will mount to 1,274,840. From this, we might apprehend being over-stocked with these animals, but a great number of enemies prevents their increase; not only men, but birds and beasts of prey, making dreadful havoc among them. They devour herbs of all kinds, roots, grain, fruits, &c.

L. MINIMUS, the **CHILESE HARE**, is remarkably small, not exceeding the size of a small rat: the form of the body is conical; the ears are sharp-pointed; the snout is long; the tail very short; the fur short, but very fine; the colour various, like that of the rabbit. The female produces six or seven young monthly. They are domesticated in Chili.

L. SERICEUS, or **ANGORENSIS**, the **ANGORA RABBIT**, with hair long, waved, and of a silky fineness, like that of the goat of Angora. This silky fur is highly valued in commerce.

L. TIMIDUS, the **COMMON HARE**, is an animal so familiarly known as to supersede the necessity of description. It is a native not only of every part of Europe, but almost of every part of the old continent. It may perhaps be doubted whether it is an aboriginal native of any part of America. The favourite residence of the hare is in rich and somewhat dry and flat grounds, and it is rarely discovered in very hilly or mountainous situations. It feeds principally by night, and remains concealed during the day in its form, beneath some bush, or slight shelter. The swiftness of this animal is proverbial, and on account of the conformation of its legs, the hinder of which are longer than the fore, it is observed to run to most advantage on slightly ascending ground. The hare is a very prolific animal, generally producing three or four young at a time, and breeding several times in a year. The young require the assistance of the parent but for a short time, and in about three weeks are able to provide for themselves; they do not remove to any great distance from each other, but continue in the same neighbourhood for a considerable time. The hare feeds on various vegetables, but it is observed to prefer those of a milky and succulent quality. It also occasionally feeds on the bark of trees, as well as on the young shoots of various shrubs, &c. The nature of the soil in which the hare resides and feeds, is observed to influence in a considerable degree the colour and constitution of the animal. Those which feed in elevated situations are larger and darker than those which reside in the plains. The hare is an animal proverbially timid, and flies, if disturbed when feeding by the slightest alarm; but when seated in its form, will allow itself to be approached so near as to be reached by a stick; seeming to be fascinated by fear, and instead of endeavouring to fly, continuing to squat immovable, with its eyes fixed on its enemy. It is necessary, however, in order to conduct this manœuvre, to approach in a gradual and circling manner. The hare, though so nearly allied to the rabbit as to make the general descriptive distinction not very easy, is yet of different habits and propensities, and never associates with the latter animal. It taken very young, the hare may be successfully tamed, and in that state shows a considerable degree of attachment to its benefactors, though it continues shy to those whose presence it has not been accustomed to. Mr. White, in his History of Selbourne, relates an instance which happened in that village, of a young leveret suckled and nursed by a cat, which received it very early under her protection, and continued to guard it with maternal solicitude till it was grown to a considerable size. A most singular variety of this animal is sometimes found, which is furnished with rough and slightly branched horns, bearing a considerable resemblance to those of a roe-buck. This particularity, as strange as it is uncommon, seems to imply a kind of indistinct approach in this animal to the order pecora. The hare is a short-lived animal, and is supposed rarely to exceed the term of seven or eight years. It may be proper to add, that

in very severe winters, and especially in those of the more northern regions, the hare becomes entirely white, in which state it is liable to be mistaken for the following species.

L. VARIABILIS, the **VARYING HARE** of Pallas, has soft hair, which in summer is grey, with a slight mixture of black and tawny: the ears are shorter, and the legs more slender, than those of the common hare: the tail is entirely white, even in summer; and the feet are most closely and warmly furred. In winter the whole hair changes to a snowy whiteness, except the tips and edges of the ears, which remain black, as well as the soles of the feet, on which, in Siberia, the fur is doubly thick, and of a yellow colour. It is less than the common species. These animals inhabit the highest Scottish Alps, Norway, Lapland, Russia, Siberia, Kamtschatka, the banks of the Wolga, and Hudson's Bay. In Scotland, they keep on the tops of the highest hills, and never descend into the vales; nor do they ever mix with the common hare, though these abound in the neighbourhood. See Plate C.

LERCHEA, in botany, a genus of the pentandria order, and monadelphia class of plants. Calyx five-toothed; corolla funnel-shaped, five-cleft; antherae five, on the tube of the germ; style one; capsule three-celled; seeds many. There is but one species, a native of the East Indies.

LERIA, or **LEIRIA**, a strong town of Portugal, in Estremadura. Lon. 7. 50. W. Lat. 39. 40. N.

LERIDA, an ancient, strong, and large town of Spain in Catalonia, with a bishop's see, an university, and a strong castle, 68 miles W. of Barcelona. Lon. 0. 35. E. Lat. 41. 31. N.

LERINS, two islands in the Mediterranean, lying on the coast of the department of Var, and late province of Provence, in France. That nearest the coast, called St. Margaret, is guarded by invalids, state-prisoners being sent to it. The other is called St. Honorat, and is less than the former, but has a Benedictine abbey. It is hardly six miles south of Antibes.

LERMA, a town of Spain, in Old Castile, 23 miles S. of Burgos.

LERNEA, in zoology, a genus of insects, of the order vermes mollusca. Body oblong, somewhat cylindrical, naked; two or three tentacula each side, and round, by which it affixes itself: two ovaries, projecting like tails from the lower extremity. These insects are without eyes, and are said to be very troublesome to fish, adhering very firmly principally to the gills and fins. There are fifteen species.

LERO, or **LEROS**, an island of the Archipelago, and one of the Sporades; anciently called Leria; the birth-place of Patroclus. Lon. 26. 15. E. Lat. 37. 0. N.

LERWICK, a town of Scotland, in the island called Mainland.

LESBOS, a large island in the Ægean sea, on the coast of Æolia, about 168 miles in circumference. It was originally called Pelasgia, from the Pelasgi by whom it was first peopled; Macaria, from Macareus, who settled in it; and Lesbos, from Lesbos, his son-in-law and successor. The chief towns of Lesbos were Methymna and Mitylene. Lesbos has given birth to many illustrious persons, such as Arion, Terpander, Sappho, &c. See **MITYLENE**.

LESCAR, a town of France, in the department of the Lower Pyrenees, and late province of Gascony, 3 miles N. W. of Pau.

LESGUIS, a people of Asia, whose country is indifferently called by the Georgians Lesquistan and Daghestan. It is bounded on the south and east by Persia and the Caspian, on the southwest and west by Georgia, the Ossi, and Kisti, and on the north by the Kisti and Tartar tribes.

LESKIA, in botany, a genus of the cryptogamia musci class and order. Natural order. Mosses. Capsule oblong; peristome double; the exterior with sixteen teeth, which are acute; the interior membranaceous, divided into equal segments. Males gemmaceous in different individuals.

LESINA, an island of Maritime Austria, in the Adriatic, on the coast of Dalmatia, anciently called Pharos, forty-four miles long and eight broad, and abounding in corn, wine, fruits, wool, and flesh-coloured striped marble.

LESINA, the capital of the above island, seated at its west end, 20 miles S. of Spolatro. Lon. 16. 19. E. Lat. 43. 33. N.

LESKARD, a town of Cornwall.

LESLIE, **JOHN**, bishop of Ross, in Scotland, the son of Gavin Leslie, an eminent lawyer, was born in 1526, and educated at the university of Aberdeen, in the cathedral of which he was canon in 1547. When the reformation began to spread in Scotland, and disputes about religion ran high, Dr. Leslie, in 1560, distinguished himself at Edinburgh as a principal advocate for the Latin church and was afterwards deputed by the chief nobility of that religion, to condole with queen Mary on the death of her husband, the king of France, and to invite her to return to her native dominions. Accordingly they embarked together at Calais, in 1561, and landed at Leith. She immediately made him one of her privy council, and a senator of the college of justice. In 1564 he was made abbot of Lindores; and on the death of Sinclair was promoted to the bishopric of Ross. The influence derived from these accumulated honours he exerted for the good of his country. To him Scotland is indebted for the publication of its laws, commonly called The Black Acts of Parliament, from the Saxon character in which they were printed. At his desire the revision and collection of them were committed to the great officers of the crown. When queen Elizabeth appointed commissioners to meet at York to consider the complaints made against Mary by her subjects, Leslie appeared in behalf of his mistress, whose cause he pleaded with great ability. He also tried many expedients to procure her liberty, for which he was committed to the Tower; but in 1573 he recovered his liberty on condition of quitting the kingdom. While abroad he endeavoured to engage many foreign princes in the interest of Mary, and wrote several pieces in her defence. Being appointed vicar-general by the bishop of Rouen, while he was visiting that diocese he was seized by the Huguenots, who would have sent him to England; but he recovered his liberty by paying a ransom. He afterwards obtained the bishopric of Constance, and died in 1596. His principal work is a history of Scotland, entitled, *De Origine, Moribus, et Rebus gestis, Scotorum*, 1578, &c.

LESSINES, a town of France, in the department of Gemmapes, and late province of Austrian Hainault, 23 miles W. S. W. of Brussels.

LESSONS, [*lectio*, Lat.] among ecclesiastical writers, portions of scripture read in divine service. In the ancient church, reading the scriptures was part of the service of the catechumens; at which all persons were allowed to be present, to obtain instruction. The church of England, in the choice of lessons, proceeds as follows: the first lesson on ordinary days, she directs to begin at the beginning of the year with Genesis, and so continue on, till the books of the Old Testament are read over; only omitting the Chronicles, which are for the most part the same with the books of Samuel and Kings, and other particular chapters in other books, either because they contain names of persons, places, or other matters less profitable to ordinary readers. The course of the first lessons for Sundays is regulated after a different manner. From Advent to Septuagesima Sunday, some particular chapters of Isaiah are appointed to be read, because that book contains the clearest prophecies concerning Christ. Upon Septuagesima Sunday Genesis is begun, because that book which treats of the fall of man, and the severe judgement of God inflicted on the world for sin, best suits with a time of repentance and mortification. After Genesis, follow chapters out of the books of the Old Testament, as they lie in order; only on festival Sundays, such as Easter, Whitsunday, &c. the particular history relating to those days is appointed to be read; and on the saints' days, the church appoints lessons out of the moral books, such as Proverbs, Ecclesiastes, Ecclesiasticus, &c. as containing excellent instructions for the conduct of life. As to the second lessons, the church observes the same course both on Sundays and week-days: reading the gospels and Acts of the Apostles in the morning, and the epistles in the evening, in the order they stand in the New Testament: excepting on saints' day and holy days, when such lessons are appointed as either explain the mystery, relate the history, or enforce the example.

L'ESTRANGE, **SIR ROGER**, a noted writer in the seventeenth century, descended from an ancient family at Hunstanton-Hall, in Norfolk, where he was born in 1616, being the youngest son of Sir Hammond L'Estrange, bart. a zealous royalist. Having in 1644, obtained a commission from king Charles I. for reducing Lynn in Norfolk, then in possession of the parliament, his design

was discovered, and his person seized. He was tried by a court marshal at Guildhall in London, and condemned as a spy; but was reprieved, and continued in Newgate for some time. He afterward went beyond sea; and in August, 1634, returned to England, where he applied to Oliver Cromwell, and having once played before him on the bass-viol, he was by some nicknamed Oliver's fiddler. Being a man of parts, but narrow in circumstances, he set up a newspaper, entitled *The Public Intelligencer*, in 1663; but gave it up upon the first publication of the first London Gazette, in 1665, having been allowed, however, a consideration by government. Some time after the Popish plot, when the Tories began to gain the ascendant, he, in a paper called the *Observer*, became a zealous champion for them. He was afterwards knighted, and served in the parliament called by James II. in 1685. But things soon taking a different turn, his *Observers* were discontinued. However, he continued licenser of the press till king William's accession, in whose reign he met with some trouble as a disaffected person. He died, however, in peace, after he had survived his intellectuals. He published many political tracts, and translated several works from the Greek, Latin, and Spanish, viz. Josephus's Works, Cicero's Offices, Seneca's Morals, Erasmus's Colloquies, Esop's Fables, and Bonas's Guide to Eternity. His style has been variously represented; his language being esteemed by some easy and humorous, while others reckon it low and grovelling.

LESTWITHIEL, a well-built town of Cornwall; 23 miles S.W. of Launceston.

LETHARGY, [from *ληθη*, oblivion, and *αργη*, numbness, or laziness,] a disease in which the patient, if awaked, remains stupid, without sense or memory, and presently sinks again into his former sleep. See **MEDICINE**.

LETHE, [*ληθη*, oblivion,] in the ancient mythology, one of the rivers of hell, signifying oblivion, or forgetfulness; its waters having, according to the poetic fiction, the peculiar quality of making those who drank them forget every thing that was past.

LETTER, [*litera*, Latin,] a character used to express one of the simple sounds of the voice; and as the different simple sounds are expressed by different letters, these, by being differently compounded, become the visible signs or characters of all the modulations and mixtures of sounds used to express our ideas in a regular language. See **LANGUAGE**. Thus, as by the help of speech we render our ideas audible; by the assistance of letters we render them visible, and by their help we can wrap up our thoughts, and send them to the most distant parts of the earth, and read the transactions of different ages. As to the first letters, what they were who first invented them, and among what people they were first in use, there is still room to doubt: Philo attributes this great and noble invention to Abraham; Josephus, St. Irenæus, and others, to Enoch; Bibliander, to Adam; Eusebius, Clemens, Clemens Alexandrinus, Cornelius Agrippa, and others, to Moses; Pomponius Mela, Herodian, Rufus Festus, Pliny, Lucan, &c. to the Phœnicians; St. Cyprian, to Saturn; Tacitus, to the Egyptians; some, to the Ethiopians. There have been also various conjectures about the different kinds of letters used in different languages: thus, according to Crinitus, Moses invented the Hebrew letters; Abraham, the Syriac and Chaldee; the Phœnicians, those of Attica, brought into Greece by Cadmus, thence into Italy by the Pelasgians; Nicostrata, the Roman; Isis, the Egyptian; and Vaisilas, those of the Goths. It is probable, that the Egyptian hieroglyphics were the first manner of writing; but whether Cadmus and the Phœnicians learned the use of letters from the Egyptians, or from their neighbours of Judea and Samaria, need hardly be a question; for as some of the books of the Old Testament were then written, they were more likely to have given them the hint of letters than the hieroglyphics of Egypt. But wheresoever the Phœnicians learned this art, it is generally agreed, that Cadmus, the son of Agenor, first brought letters into Greece; whence, in following ages, they spread over the rest of Europe. See **ALPHABET**, and **WRITING**. Letters make the first part or elements of grammar; an assemblage of these compose syllables and words, and these compose sentences. The alphabet of every language consists of a number of letters, which ought each to have a different sound, figure, and use. As the difference of articulate sounds was intended to express the different ideas of the mind, so one letter was originally intended to signify only one sound, and not, as at present, to express sometimes one

sound, and sometimes another; which practice has brought a great deal of confusion into the languages, and rendered the learning of the modern tongues much more difficult than it would otherwise have been. This consideration, together with the deficiency of all the known alphabets, from their wanting some letters to express certain sounds, has occasioned several attempts towards an universal alphabet, to contain an enumeration of all such single sounds or letters as are used in any language. Grammarians distinguish letters into vowels, consonants, mutes, liquids, diphthongs, and characteristics. They are likewise divided into capitals and small letters. They are also denominated from the shape and turn of the letters; and in writing are distinguished into different hands, as round-text, German-text, round-hand, Italian, &c. and in printing, Roman, Italic, and black-letter.

LETTER is also a writing addressed and sent to a person. Epistle is seldom used but in poetry. Letter-writing was esteemed a liberal art by the Romans, and Cicero mentions with pleasure, in his Epistles to Atticus, the elegant specimens he had received from his son of his genius in this way. Mr. Lockethinks it ought to form a particular branch of education. But no man who has got a liberal education can be at any loss to write a good letter. It has been said, that "a fine letter does not consist in saying fine things, but in expressing ordinary ones in an uncommon manner. It is the proprie communia dicere, the art of giving grace and elegance to familiar occurrences, that constitutes the merit of this kind of writing." This is very just, but if laid down as a general rule, will lead a young person, whose taste is not properly formed, to write his letters in a style of the most ridiculous and affected bombast. Purity in the choice of words, and justness of construction, joined with perspicuity, are the chief properties of the Epistolary style. Seneca lays down a good general rule: "I would have my letters (says he) to be like my discourses, when we either sit or walk together, unstudied and easy." And what wise man, in common discourse, aims at bright figures, beautiful turns of language, or laboured periods? It is not even always requisite to attend to exact order and method. He that is master of what he writes, will naturally express his thoughts, without perplexity and confusion; and more than this is seldom necessary, especially in familiar letters. But as the subjects of letters are exceedingly various, the style ought to be accommodated to the particular subject about which the letter is written. All such words and expressions as are unbecoming in conversation should be avoided in letters; and a manly simplicity, free of all affectation, plain, but decent and agreeable, should run through the whole.

LETTER OF ATTORNEY, in law is a writing by which one person authorises another to do some lawful act in his stead; as to give seisin of lands, to receive debts, sue a third person, &c. The nature of this instrument is to transfer to the person to whom it is given, the power of the maker, to enable him to accomplish the act intended to be performed. It is either general or special; and sometimes it is made recoverable, which is when a bare authority is only given; and sometimes it is irrevocable, as where debts, &c. are assigned from one person to another. It is generally held, that the power granted to the attorney must be strictly pursued; and that where it is made to three persons, two cannot execute it. In most cases the power given by a letter of attorney determines upon the death of a person who gave it. No letter of attorney, made by any seaman, &c. in any ship of war, or having letters of marque, or by their executors, &c. in order to empower any person to receive any share of prizes of bounty-money, shall be valid, unless the same be made revocable and for the use of such seamen, and be signed and executed before, and attested by the captain and one other of the signing officers of the ship, or the mayor or chief magistrate of some corporation.

LETTER OF MARQUE, or MART. See **MARQUE**.

LETTERS, PATENT, or OVERT, are writings sealed with the great seal of England, whereby a man is authorised to do or enjoy any thing, which, of himself, he could not do. See **PATENT**. They are so called by reason of their form; as being open with their seal affixed, ready to be shewn for the confirmation of the authority given by them.

LETTRES, BELLES. See **BELLES LETTRES**.

LETTUCE, [*lactuca*, Latin,] in botany. See **LACTUCA**.

LEVADA, a town of Italy, in the department of the Mincio, in the district and late duchy of Mantua, seated on the Po.

LEVANT, in commerce and geography, is generally used in Turkey and Asia, comprehending Nafola, Syria, Palestine, Egypt, Barca, Candia, &c. The word literally signifies rising, and hence is used for the east, from the rising of the sun.

LEVANT, or TITAN, one of the hieres.

LEVANT SEA, the eastern part of the Mediterranean, bounded by Lesser Asia on the north, by Syria and Palestine on the east, by Egypt and Barca on the south, and by Candia and the other points of the Mediterranean on the west.

LEVATOR, [Latin,] a chirurgical instrument, by which depressed parts of the skull are lifted up.

LEVATOR, in anatomy, a name given to several muscles. See ANATOMY.

LEUCA, in antiquity, a geographical measure of length in use among the later Gauls; which, according to Jornandes, who calls it *lenga*, contained 1500 paces, or one mile and a half. Hence the word league, now reckoned at three miles; in the lower age, called *leuva*.

LEUCADIA, formerly called *neritis*, a peninsula of Acarnania; but afterwards, by cutting through the peninsula, made an island, as it is at this day, called *St. Maura*. It is 48 miles in circumference, and lies 15 miles N.E. of Cephalonia. Lon. 20. 46. E. Lat. 39. 4. N.

LEUCAS, in ancient geography, a city of Leucadia, formerly called *Neritos* and *Neritum*, situated near a narrow neck of land, or isthmus, on a hill facing the east and Acarnania.

LEUCAS, in Zoology. See DELPHINUS.

LEUCATA, or LEUCATE, in ancient geography, a promontory of Leucadia, according to Strabo, a white rock projecting into the sea towards Cephalonia, on which stood a temple of Apollo, surnamed *Leucadius*.

LEUCATE, a lake and town of France, on the north side of the lake, 17 miles S. of Narbonne, and 20 N.E. of Perpignan.

LEUCHSTENBERG, or LEUCHTENBERG, a town of Bavaria, capital of a landgraviate so named, 36 miles E. of Nuremberg, and 39 N. of Ratisbon. Lon. 12. 26. E. Lat. 49. 40. N.

LEUCIPPUS, a celebrated Greek philosopher and mathematician; first author of the famous system of atoms and vacuums, and of the hypothesis of storms; since attributed to the moderns. He flourished about B. C. 428.

LEUCOGÆUS, in ancient geography, a hill of Italy, between Puteoli and Neopolis, in Campania, abounding in sulphur, now *l'Alumera*.

LEUCOIUM, GREAT SNOW-DROP; a genus of the monogynia order, and hexandria class of plants; natural order *Spathaceæ*. Corolla campanulated, sexpartite, the segments increased at the points; stigma simple. There are four species, very hardy, durable in the roots, and increase exceedingly by offsets, which may be separated every two or three years.

LEUCOMA, in antiquity, a public register amongst the Athenians, in which were inserted the names of all the citizens, as soon as they were of age to enter upon their paternal inheritance.

LEUCOMA, in surgery, a distemper of the eye, otherwise called *albugo*. See ALBUGO, and SURGERY.

LEUCOPETRIANS, in ecclesiastical history, a fanatical sect, which sprang up in the Greek and Eastern churches towards the close of the twelfth century: the fanatics of this denomination professed to believe in a double trinity, rejected wedlock, abstained from flesh, treated with the utmost contempt the sacraments of Baptism and the Lord's Supper, and all the various branches of external worship; placed the essence of religion in internal prayer alone, and maintained, as it is said, that an evil being, or genius, dwelt in the breast of every mortal, and could be expelled from thence by no other method than by perpetual supplication to the Supreme Being.

LEUCOPETRUS, the founder of the above enthusiastical sect. His chief disciple, *Tychicus*, corrupted, by fanatical interpretations, several books of scripture, and particularly *St. Matthew's Gospel*.

LEUCOPHLEGMATIA, [from *λευκος*, and *φλεγμα*,] in medicine, a kind of dropsy, otherwise called *anasarca*. See MEDICINE.

LEUCOTHEA, or LEUCOTHOE, in the mythology, the wife of *Athamas*, changed into a sea-deity. She was called *Matuta* by the Romans. She had a temple at Rome, where all the people, particularly women, offered vows for their brother's children.

LEUCTRA, in ancient geography, a town of Boeotia, west of Thebes, or between Platea and Thespie, where the Lacedæmonians were completely defeated by *Epaminondas* and *Pelopidas*, the Theban generals.

LEVEL, [from *libella*, Lat.] an instrument by means of which a line may be drawn parallel to the horizon, in order to determine the height of one place with respect to another; for laying grounds even, conducting water, regulating descents, draining fens, &c. There are various kinds of levels, adapted to different purposes; all of which, for the practice, may be reduced to the following:

LEVEL, AIR.—The air-level is that which shews the line of level, by means of a bubble of air inclosed with some liquor in a glass-tube of an indeterminate length and thickness, whose two ends are hermetically sealed. When the bubble fixes itself at a certain mark, made exactly in the middle of the tube, the plane or ruler wherein it is fixed is level. When it is not level, the bubble will rise to one end. This glass-tube may be set in another of brass, having an aperture in the middle, whence the bubble of air may be observed. The tube should be filled with a liquid not liable to freeze. This application of a bubble of air was the invention of *Dr. Hooke*. There is one of these instruments made with sights, being an improvement upon the above, which, by the addition of other apparatus, becomes more commodious and exact. It consists of an air-level, Plate XCVII. fig. 5, about eight inches long, and seven or eight lines in diameter, set in a brass-tube, 2, having an aperture in the middle, C. The tubes are carried in a straight ruler, a foot long; at whose ends are fixed two sights, 3, 3, exactly perpendicular to the tubes, and of an equal height, having a square hole, formed by two fillets of brass crossing each other at right angles; in the middle is drilled a very little hole, through which a point on a level with the instrument is to be observed. The brass-tube is fastened on the ruler by means of two screws; one whereof, marked 4, serves to raise or depress the tube at pleasure, for bringing it toward a level. The top of the ball and socket is riveted to a little ruler that springs, one end of which is fastened with screws to the great ruler, and at the other end has a screw, 5, serving to raise and depress the instrument when nearly level. The following instrument is, however, preferable, because though the holes be ever so small, yet they will still take in too great a space to determine the point of level precisely. It consists of an air-level, with telescope-sights. This level, fig. 6, instead of plain sights, carries a telescope to determine exactly a point of level. The screw 3, is for raising or lowering the little fork, for carrying the air, and making it agree with the bubble of air when the instrument is level; and the screw 4, is for making the bubble of air, D or E, agree with the telescope: the whole is fitted to a ball and socket. *M. Huygens* is said to be the first inventor of this level; which has this advantage, that it may be inverted by turning the ruler and telescope half round; and if then the hair cut the same point that it did before, the operation is just. A telescope may be added to any kind of level, by applying it upon, or parallel to, the base or ruler, on which the level is fixed.

LEVEL, SPIRIT. This, which is the most complete level, was invented by the late *Mr. Ramsden*. See Plate XCVII. ABD, fig. 8, are the three legs upon which it is placed; when shut up, they form one round rod, and are kept together by three rings. At *a*, is a hemispherical cavity to contain a spherical ball, which has a male screw on its top, to screw in the plate G, and is so ordered that the upper plate G can move in any direction within certain limits by the play of the ball in its socket; to confine the upper plate G when it is set in any direction, four screws, HHHH, are employed; they work in tubes firmly fixed to the plate F, and are turned by their milled heads; the upper ends of these screws act against the under side of the plate G; so that when it is required to be moved in any direction, it is done by screwing up one screw, and screwing down the opposite, till it is brought to the proper inclination; then by screwing up both together, the plate is firmly fixed. The compass-box I, cannot be lifted out of its place, but at the same time is at liberty to turn round independent of the ball. On each side of the compass-box I, is a bar KK,

on the end of which are fixed two forked pieces IO, called the Y's (from their resemblance to that letter), carrying the telescope M. One of these (O) is capable of being raised or lowered by means of a milled head-screw N, which works through a collar in the lower end of the tube g; the rest of the tube has a triangular hole through it, in which slides a bar k, which is part of the Y. The level-tube Z is fastened to the under-side of the telescope by a screw q at one end and a bar r at the other: the use of these are to adjust it so that it shall be exactly parallel to the axis of the telescope-tube. The other parts of this excellent instrument will be understood by observing the figure.

LEVEL, ARTILLERY FOOT, is in form of a square, having its two legs or branches of an equal length, at a juncture whereof is a little hole, whence hangs a thread and plummet, playing on a perpendicular line in the middle of a quadrant. It is divided into twice forty-five degrees from the middle. See fig. 9. This instrument may be used on other occasions, by placing the ends of its two branches on a plane; for when the thread plays perpendicularly over the middle-division of the quadrant, that plane is assuredly level. To use it in gunnery, place the two ends on the piece of artillery, which you may raise to any proposed height, by means of the plummet, whose thread will give the degree above the level.

LEVEL, GUNNER'S, for levelling cannons and mortars, consists of a triangular brass-plate, about four inches high, fig. 11, at the bottom of which is a portion of a circle, divided into forty-five degrees; which number is sufficient for the highest elevation of cannons and mortars, and for giving shot the greatest range: on the centre of this segment of a circle is screwed a piece of brass, by means of which it may be fixed or screwed off at pleasure: the end of this piece of brass is made so as to serve for a plummet and index, in order to shew the different degrees of elevation of pieces of artillery. This instrument has also a brass-foot to set upon cannons or mortars, so as, when those pieces are horizontal, the instrument will be perpendicular. The foot of this instrument is to be placed on the piece to be elevated, in such a manner, as that the point of the plummet may fall on the proper degree: this is what they call levelling the piece.

LEVEL, MASON'S, is composed of three rules, so joined as to form an isosceles rectangle, somewhat like a Roman A; at the vertex whereof is fastened a thread, from which hangs a plummet, that passes over a fiducial line, marked in the middle of the base, when the thing to which the level is applied is horizontal; but declines from the mark, when the thing is lower on the one side than on the other.

LEVEL, CARPENTER'S and PAVIOUR'S, consists of a long ruler in the middle whereof is fitted, at right angles, another somewhat bigger, at the top of which is fastened a line, which, when it hangs over a fiducial line at right angles with the base, shews that the said base is horizontal. Sometimes this level is all of one board. See fig. 10.

LEVEL, PLUMB, or PENDULUM, invented by M. Picard, shews the horizontal lines by another line perpendicular to that described by a plummet or pendulum. This instrument, fig. 7, consists of two legs or branches, joined together at right angles, whereof that which carries the thread and plummet is about a foot and a half long; the thread is hung towards the top of the branch, at the point 2. The middle of the branch where the thread passes is hollow, so that it may hang free every where: but towards the bottom, where there is a little blade of silver, whereon is drawn a line perpendicular to the telescope, the said cavity is covered by two pieces of brass, making as it were a kind of case, lest the wind should agitate the thread; for which reason the silver blade is covered with a glass G, to the end that it may be seen when the thread and plummet play upon the perpendicular: the telescope is fastened to the other branch of the instrument, and is about two feet long; having an hair placed horizontally across the focus of the object-glass, which determines the point of the level. The telescope must be fitted at right angles to the perpendicular. It has a ball and socket, by which it is fastened to the foot.

LEVEL, REFLECTING, that made by means of a pretty long surface of water representing the same object inverted which we see erected by the eye, so that the point where these two objects appear to meet is level with the place where the surface of the water is found. This is the invention of M. Marriotte. There is

another reflecting level consisting of a mirror of steel, or the like, well polished, and placed a little before the object-glass of a telescope, suspended perpendicularly. This mirror must take an angle of 45° with the telescope, in which case the perpendicular line of the telescope is converted into a horizontal line, which is the same with the line of level. This is the invention of M. Cassini.

LEVEL, WATER, that which shews the horizontal line by means of a surface of water or other liquor; founded on this principle, that water always places itself level. The most simple is made of a long wooden trough or canal, whose sides are parallel to the base; so that being equally filled with water, its surface shews the line of level. This is the chorobates of the ancients. It is also made with two cups fitted to the two ends of a pipe, three or four feet long, about an inch in diameter, by which means the water communicates from the one to the other cup; and this pipe being moveable on its stand by means of a ball and socket, when the two cups become equally full of water, their two surfaces mark the line of level. This instrument, instead of cups, may also be made with two short cylinders of glass three or four inches long, fastened to each extremity of the pipe with wax or mastic. Into the pipe is poured some common or coloured water, which shews itself through the cylinders, and hence the line of level is determined; the height of the water with respect to the centre of the earth, being always the same in both cylinders; this level, though very simple, is yet very commodious for levelling small distances.

LEVELLING, the art which instructs us in finding how much higher or lower any given point on the surface of the earth is than another; or, in other words, the difference in their distance from the centre of the earth. The practice of levelling therefore consists, 1. In finding and marking two or more points that shall be in the circumference of a circle whose centre is that of the earth. 2. In comparing the points thus found with other points, to ascertain the difference in their distances from the earth's centre. With regard to the theory of levelling, we must observe, that a plumb-line, hanging freely in the air, points directly towards the centre of the earth; and a line drawn at right angles, crossing the direction of the plumb-line, and touching the earth's surface, is a true level only in that particular spot; but if this line which crosses the plumb be continued for any considerable length, it will rise above the earth's surface, and the apparent level will be above the true one, because the earth is globular; and, because the distance to be levelled is small compared with the earth's semi-diameter, this rising will be very nearly as the square of the distance to which the said right line is produced; that is to say, however much it is raised above the earth's surface at one mile's distance, it will rise four times as much at the distance of two miles, nine times at the distance of three, &c. This is owing to the globular figure of the earth; and this rising is the difference betwixt the true and apparent levels; the real curve of the earth being the true level, and the tangent to it the apparent level. Hence it appears, that the less distance we take betwixt any two stations, the truer will be our operations in levelling; and so soon does the difference betwixt the true and apparent levels become perceptible, that it is necessary to make an allowance for it, if the distance betwixt the two stations exceeds two chains in length. All this will appear from what follows; let C, Plate XCVII. fig. 12, represent the centre of the earth, AH, a part of the circumference, and AE, a tangent at A, then BF, DG, EH, &c. shew the difference between the true level and the line of sight, or apparent level, at the points B, D, E. This difference BF is easily found, for by prop. 36, sixth book of the elements, $AB^2 = BF \times 2FC + BF^2$, or BF

$$= \frac{AB^2}{2FC + BF}, \text{ or very nearly equal to } \frac{AB^2}{2FC}, \text{ because in all the}$$

operations of levelling BF is indefinitely small in respect of 2FC, and AB is not sensibly greater than AF. Hence BF, the difference between the true and apparent level, is equal to the square of the distance between the places, divided by the diameter of the earth; and consequently it is always proportional to the square of the distance. Now if we take $AF = 1000$ yards the diameter of the earth, or 2FC, being nearly 7958 miles, we shall have the difference $BF = 2.57$ inches, from which we obtain this rule for finding the difference to be allowed at any distance, viz. Multiply the square of the distance in yards by 2.57, and divide by 1,000,000, or, which is the same, multiply by 257, and cut off

eight places on the right for decimals; the rest are inches. And thus we easily construct the following table, shewing the height of the apparent above the true level for every 100 yards of distance on the one hand, and for every mile on the other.

Dist. or BC. AF	Dif. of Level, or CD. BF	Dist. or BC. AF	Dif. of Level, or CD. BF
Yards	Inches.	Miles.	Feet. Inc.
100	0.026	$\frac{1}{4}$	0 0 $\frac{1}{2}$
200	0.103	$\frac{1}{2}$	0 2
300	0.231	$\frac{3}{4}$	0 4 $\frac{1}{2}$
400	0.411	1	0 8
500	0.643	2	2 8
600	0.925	3	6 0
700	1.260	4	10 7
800	1.645	5	16 7
900	2.081	6	23 11
1000	2.570	7	32 6
1100	3.110	8	42 6
1200	3.701	9	53 9
1300	4.344	10	66 4
1400	5.038	11	80 3
1500	5.784	12	95 7
1600	6.580	13	112 2
1700	7.425	14	130 1

If the distance be measured by Gunter's chain; multiply the square of the chains by 124, and cut off five figures on the right hand for decimals, the rest are inches. In the practice of levelling proceed according to the following directions. Suppose the heights of the point A, Plate XCVII. fig. 13, on the top of a mountain, above that of B at the foot of it, is required. Place the level about the middle-distance at D, and set up pickets, poles, or staffs, at A and B, where persons must attend with signals for raising and lowering, on the said poles, little marks of pasteboard or other matter. The level having been placed horizontally by the bubble, &c. look towards the staff AE, and cause the person there to raise or lower the mark till it appears through the telescope or sights, &c. at E: then measure exactly the perpendicular height of the point E above the point A, which suppose five feet eight inches, and set it down in your book. Then turn your view the other way towards the pole B, and cause the person there to raise or lower his mark, till it appears in the visual line as before at C: and measuring the height of C above B, which suppose fifteen feet six inches, set this down in your book also, immediately above the number of the first observation. Then subtract the one from the other, and the remainder nine feet ten inches will be the difference of level between A and B, or the height of the point A above the point B. If the point D, where the instrument is fixed, be exactly in the middle between the points A and B, there will be no necessity for reducing the apparent level to the true one, the visual ray on both sides being raised equally above the true level. But if not, each height must be corrected or reduced according to its distance, before the one corrected height is subtracted from the other: When the distance is very considerable or irregular, so that the operation cannot be effected at one placing of the level, or when it is required to know if there be a sufficient descent for conveying water from the spring A to the point B, fig. 14, this must be performed at several operations. Having chosen a proper place for the first station, as at I, fix a pole at the point A near the spring, with a proper mark to slide up and down it, as L; and measure the distance from A to I. Then the level being adjusted in the point I, let the mark L be raised or lowered till it is seen through the telescope or sights of the level, and measure the height AL. Then having fixed another pole at II, direct the level to it, and cause the mark G to be moved up or down till it appears through the instrument; then measure the height GH, and the distance from I to II, noting them down in the book. This done, remove the level forward to some other eminence as E, from whence the pole II may be viewed, as also another pole at D: then having adjusted the level in the point E, look back to the pole II; and managing the mark as before, the visual ray will give the point F;

then measuring the distance HE, and the height HF, note them down in the book. Then, turning the level to look at the next pole D, the visual ray will give the point D: there measure the height of D, and the distance EB, entering them in the book as before. And thus proceed from one station to another till the whole is completed. But all these heights must be corrected or reduced by the foregoing rule or the table, according to their respective distances; and the whole, both distances and heights, with their corrections, entered in the book in the following manner:

BACK-SIGHTS.			FORE-SIGHTS.		
Dists	Hts.	Cors.	Dists.	Hts.	Cors.
yds.	ft. in.	inc.	yds.	ft. in.	inc.
1A 1650	AL 11 3	7.0	1H 1265	HG 19 5	4.0
EH 940	HF 10 7	2.2	EB 900	BD 8 1	2.1
2590	21 10 92	9.2	2165	27 6	6.1
	21 08		2590	6.1	
			Dist. 4755	26 11.9	
				21 0.8	
			Whole Dis. of level.	5 11.1	

Having summed up all the columns, add those of the distances together, and the whole distance from A to B is 4755 yards, or two miles and three quarters nearly. Then the sums of the corrections taken from the sums of the apparent heights, leave the two corrected heights; the one of which being taken from the other, leaves 5 feet 11.1 inches for the true difference of level sought between the two places A and B, which is at the rate of an inch and a half nearly to every 100 yards, a quantity more than sufficient to cause the water to run from the spring to the house. Or the operation may be otherwise performed, thus: instead of placing the level between every two poles, and taking both back-sights and fore-sights, plant it first at the spring A, and from thence observe the level to the first pole; then remove it to this pole, and observe the second pole; next move it to the second pole, and observe the third pole; and so on, from one pole to another, always taking forward sights or observations only. And then at the last, add all the corrected heights together, and the sum will be the whole difference of level sought.

LEVELLING STAVES, instruments used in levelling, serving to carry the marks to be observed, and at the same time to measure the heights of those marks from the ground. They usually consist of two mahogany staves ten feet long, in two parts, that slide upon one another to about five one-tenth feet for the more portable carriage. They are divided into 1000 equal parts, and numbered at every tenth division by ten, twenty, thirty, &c. to 1000; and on one side the feet and inches are also sometimes marked. See Plate XCVII. fig. 15. A vane slides up and down upon each set of these staves, which, by brass-springs, will stand at any part. These vanes are about ten inches long and four inches broad; the breadth is first divided into three equal parts, the two extremes painted white, the middle space divided again into three equal parts, which are less; the middle one of them is also painted white, and the two other parts black; and thus they are suited to all the common distances. These vanes have each a brass-wire across a small square hole in the centre, which serve to point out the height correctly, by coinciding with the horizontal wire of the telescope of the level.

LEVEN, a borough of Scotland, in Fifeshire, E. of Dysart, on the Frith of Forth.

LEVENS, or LEVENEZ, a town of Hungary, near the Gran; eighty-four miles E. of Vienna.

LEVER, [*levier*, Fr.] in mechanics, is a bar of iron or wood, one

one part of which being supported by a prop, all other parts turn upon that prop as their centre of motion. See MECHANICS.

LEVER. SIR ASHTON, a late celebrated collector of curiosities in Natural History, was the son of Sir D'Arcy Lever, Kt. of Alcam, gentleman-commoner of Corpus Christi College. On leaving it, he soon rendered his family-seat famous by the best aviary in the kingdom. He afterwards extended his plan to all branches of natural history, and thus rendered his museum one of the most complete in the world. He died in 1788. The Leverian Museum was sold by lottery, and was transferred to the Surrey side of Blackfriars Bridge. It was afterwards sold by auction by Messrs. King and Lochee, and the building which contained it is now appropriated to an eminent literary establishment, known by the name of the "Surrey Institution."

LEVERET, among sportsmen, is a hare in the first year of her age. See LEPUS.

LEVERET, a township of Massachusetts, in Hampshire county, near the Connecticut, ninety-five miles W. of Boston.

LEVERIAN MUSEUM. See LEVER.

LEVI, [לֵוִי, Heb. *i. e.* Joined,] the third son of Jacob by Leah, and the progenitor of the priests and Levites, was born about A. M. 2254. His treacherous and bloody combination with Simeon, to murder the Schechemites, is recorded in Gen. xxxiv: as well as Jacob's detestation of it, and his curse denounced against them for it, on his death-bed, at the very time that he pronounced blessings on Judah, Joseph, and the rest of his sons. (See Chap. xlix. 5—7.) Levi died A. M. 2391, aged 137.

LEVIATHAN, [לִיְאֹת,] Zoologists and commentators have been much puzzled to determine what genius of animals the leviathan belongs to. Some suppose it to be the whale; others a species of land-dragon, said to frequent the banks of the Red Sea; others the crocodile; while a fourth class do not reckon it an animal at all, but a whirlpool. This last opinion is too absurd to require refutation, as the whole description in Job xli. of his parts, passions, motions, strength, invulnerability, &c. evidently refer to an animated being, and not to a collection of dead matter, such as a whirlpool. Of the dragon nothing yet certainly known suits the description of the leviathan. (See DRACO.) As to the whale, many parts of the description, particularly verses sixth and seventh, cannot, by any construction of language, be made to apply to it; for it is well known that the whale's "skin" is often "filled with barbed irons," and "his head with fish-spears;" and that those engaged in the whale-fishery "part him" (his blubber, bones, spermæti, &c.) "among the merchants." In a word, no animal, that we have any certain knowledge of, comes any thing near the grand and majestic description given of the leviathan, by his Creator, except the crocodile; who, it is well ascertained, cannot be "drawn out" or taken "with an hook," or his "jaw bored through with a thorn;" whose "teeth are indeed terrible round about," whose scales may be said to be "his pride, shut up together as with a close seal; one so near to another, that no air can come between them; so joined one to another, and sticking together, that they cannot be sundered," &c. See LACERTA.

LEVICO, a lake of Austria, in Tirol.

LEVIE, a town of France, in the department and island of Corsica; thirteen miles N. W. of Porto Vecchio.

LEVIER, a town of France, in the department of the Doubs; nine miles S. of Ornans.

LEVIGATE, [*levigo*, Lat.] 1. To rub or grind to an impalpable powder. 2. To mix till the liquor becomes smooth and uniform. Thus the chyle is said to be white, as consisting of salt, oil, and water, much levigated or smooth.

LEVIGATION, [from *levigate*.] Levigation is the reducing of hard bodies, as coral, tully, and precious stones, into a subtle powder, by grinding upon marble with a muller; but unless the instruments are extremely hard, they will so wear as to double the weight of the medicine.

LEVIGATION, [*levigo*, Lat.] in pharmacy and chemistry, is the grinding of hard and ponderous bodies to an impalpable powder, on a porphyry, or in a mill.

LEVISANUS, a genus of the class and order pentandria monogynia. Flowers aggregate; corolla one-leaved, superior, five-cleft; filaments inserted into the base of the perianthium; styles two, conjoined; seeds five or six. There are five species, shrubs of the Cape of Good Hope.

LEVITES, [*levita*, Lat. from *Levi*,] in a general sense, include

all the descendants of Levi, among whom were the Jewish priests. In a more particular sense, the Levites were an order of officers in the Jewish church, who were employed in performing the manual service of the temple. They were obedient to the priests, the descendants of Aaron, in their ministration, and brought them wood, water, and other necessities, for the sacrifice. They sung and played upon instruments in the temple and other places. They applied themselves to the study of the law, and were the ordinary judges of the country, but always subordinate to the priests. Their subsistence was the tythes of corn, fruit, and cattle, throughout Israel: but the priests were entitled to a tenth of their tythes, by way of first-fruits to the Lord: forty-eight cities were assigned for the residence of the Levites, of which the priests claimed thirteen, six whereof were appointed cities of refuge. They were consecrated, before they entered upon their ministry, by shaving their flesh, washing their clothes, and sprinkling with the water of expiation. Imposition of hands was used in consecration, and two bullocks were offered at the door of the tabernacle. They waited weekly, and by turns, in the temple, beginning their attendance on one sabbath and ending the next: during this time they were maintained out of the offerings, &c. In the time of Solomon, the number of Levites, from the age of twenty, capable of serving, was 38,000.

LEVIZANO, a town of Italy, in the department of Panaro, six miles S. E. of Modena.

LEUK, a town of Switzerland, almost in the middle of the Valais. Lon. 7. 39. E. Lat. 45. 12. N.

LEVROUX, a town of France, in the department of Indre; seventeen miles E. of Chatillon, and 35 S. W. of Bourges. Lon. 1. 40. E. Lat. 46. 59. N.

LEUSDEN, JOHN, a celebrated philologist, born in 1624. He studied the learned languages and mathematics at Utrecht; and then went to Amsterdam, to converse with the rabbis, and perfect himself in the Hebrew tongue. After which he was professor of Hebrew at Utrecht, where he acquired a great reputation, and died in 1699. He wrote many valuable works; the principal of which are, 1. *Onomasticum Sacrum*, 8vo. 2. *Clavis Hebraica et Philologica Veteris Testamenti*, 4to. 3. *Novi Testamenti Clavis Græca, cum Annotationibus Philologicis*, 8vo. 4. *Compendium Biblicum Veteris Testamenti*, 8vo. 5. *Compendium Græcum Novi Testamenti*; the best edition of which is that of London, in 1668, 12mo. 6. *Philologus Hebræus*, 4to. 7. *Philologus Hebræo-mixtus*, 4to. 8. *Philologus Hebræo-Græcus*, 4to. 9. *Notes on Jonas, Joel, Hosea, &c.* He gave also correct editions of several learned works.

LEUSE, a town of France, in the department of Gemappes, and late province of Austrian Hainaut, fourteen miles N. W. of Mons.

LEUTKIRCH, or **LEUTKIRK**, an imperial town of Suabia, in Algow. Lon. 10. 10. E. Lat. 47. 53. N.

LEUWENHOEK, ANTHONY DE, F.R.S. a celebrated Dutch physician and naturalist, born at Delft in 1632. He was of an ancient family, and acquired great reputation throughout all Europe, by his experiments and discoveries. He particularly excelled in making glasses for microscopes and spectacles, and died in 1723. His letters to the Royal Society of London were printed at Leyden, in 1722, in 4to.

LEWARDEN, a handsome, rich, and strong, town of Batavia, in the department of the Eems, and late capital of Ostergow, Westergow, Sevenwolden, and W. Friesland. Lon. 5. 42. E. Lat. 53. 12. N.

LEWENTZ, a town of Upper Hungary, in the county of Gran. Lon. 18. 19. E. Lat. 48. 15. N.

LEWES, an ancient, large, and well-built, town of Sussex, thirty miles E. of Chichester, and forty-nine S. of London. Lon. 0. 5. E. Lat. 50. 55. N.

LEWIS, [*Louis*, Fr.] the name of sixteen kings of France.

LEWIS IX. or **ST LEWIS**, was one of the greatest monarchs of France; equally memorable for his valour and his virtues, but unfortunately, misled by the superstition of the times, he sacrificed his own repose, and the welfare of his kingdom, to the folly of crusading. He succeeded his father in 1226. In 1248, leaving France to the care of his mother, he embarked for Egypt, attended by his queen, his three brothers, and the flower of the French nobility. At first his victories were rapid; he took Damietta in 1249; but in 1250 was defeated and taken prisoner by the Turks, with all his nobles, and the greatest part of his army.

The sultan demanded an exorbitant sum for his ransom, and his answer deserves to be recorded: "Tell the sultan, that a king of France is not to be ransomed with money; I will give the sum required for my people, and Damietta for myself." These terms were accepted, and a peace of ten years ensued. Upon his return to France, he diminished the taxes, revoked those which the financiers had introduced; issued several salutary edicts; founded several churches and hospitals; and effectually overturned the ecclesiastical jurisdiction of the court of Rome, by his pragmatic sanction in 1269, which established the independency of the Gallican church. Thirteen years residence in his capital indemnified his subjects for his absence; but his pious zeal prevented the enjoyment of this happiness: he embarked for the sixth crusade in 1270; and died the same year, at the siege of Tunis, aged 55.

LEWIS XI. was one of the greatest tyrants that ever existed. He began to reign A. D. 1461. His oppressions obliged his subjects to enter into a league against him, styled "Ligue de bien public," in which his brother the Duke of Berri and some of the principal nobility were concerned: they solicited succours from John, Duke of Calabria, who joined them with 500 Swiss; the first introduction of Swis soldiers into the French armies. His reign was almost one continued scene of civil war; and it is computed that 400 of his subjects were executed in public and private, either for being in arms against him, or suspected by him. In his last illness, he drank the warm blood of children, in the vain hope of restoring his decayed strength. He died in 1483, aged 60. The posts for letters were established in his reign, the first institution of this nature in Europe.

LEWIS XVI. the last French monarch of the race of Capet, and house of Bourbon, succeeded his grandfather in 1774. His character is universally allowed to have been such, as, in times of less disturbance, would have insured him a high degree of popularity to the end of his life. He was naturally of a mild and humane disposition; and has the peculiar merit of having been the first who instituted a society for the instruction and employment of the blind; an example of benevolence which has been since successfully followed in this and other countries. He was also an author, and translated five volumes of Gibbon's History, and Walpole's Historical Doubts, into French. His last will and testament, written by himself, exhibits a strong picture of his piety, resignation, and affection, for his relations. At his trial, he shewed an uncommon degree of spirit, recollection, and undaunted fortitude. On the 21st of January 1793, this unfortunate monarch, one of the best of his race, and whose private virtues, as well as his repeated concessions to his subjects, merited a better fate, fell by the guillotine, a sacrifice to that democratic jealousy, that popular fury, which exhausted its rage by cutting off many of the greatest men in France.

LEWIS, in geography, one of the largest of the Western Islands of Scotland, extending about sixty miles in length from N. to S. and from thirteen to fourteen in breadth, consisting of a great number of isles and rocks, and connected by an isthmus of six miles with the Isle of Harris. See HARRIS.

LEWIS D'OR, [Fr.] a golden French coin, in value twelve livres, now settled at seventeen shillings.

LEWISTOWN, a town of Pennsylvania, capital of Mifflin county, 115 miles W. N. W. of Philadelphia.

LEX, LAW. See LAW.

LEXIARCHI, at Athens, six officers assisted by thirty inferior ones, whose business it was to fine such as came not to the public assemblies, and to make scrutiny among such as were present. They kept a register of the age, manners, and abilities, of all the citizens, who were enrolled at the age of twenty.

LEXICOGRAPHER, [λεξικον, and γραφω.] a writer of dictionaries; a harmless drudge, that busies himself in tracing the original, and detailing the signification of words.

LEXICOGRAPHY, [λεξικον and γραφω.] the art or practice of writing dictionaries.

LEXICON, [λεξικον, from λεξω, a word,] a dictionary; a book teaching the signification of words. Lexicon is chiefly used in speaking of Greek dictionaries.

LEXINGTON, a town of Massachusetts, in Middlesex county, ten miles N. W. of Boston.

LEXINGTON, a flourishing town of Kentucky, formerly capital of the state, in Fayette county, twenty-four miles E. of Frankfort, and 774 S. W. of Philadelphia.

LEY, or LEES, a term usually applied to any alkaline solution made by levigating any ashes that contain an alkali. Soap-tees is an alkali used by soap-boilers, or potash or soda in solution, and made caustic by lime.

LEYBOURN, WILLIAM, an English mathematician of the seventeenth century, originally a printer in London. He published, *The Trader's Sure Guide*, which has gone through many editions: *Cursus Mathematicus*: *Treatises on Surveying*, on Dialing, &c. He died about 1699.

LEYDEN, [in Latin, *Lugdunum Batavorum*,] one of the largest and finest cities of Batavia, in the department of Delft, and late province of South Holland, abounding with canals, along which are rows of lofty trees, that afford very pleasant walks. It is 15 miles S. of Haarlem, and 20 S.W. of Amsterdam. Lon. 4. 33. E. Lat. 52. 10. N.

LEYDEN PHIAL, a phial coated on the inside and outside with tinfoil, or other proper conducting substance, and furnished with a brass-wire, and knob, for giving the electrical shock. See ELECTRICITY.

LEYSERA, in botany, a genus of the polygamia superflua order, and syngenesia class of plants; natural order Compositae, Calyx scarious; down chafly; in the disk feathery also; receptacle subpaleaceous. There are three species.

LEYTE, or LEITE, one of the Philippine islands, in the East-Indian Ocean, about forty leagues long, and in circumference about ninety or a hundred. Lat. 118. 0. E. Lat. 11. 0. N.

LIIWYD, EDWARD, a Welch antiquary, was a native of Caermarthenshire, and educated at Jesus College, Oxford, where he took his degree of M. A. in 1701. He succeeded his tutor, Dr. Plot, as keeper of the Ashmolean museum, and had the use of all Vaughan's collections. With incessant labour, and great exactness, he employed a considerable part of his life in searching into the Welch antiquities; had perused or collected a great deal of ancient and valuable matter from their manuscripts; transcribed all the old characters of the monasteries that he could meet with; travelled several times over Wales, Cornwall, Scotland, Ireland, Armoric Bretagne, countries inhabited by the same people, compared their antiquities, and made observations upon the whole; but died in 1709, before he had digested them into the form of a discourse, as he intended, on the ancient inhabitants of this island. Many of his observations were inserted in Gibson's edition of Camden's Britannia. He also published the *Archæologia Britannica*, or an Account of the Languages, Histories, and Customs, of the original Inhabitants of Great Britain, &c. folio, Oxford, 1707. He left in manuscript a Scottish or Irish-English Dictionary, and other proofs of his learning and industry. (Watkins.)

LIATRIS, in botany, a genus of the syngenesia polygamia æqualis class and order. Natural order, Compositæ capitata. Calyx oblong, imbricate, awnless, coloured; down feathered, coloured; receptacle naked, hollow, dotted. Eight species are enumerated.

LIBANOMANTIA, in antiquity, a species of divination performed with frankincense; which, if it presently caught fire, and sent forth a grateful odour, was esteemed a happy omen, and vice versa.

LIBANUS, a chain of mountains of Turkey in Asia, which lie between Syria Proper and Palestine, extending, from west to east, from the Mediterranean sea as far as Arabia. The summits are always covered with snow, but below there are very pleasant and fertile valleys. They were formerly famous for great numbers of cedar-trees, but now there are very few remaining. Geographers distinguish this chain into Libanus and Antilibanus; the latter of which lies on the south side of the valley, rising near the ruins of Sidon, and terminates at others in Arabia, in N. Lat. 34. They are separated from each other, at an equal distance throughout, by a country, called by the ancients Cælo-Syria.

LIBATION, [*libatio*, Lat.] amongst the ancient Greeks and Romans, was an essential part of solemn sacrifices. It was also performed alone, as a drink-offering, by way of procuring the protection and favour of the gods, in the ordinary affairs of life. Libations, according to the different attributes of the gods in honour of whom they were made, consisted of different liquids, but wine was the most usual. It was always unmixed with water. Libations of water, of honey, of milk, and of oil; were called *νημελια ιερα*. They were all made with a serious deportment and solemn prayer.

prayer. At sacrifices, the libation, after it had been tasted by the priest, and handed to the by-standers, was poured upon the victim. At entertainments, a little wine was generally poured out of the cup, before the liquor began to circulate, to shew their gratitude to the gods for the blessings they enjoyed. Libations were also in use among the Hebrews, who poured an hin of wine on the victim after it was killed, and the several pieces of the sacrifice were laid on the altar, ready to be burnt.

LIBEL, [*libellus famosus*,] taken in its largest and most extensive sense, signifies any writing, picture, or the like, of an immoral or illegal tendency; but, in a peculiar sense, is used to denote a malicious defamation of any person, and especially a magistrate, made public by either printing, writing, signs, or pictures, in order to provoke him to wrath, or expose him to public hatred, contempt, and ridicule. The direct tendency of these libels is the breach of the public peace, by stirring up the objects of them to revenge, and perhaps to bloodshed. The communication of a libel to any one person is a publication in the eye of the law: and therefore the sending an abusive private letter to a man is as much a libel as if it were openly printed, for it equally tends to a breach of the peace. With regard to libels in general, there are two remedies; one by indictment, and another by action. The former for the public offence; for every libel has a tendency to break the peace, or provoke others to break it: which offence is the same whether the matter contained be true or false; and therefore the defendant, on an indictment for publishing a libel, is not allowed to allege the truth of it by way of justification. But in the remedy by action on the case, which is to repair the party in damages for the injury done him, the defendant may, as for words spoken, justify the truth of the facts, and shew that the plaintiff has received no injury at all. What was said with regard to words spoken, will also hold in every particular with regard to libels by writing or printing, and the civil actions consequent thereupon: but as to signs or pictures, it seems necessary always to shew, by proper innuendos and averments of the defendant's meaning, the import and application of the scandal, and that some special damage has followed; otherwise it cannot appear, that such libel by picture was understood to be levelled at the plaintiff, or that it was attended with any actionable consequences. In a civil action, then, a libel must appear to be false, as well as scandalous; for, if the charge be true, the plaintiff has received no private injury, and has no ground to demand a compensation for himself, whatever offence it may be against the public peace: and therefore, upon a civil action, the truth of the accusation may be pleaded in bar of the suit. But in a criminal prosecution, the tendency which all libels have to create animosities, and to disturb the public peace, is the sole consideration of the law. And therefore, in such prosecutions, the only points to be considered are, first, the making or publishing of the book or writing; and, secondly, whether the matter be criminal: and, if both these points are against the defendant, the offence against the public is complete. The punishment of such libellers, for either making, repeating, printing, or publishing, the libel, is a fine, and such corporal punishment as the court in its discretion shall inflict; regarding the quantity of the offence, and the quality of the offender. By the law of the XII tables at Rome, libels, which affected the reputation of another, were made a capital offence: but, before the reign of Augustus, the punishment became corporal only. Under Valentinian it was again made capital, not only to write, but to publish, or even to omit destroying them. Our law, in this and many other respects, corresponds rather with the middle age of Roman jurisprudence, when liberty, learning, and humanity, were in their full vigour, than with the cruel edicts that were established in the dark and tyrannical ages of the ancient decemviri, or the latter emperors. In this, and other instances, where blasphemous, immoral, treasonable, schismatical, seditious, or scandalous libels are punished by the English law, some with a greater, others with a less degree of severity; the liberty of the press, properly understood, is by no means infringed or violated. See **LIBERTY**.

LIBELLA, a piece of money amongst the Romans, being the tenth part of the denarius, and equal in value to the as. It was called libella, as being a little pound, because equal to a pound of brass.

LIBELLA, or **LIBELLULA**, in zoology, a genus of the class and order insecta, neuroptera. Mouth armed with jaws, more than

two in number; lip trifid; antennæ very thin, filiform, and shorter than the thorax; wings expanded; tail of the male insect furnished with a forked process. There are about 60 species of this insect. The larva of this beautiful animal is a water-worm with six feet. It wears a mask as perfectly formed as those worn at a masquerade; and this mask, fastened to the insect's neck, and which it moves at will, serves to hold its prey while it devours it. The period of transformation being come, the chrysalis makes to the water-side, swims in search of a convenient place; fixes on a plant, or sticks fast to a bit of dry wood. Its skin, grown parched, splits at the upper part of the thorax. The winged insect issues forth gradually, throws off its slough, expands its wings, flutters, and then flies off with gracefulness and ease. The elegance of its slender shape, the richness of its colours, the delicacy and resplendent texture of its wings, are admirable. "It is impossible," says Dr. Shaw, "not to be struck with admiration on contemplating the changes of the libellula, which, while an inhabitant of the water, would perish by any long exposure to the air, while the complete animal, once escaped from the pupa, would as effectually be destroyed by submersion under water, of which not an hour before it was the legitimate inhabitant." The structure of the eye is very remarkable. A microscope shews that it consists of a continued surface of convex hexagonal lens. According to Lewenhoeck there are 12,344 lenses in each eye of this animal. See Plate LXXXVI.

LIBELLI, a name given to the bills which were put up amongst the Romans, giving notice of the time when a show of gladiators would be exhibited, with the number of combatants, and other circumstances.

LIBELLI FAMOSI, defamatory libels. Seneca calls them contumeliosi libelli, infamous rhymes, which by a Roman ordinance were punishable with death.

LIBELLUS, in the civil law, signifies declaration, or state of the prosecutor's charge against the defendant; and it has the same signification in our spiritual courts.

LIBER, in botany, the bark or rind, principally of trees. This is conceived as consisting of a number of cylindric and concentric surfaces whose texture is reticular, and in some trees plainly extrusible every way, as the fibres are soft and flexible.

LIBER, [Lat. *z. e. free*,] in mythology, a title conferred on Bacchus in memory of the freedom which he granted to the people of Boeotia; or, perhaps, because wine, whereof he was the reputed deity, delivers men from care, and sets their mind at ease and freedom.

LIBERA, in mythology, a goddess whom Cicero, in his book *De Nat. Deor.* styles the daughter of Jupiter and Ceres.

LIBERAL ARTS, are such as depend more on the labour of the mind than on that of the hands; or, that consist more in speculation than operation; and have a greater regard to amusement and curiosity than to necessity. The word is derived from the Latin *liberalis*, which among the Romans signified a person who was not a slave; and whose will, of consequence, was not checked by the command of any master. Such are grammar, rhetoric, painting, sculpture, architecture, music, &c. See **ART**.

LIBERALIA, feasts celebrated by the ancient Romans, in honour of Liber, or Bacchus, the same with those which the Greeks called Dionysia, and Dionysiacæ. Varro derives the name of this feast from *liber*, considered as a noun adjective, and signifying free; because the priests were free from their function, and eased of all care, during the time of the liberalia.

LIBERIA, in Roman antiquity, a festival observed on the 16th of the kalends of April, at which time the youth laid aside their juvenile habit for the toga virilis, or habit peculiar to grown men. See **TOGA**.

LIBERTAS. See **LIBERTY**.

LIBERTINES, **LIBERTINI**, in ecclesiastical history, a religious sect, which arose in 1525, whose principal tenets were, that the Deity was the sole operating cause in the mind of man, and the immediate author of all human actions; that, consequently, the distinctions of good and evil, which had been established with regard to those actions, were false and groundless, and that men could not, properly speaking, commit sin; that religion consisted in the union of the spirit or rational soul with the Supreme Being; that all those who had attained this happy union, by sublime contemplation and elevation of mind, were then allowed to indulge, without

without exception or restraint, their appetites or passions; that all their actions and pursuits were then perfectly innocent; and that, after the death of the body, they were to be united to the Deity. They likewise said that Jesus Christ was nothing but a mere *je ne sçai quoi*, composed of the spirit of God, and of the opinion of men.—These maxims occasioned their being called Libertines; and ever since an odium has been attached to the word. They spread principally in Holland and Brabant. Their leaders were Quintin, Picard, Pocksius, Ruffus, and Chopin, who joined with Quintin, and became his disciple. This sect obtained a footing in France through the favour of Margaret, Q. of Navarre, and sister to Francis I. and found patrons in several of the reformed churches.

LIBERTINES OF GENEVA, were a cabal of rakes rather than of fanatics; for they made no pretences to any religious system, but pleaded only for the liberty of leading voluptuous and immoral lives. This cabal was composed of a certain number of licentious citizens, who could not bear the severe discipline of Calvin, who punished with rigour not only dissolute manners, but also whatever bore the aspect of irreligion and impiety. In this turbulent cabal there were several persons who were not only notorious for their dissolute manner of living, but also for their atheistical impiety, and contempt of all religion. To this class belonged one Gruet, who denied the divinity of the Christian religion, the immortality of the soul, the difference between moral good and evil, and rejected with disdain the doctrines that are held most sacred among Christians; for which impieties he was at last brought before the civil tribunal, in 1550, and condemned to death.

LIBERTUS, or LIBERTINUS, among the Romans, a freed man, or a person set free from a legal servitude.

LIBERTY, [*libertas*, Lat.] in general, denotes a state of freedom, in contradistinction to slavery. According to Cicero, liberty is the power of living as a man pleases, or without being controlled by another. In a legal sense, liberty signifies some privilege that is held by charter or prescription. Liberty may be considered as either natural or civil.

I. LIBERTY, NATURAL. The absolute rights of man, considered as a free agent, endowed with discernment to know good from evil, and with power of choosing those measures which appear to him to be most desirable, are usually summed up in one general appellation, and denominated the natural liberty of mankind. This natural liberty consists properly in a power of acting as one thinks fit, without any restraint or controul, unless by the law of nature, or the law, originally impressed on our minds; being a right inherent in us by birth, and one of the gifts of God to man at his creation, when he endued him with the faculty of free-will. But every man, when he enters into society, gives up a part of his natural liberty, and, in consideration of receiving the advantages of mutual commerce, obliges himself to conform to those laws which the community has thought proper to establish. And this species of legal obedience and conformity in the present degenerate state of mankind, is infinitely more desirable than that wild and savage liberty which is sacrificed to obtain it. For no man, who considers a moment, would wish to retain the absolute and uncontrouled power of doing whatever he pleases: the consequence of which would be, that every other man would also have the same power; and then, because of man's degeneracy, there would be no security to individuals in any of the enjoyments of life.

II. LIBERTY, POLITICAL, therefore, or **CIVIL LIBERTY**, which is that of a member of society, is no other than natural liberty, so far restrained by human laws (and no farther) as is necessary and expedient for the general advantage of the public. Hence we may collect, that the law, which restrains a man from doing mischief to his fellow-citizens, though it diminishes the natural, increases the civil liberty of mankind: but every wanton and causeless restraint of the will of the subject, whether practised by a monarch, a nobility, or a popular assembly, is a degree of tyranny. Nay, that even laws themselves, whether made with or without our consent, if they regulate and constrain our conduct in matters of mere indifference, without any good end in view, are laws destructive of liberty: whereas, if any public advantage can arise from observing such precepts, the controul of our private inclinations, in one or two particular points will conduce to preserve our general freedom in others of more importance, by supporting

that state of society which alone can secure our independence. Thus the statute of Edward IV. which forbade the fine gentlemen of those times (under the degree of a lord) to wear pikes upon their shoes or boots of more than two inches in length, was a law that savoured of oppression; because, however ridiculous the fashion then in use might appear, the restraining it by pecuniary penalties could serve no purpose of common utility. But the statute of Charles II. which prescribes a thing seemingly as indifferent, viz. a dress for the dead, who were all ordered to be buried in woollen, is a law consistent with public liberty; for it encourages the staple trade, on which in a great measure depends the universal good of the nation. So that laws, when prudently framed, are by no means subversive, but rather introductive, of liberty; for (as Mr. Locke has well observed) where there is no law there is no freedom. But on the other hand, that constitution or frame of government, that system of law, is alone calculated to maintain civil liberty, which leaves the subject entire master of his own conduct, except in those points wherein the public good requires some direction or restraint. The idea and practice of this political or civil liberty flourish in their highest vigour in these kingdoms, where it falls little short of perfection, and can only be lost or destroyed by the folly or demerits of its owner; the legislature, and of course the laws of Britain, being peculiarly adapted to the preservation of this inestimable blessing even in the meanest subject. Very different from the modern constitutions of other states on the continent, and from the genius of the imperial laws; which in general are calculated to vest an arbitrary and despotic power, of controuling the actions of the subject, in the prince, or in a few grandees. And this spirit of liberty is so deeply implanted in our constitution, and rooted even in our very soil, that a slave or a negro, the moment he lands in Britain, falls under the protection of the laws, and so far becomes a freeman; though the master's right to his service may possibly still continue. The absolute rights of every Briton (which, taken in a political and extensive sense, are usually called their liberties), as they are founded on nature and reason, so they are coeval with our form of government; though subject at times to fluctuate and change, their establishment (excellent as it is) being still human. At some times they have been depressed by tyrannical princes; at others, so luxuriant as even to tend to anarchy, a worse state than tyranny itself, as any government is better than anarchy. But the vigour of our free constitution has always delivered the nation from these embarrassments: and, as soon as the convulsions consequent on the struggle have been over, the balance of our rights and liberties has settled to its proper level; and their fundamental articles have been from time to time asserted in parliament, as often as they were thought to be in danger: first, by the great charter of liberties, which was obtained, sword in hand, from King John, and afterwards, with some alterations, confirmed in parliament by Henry III. his son. (See *MAGNA CHARTA*.) Which charter contained very few new grants; but, as Sir Edward Coke observes, was for the most part declaratory of the principal grounds of the fundamental laws of England. Afterwards, by the statute called *confirmatio cartarum*, whereby the great charter is directed to be allowed as the common law; all judgements contrary to it are declared void; copies of it are ordered to be sent to all cathedral churches, and read twice a-year to the people; and sentence of excommunication is directed to be as constantly denounced against all those that by word, deed, or counsel, act contrary thereto, or in any degree infringe it. Next by a multitude of subsequent corroborating statutes (Sir Edward Coke reckons thirty-two,) from Edward I. to Henry IV. Then, after a long interval, by the petition of right; which was a parliamentary declaration of the liberties of the people, assented to by Charles I. in the beginning of his reign. This was closely followed by the still more ample concessions made by that unhappy prince to his parliament, before the fatal rupture between them; and by the many salutary laws, particularly the *habeas corpus* act, passed under Charles II. To these succeeded the bill of rights, or declaration delivered by the lords and commons to the prince and princess of Orange, 13th February, 1688; and enacted in parliament, when they became king and queen: which declaration concludes in these remarkable words; "and they do claim, demand, and insist upon, all and singular the premises, as their undoubted rights and liberties." And the act of parliament itself recognises "all and singular the rights and liberties

es asserted and claimed in the said declaration to be the true, ancient, and indubitable rights of the people of this kingdom." Lastly, these liberties were again asserted at the commencement of the 18th century, in the act of settlement, whereby the crown was limited to his present majesty's illustrious house: and some new provisions were added, at the same fortunate era, for better securing our religion, laws, and liberties; which the statute declares to be "the birthright of the people of England," according to the ancient doctrine of the common law. The rights thus defined by these several statutes, consist in a number of private immunities; which appear to be indeed no other, than either that residuum of natural liberty, which is not required by the laws of society to be sacrificed to public convenience; or else those civil privileges, which society hath engaged to provide, in lieu of the natural liberties so given up by individuals. These therefore were formerly, either by inheritance or purchase, the rights of all mankind; but in most other countries in the world, being now more or less debased and destroyed, they at present may be said to remain, in a peculiar and emphatical manner, the rights of the people of Britain. And these may be reduced to three principal or primary articles; the right of personal security, the right of personal liberty, and the right of private property: because as there is no other known method of compulsion, or of abridging man's natural free-will, but by an infringement or diminution of one or other of these important rights, the preservation of these inviolate may justly be said to include the preservation of our civil immunities in their largest and most extensive sense. See RIGHTS. In vain, however, would these rights be declared, ascertained, and protected, by the dead letter of the laws, if the constitution had provided no other method to secure their actual enjoyment. It has therefore established certain other auxiliary subordinate rights of the subject, which serve principally as barriers to protect and maintain inviolate the three great and primary rights, of personal security, personal liberty, and private property. These are, 1. The constitution, powers, and privileges, of parliament. See PARLIAMENT. 2. The limitation of the king's prerogative, by bounds so certain and notorious, that it is impossible he should exceed them without the consent of the people; as to which, see PREROGATIVE. The former of these keeps the legislative power in due health and vigour, so as to make it improbable that laws should be enacted destructive of general liberty: the latter is a guard upon the executive power, by restraining it from acting either beyond or in contradiction to the laws that are framed and established by the other. 3. A third subordinate right of every Briton is that of applying to the courts of justice for redress of injuries. Since the law is, in this realm, the supreme arbiter of every man's life, liberty, and property, courts of justice must at all times be open to the subject, and the law be duly administered therein. The emphatical words of magna charta, spoken in the person of the king, are these: *Nulli vendemus, nulli negabimus, aut differemus rectum vel justitiam*; "and therefore every subject (says Sir Edward Coke) for injury done to him in bonis, in terriis, vel persona, by any other subject, be he ecclesiastical or temporal, without any exception, may take his remedy by the course of the law, and have justice and right for the injury done to him, freely without sale, fully without any denial, and speedily without delay." It were endless to enumerate all the affirmative acts of parliament, wherein justice is directed to be done according to the law of the land: and what that law is, every subject knows, or may know if he please; for it depends not upon the arbitrary will of any judge, but is permanent, fixed, and unchangeable, unless by authority of parliament. We shall, however, just mention a few negative statutes, whereby abuses, perversions, or delays of justice, especially by the prerogative, are restrained. It is ordained by magna charta, that no freeman, shall be outlawed, that is, put out of the protection and benefit of the laws, but according to the law of the land. By 2 Edw. III. c. 8, and 11 Ric. II. c. 10, it is enacted, that no commands or letters shall be sent under the great seal, or the little seal, the signet or privy seal, in disturbance of the law; or to disturb or delay common right: and, though such commandments should come, the judges shall not cease to do right: which is also made a part of their oath by a statute 18 Edw. III. st. 4. And by 1 W. & M. t. 2, c. 2, it is declared, that the pretended power of suspending or dispensing with laws, or the execution of law, by regal authority without consent of parliament, is illegal. Not only the substantial part, or judicial decisions, of the law, but also the formal part or method of proceeding, cannot be altered but by parliament: for, if once those outworks were demolished, there would be an inlet to all manner of innovation in the body of the law itself. The king, it is true, may erect new courts of justice; but then they must proceed according to the old established forms of the common law. For which reason it is declared in stat. 16, Car. I. c. 10, upon the dissolution of the court of star-chamber, that neither his majesty, nor his privy-council, have any jurisdiction, power, or authority, by English bill, petition, articles, libel (which were the course of proceeding in the star-chamber, borrowed from the civil law,) or by any other arbitrary way whatsoever, to examine, or draw into question, determine, or dispose of the lands or goods of any subjects of this kingdom; but that the same ought to be tried and determined in the ordinary courts of justice, and by course of law. 4. If there should happen any uncommon injury, or infringement of the rights before mentioned, which the ordinary course of law is too defective to reach, there still remains a fourth subordinate right, appertaining to every individual, namely, the right of petitioning the king, or house of parliament, for the redress of grievances. In Russia Peter the Great established a law, that no subject might petition the throne till he had first petitioned two different ministers of state. In case he obtained justice from neither, he might then present a petition to the prince: but upon pain of death, if found to be in the wrong. The restrictions, for some there are, which are laid upon petitioning in Britain, are of a nature extremely different; and while they promote the spirit of peace, they are no check upon that of liberty. Care only must be taken, lest, under the pretence of petitioning, the subject be guilty of any riot or tumult: as happened in the opening of the memorable parliament in 1640: and, to prevent this, it is provided by the statute 13 Car. II. st. 1, c. 5, that no petition to the king, or either house of parliament, for any alteration in church or state, shall be signed by above twenty persons, unless the matter thereof be approved by three justices of the peace, or the major part of the grand jury, in the county; and in London, by the lord mayor, aldermen, and common council: nor shall any petition be presented by more than ten persons at a time. But under these regulations, it is declared by the statute, 1 W. & M. st. 2, c. 2, that the subject hath a right to petition; and that all commitments and prosecutions for such petitioning are illegal. 5. The fifth and last auxiliary right of the subject, that we shall mention, is that of having arms for their defence, suitable to their condition and degree, and such as are allowed by law. Which is also declared by the same statute, 1 W. & M. st. 2, c. 2, and is indeed a public allowance, under due restrictions, of the natural right of resistance and self-preservation, when the sanctions of society and laws are found insufficient to restrain the violence of oppression. In these several articles consist the right or liberties of Britons: liberties more generally talked of, than thoroughly understood; and yet highly necessary to be perfectly known and considered by every Briton; more especially by every man of rank or property, lest his ignorance of the points whereon they are founded should hurry him into faction and licentiousness on the one hand, or a pusillanimous indifference and criminal submission on the other. So long as these rights of personal security, personal liberty, and private property, remain inviolate, the subject is perfectly free; for every species of compulsive tyranny and oppression must act in opposition to one or other of these rights, having no other object upon which it can possibly be employed. To preserve these from violation, it is necessary that the constitution of parliament be supported in its full vigour; and limits, certainly known, be set to the royal prerogative. And, lastly, to vindicate these rights, when actually violated or attacked, the subjects of Britain are entitled, in the first place, to the regular administration and free course of justice in the courts of law; next, to the right of petitioning the king and parliament for redress of grievances; and, lastly, to the right of having and using arms for self-preservation and defence. And all these rights and liberties are our birthright to enjoy entire; unless where the laws of our country have laid them under necessary restraints. Restraints in themselves so gentle and moderate, as will appear upon farther inquiry, that no man of sense or probity would wish to see them slackened. For all of us have it in our choice to do every thing

that a good man would desire to do; and are restrained from nothing, but what would be pernicious either to ourselves or our fellow-citizens. So that this review of our situation may fully justify the observation of a learned French author, who indeed generally both thought and wrote in the spirit of genuine freedom: that the British is the only nation in the world where political or civil liberty is the direct end of its constitution. The United States of America need hardly be mentioned as an exception, as the spirit of liberty which pervades their constitution owes its origin to that of Britain. We shall therefore close our remarks upon it with the expiring wish of the famous Father Paul to his country, "Eto perpetua!"

LIBERTY, in mythology, was a goddess both among the Greeks and Romans. Among the former she was invoked under the title Eleutheria, and by the latter she was called Libertas, and held in singular veneration; temples, altars, and statues, were erected in honour of her.

LIBERTY AND NECESSITY. See **METAPHYSICS**.

LIBERTY OF THE PRESS. The art of printing, soon after its introduction, was looked upon in England, as well as in other countries, as merely a matter of state, and subject to the coercion of the crown. It was therefore regulated with us by the king's proclamations, prohibitions, charters of privilege and licence, and finally by the decrees of the court of star-chamber, which limited the number of printers, and of presses which each should employ, and prohibited new publications unless previously approved by proper licensers. On the demolition of this odious jurisdiction in 1641, the long parliament of Charles I. after their rupture with that prince, assumed the same powers as the star-chamber had exercised with respect to the licensing of books: and in 1643, 1647, 1649, and 1652, (Scobell, i. 44, 134, ii. 88, 230,) issued their ordinances for the purpose, founded principally on the star-chamber's decree of 1637. In 1692, was passed the statute 13 & 14 Car. II. c. 33, which, with some few alterations, was copied from the parliamentary ordinances. This act expired in 1679; but was revived by statute 1 Jac. II. c. 17, and continued till 1692. It was then continued for two years longer by statute 4 W. & M. c. 24, but though frequent attempts were made by the government to revive it, in the subsequent part of that reign (Com. Journ. 11 Feb. 1694, 26 Nov. 1695, 22 Oct. 1696, 9 Feb. 1697, 31 Jan. 1698,) yet the parliament resisted it so strongly, that it finally expired, and the press became properly free in 1694, and has continued so ever since. The liberty of the press, however, so essential to the existence of a free state, consists not in freedom from any criminal matter that may be published, but in laying no previous restraints upon publications. Every freeman has undoubtedly a right to lay what sentiments he pleases before the public; to forbid this, is to destroy the freedom of the press: but if he publishes what is improper, mischievous, or illegal, he must take the consequence of his own temerity. See **LIBEL**. To subject the press to the restrictive power of a licenser in the manner above mentioned, is to subject all freedom of sentiment to the prejudices of one man, and make him the arbitrary and infallible judge of all disputed points in learning, religion, and government. But to punish (as the law does at present) any dangerous or offensive writings which, when published, shall, on a fair and impartial trial, be adjudged of a pernicious tendency, is necessary for the preservation of peace and good order, of government and religion, the only solid foundations of civil liberty. Thus the will of individuals is still left free; the abuse only of that free-will is the object of legal punishment. Neither is any restraint hereby laid upon freedom of thought or inquiry; liberty of private sentiment is still less; the disseminating or making public of bad sentiments, destructive of the ends of society, is the crime which society corrects. A man (says a fine writer on this subject) may be allowed to keep poisons in his closet, but not publicly to vend them as cordials. And to this we may add, that the only plausible argument heretofore used for restraining the just freedom of the press, "that it was necessary to prevent the daily abuse of it," will entirely lose its force, when it is shewn (by a seasonable exertion of the laws,) that the press cannot be abused to any bad purpose without incurring a suitable punishment: whereas it can never be used to any good one when under the controul of an inspector. So true will it be found, that to censure the licentiousness, is to maintain the liberty of the press.

LIBERTY, PORT, a port of Guadaloupe.

LIBERTY, TOWN, a town of Maryland, in Frederick county, 42 miles W. N. W. of Baltimore, near some copper-mines.

LIBERTY, WEST, a town of Virginia, capital of Ohio county, seated at the head of Short Creek, 6 miles from Ohio, 2 W. of the Pennsylvania Line, 18 N. W. of Wheeling, 23 W. of Washington in Pennsylvania, and 348 from Philadelphia.

LIBETHRA, in ancient geography, a town and fountain of Thessaly. The latter was called the fountain of song, and was situated in Magnesia, a district of Macedonia annexed to Thessaly. The town stood on Mount Olympus, where it verges towards Macedonia: hence the Muses are called Libethrides. Strabo places on Helicon, not only Hippocrene, and the temple of the Muses, but also the caves of the nymphs Livethrides.

LIBITINA, in the Roman mythology, a goddess who presided over funerals. She was the same with the Venus infera or Epithymia of the Greeks. She had a temple at Rome, where was lodged a certain piece of money for every person who died, whose name was recorded in a register called Libitinæ ratio. This practice was established by Servius Tullus, in order to obtain an account of the number of annual deaths in the city of Rome, and consequently the increase or decrease of its inhabitants.

LIBITINARI, [from *Libitina*.] were undertakers whose office it was to take care of funerals, prepare all things necessary upon the solemn occasion, and furnish every article required.

LIBNA, in ancient geography, a sacerdotal city in the tribe of Judah, a place of strength, as appears from Sennacherib's laying siege to it. 2 Kings xix. Is. xxxvii.

LIBOURNE, a town of France, in the department of Gironde and late province of Guienne, 20 miles N. E. of Bourdeaux, and 205 S. by W. of Paris. Lon. 0. 10. W. Lat. 44. 55. N.

LIBRA, or **BALANCE**, one of the mechanical powers. See **BALANCE**.

LIBRA, in astronomy, one of the twelve signs of the zodiac, exactly opposite to Aries; so called because when the sun is in this sign at the autumnal equinox, the days and nights are equal, as it weighed in a balance. See **ASTRONOMY**.

LIBRA, also denotes the ancient Roman pound, borrowed from the Sicilians, who called it *litra*. The libra was divided into twelve uncia or ounces, and the ounce into twenty-four scruples. The divisions of the libra were, the uncia, one-twelfth; sextans, one-sixth; quadrans, one-fourth; triens, one-third; quincunx, five ounces; semis, the half pound or six ounces; septunx, seven; bes, eight; dodrans, nine; dextrans, ten; denux, eleven; lastly, the as weighed twelve ounces or one libra. The Roman libra was used in France for the proportion of their coin, till the time of Charlemagne, or perhaps till that of Philip I. in 1093, their sols being so proportioned, as that twenty of them were equal to the libra. By degrees it became a term of account; and every thing of the value of twenty sols was called a livre. Hence too *L.* stands for pound Sterling, and *lb.* for a pound in weight.

LIBRA Pensa, in law-books, denotes a pound of money in weight. It was anciently used not only to tell the money but to weigh it: because many cities, lords, and bishops, having their mints, coined money, and often bad, or too light; for which reason, though the pound consisted of twenty shillings, they always weighed it.

LIBRARIAN, [*librarius*, Lat.] 1. One who has the care of a library. 2. One who transcribes or copies books.

LIBRARI, among the ancients, were a sort of copyists who transcribed in beautiful or at least legible characters, what had been written by the notarii in notes and abbreviations.

LIBRARY, an edifice or apartment destined for holding a considerable number of books placed regularly on shelves. Some authors refer the origin of libraries to the Hebrews; and observe, that the care they took to preserve their sacred books, and the memory and actions of their ancestors, became an example to other nations, particularly to the Egyptians. Osymandias, King of Egypt, is said to have taken the hint first; who, according to Diodorus, had a library built in his palace, with this inscription over the door, ΨΥΧΗ ΙΑΤΡΙΕΙΟΝ. Nor were the Ptolemies, who reigned in the same country, less curious and magnificent in books. A library of the kings of Persia, called a house of the rolls,

rolls, or books, is mentioned in Ezra vi. 1, which some imagine to have consisted of the historians of that nation, and of memoirs of the affairs of state; but it seems rather to have been a depository of laws, charters, and ordinances of the kings. In chap. v. 17, it is called the king's treasure-house. We may, with more certainty, call that a library, mentioned in the second of Esdras to have been built by Nehemiah, in which were preserved the books of the prophets, and the letters of their kings. The first who erected a library at Athens, was the tyrant Pisistratus; though Strabo ascribes the honour to Aristotle. That of Pisistratus was transported by Xerxes into Persia, and was afterwards brought back by Seleucus Nicator to Athens. Long after, it was plundered by Sylla, and re-established by Adrian. Plutarch says, that under Eumenes there was a library at Pergamus, containing 200,000 books. Tyrannian, a celebrated grammarian, contemporary with Pompey, had a library of 30,000 volumes. That of Ptolemy Philadelphus, according to A. Gellius, contained 700,000, all in rolls, burnt by Cæsar's soldiers. Constantine, and his successors, erected a magnificent one at Constantinople; which, in the eighth century, contained 300,000 volumes, all burnt by order of Leo III; and, among the rest, one wherein the Iliad and Odyssey were written in letters of gold, on the guts of a serpent. The most celebrated libraries of ancient Rome, were the Ulpian, and the Palatine. Those of Paulus Æmilius, who conquered Perseus; of Lucilius, Lucullus, of Asinius Pollio, Atticus, Julius Severus, Domitius Serenus, Pamphilus Martyr, and the emperors Gordian and Trajan, are also much celebrated. Anciently, every large church had its library; as appears by the writings of St. Jerome, Anastasius, and others. Pope Nicholas laid the foundation of that of the Vatican, in 1450. It was destroyed by the constable Bourbon, in the sacking of Rome; restored by Pope Sixtus V. and considerably enriched with books from that of Heidelberg, plundered by Count Tilly in 1622. One of the most complete libraries in Europe, was said to be that erected at Florence by Cosmo de Medicis, over the gate whereof is written, *LABOR ABSQUE LABORE*; though it was afterwards exceeded by that of the French king, begun by Francis I. augmented by Cardinal Richelieu, completed by M. Colbert, and now the national library. The emperor's library at Vienna, according to Lambecius, consists of 80,000 volumes, and 15,942 curious medals. The Bodleian library at Oxford, built on the foundation of that of Duke Humphry, exceeds that of any university in Europe, and even those of all the sovereigns of Europe, except the emperor's and the French one, which are each of them older by a hundred years. It was first opened in 1602, and has since found a great number of benefactors; particularly Sir Robert Cotton, Sir H. Savil, Archbishop Laud, Sir Kenelm Digby, Mr. Allen, Dr. Pococke, Mr. Selden, and others. The Vatican, the Medicean, that of Bessarion at Venice, and those just mentioned, exceed the Bodleian in Greek MSS. but in oriental MSS. it excels them all. As to printed books, the Ambrosian at Milan, and that of Wolfenbüttele, are two of the most famous, and yet both inferior to the Bodleian. There are also many public libraries belonging to the colleges at Oxford and Cambridge. The principal public libraries in London, besides that of the Museum, are those of the college of Heralds, of the College of Physicians, of Doctor Commons, to which every bishop, at the time of his consecration, gives at least 20*l.* sometimes 50*l.* for the purchase of books; those of the Gray's Inn, Lincoln's Inn, Inner Temple; and Middle Temple; that of Lambeth, founded by Archbishop Bancroft in 1610, for the use of succeeding archbishops of Canterbury, and increased by the benefactions of Archbishops Abbot, Sheldon, and Tension, and said to consist of at least 15,000 printed books, and 617 volumes in MS.; that of Red-cross Street, founded by Dr. Daniel Williams, a Presbyterian divine, and since enriched by many private benefactions; that of the Royal Society, called the Arundelian or Norfolk Library, because the principal part of the collection formerly belonged to the family of Arundel, and was given to the society by Henry Howard, afterwards Duke of Norfolk, in 1666, which library has been increased by the valuable collection of Francis Aston, Esq. in 1715, and is still increasing by the numerous benefactions of the works of its learned members, and others; that of St. Paul's, of Sion College; the queen's library, erected by Queen Caroline in 1737; and the surgeon's library, kept in their hall in the Old Bailey, &c. In Edinburgh

there is a good library belonging to the university, well furnished with books; which are kept in good order. There is also a noble library of books and MSS. belonging to the faculty of advocates. There are likewise several valuable public libraries in the different colleges belonging to the universities of Glasgow, Aberdeen, and St. Andrews, wherein are many curious and beautifully illuminated ancient MSS. The Cottonian library originally consisted of 958 volumes of original charters, grants, instruments, letters of sovereign princes, transactions between this and other kingdoms and states, genealogies, histories, registers of monasteries, remains of Saxon laws, the book of Genesis, thought to be the most ancient Greek copy extant, and said to have been written by Origen in the second century, and the curious Alexandrian MS. copy, in Greek capitals. This library is kept in the British Museum, with the large and valuable library of Sir Hans Sloane, amounting to upwards of 42,000 volumes, &c.

LIBRATION, [*libratio*, Lat.] in astronomy, an apparent irregularity of the moon's motion, whereby she seems to librate about her axis, sometimes from the east to the west, and now and then from the west to the east; so that the parts in the western limb or margin of the moon sometimes recede from the centre of the disk, and sometimes move towards it, by which means they become alternately visible and invisible to the inhabitants of the earth. See **ASTRONOMY**.

LIBURNA, or **LIBURNICA**, a kind of light and swift skiff, used by the Liburnians in their piracies, for which they were noted.

LIBURNIA, in ancient geography, a district of Illyricum, extending towards the Adriatic, between Istria on the W. Dalmatia on the E. and mount Albis on the N.

LIBURNUS, an ancient port of Tuscany, now called Livorno, or Leghorn.

LIBYA, in a general sense, among the Greeks, denoted Africa, a name derived from *lub*, thirst, being a dry and thirsty country. See **AFRICA**.

LIBYA, in a more restrained sense, was the middle part of Africa, extending N. and W. according to Pliny; between the Mediterranean on the N. and Ethiopia on the E. and was divided into the Hither or Exterior Libya; and the Farther or Interior. The former lay between the Mediterranean on the N. and the Farther Libya, and Ethiopia beyond Egypt on the S. (Ptolemy). The Farther or Interior Libya, was a vast country, lying between the Hither Libya on the N. the Atlantic Ocean on the W. the Ethiopic on the S. and Ethiopia beyond Egypt on the E. **PTOLEMY**.

LIBYA, in a still more restrained sense, called, for distinction's sake, Libya Propria, was a northern district of Africa, and a part of the Hither Libya; situated between Egypt on the E. the Mediterranean on the N. the Syrtis Major and the Regio Tripolitana on the W. the Garamantes and Ethiopia beyond Egypt on the S. now the kingdom and desert of Barca.

LIBYCEUM MARE, the **LIBYAN SEA**, a part of the Mediterranean on the coast of Cyrene.

LIBYSSA, a town and river of Bithynia, where the tomb of Hannibal the Great was visible in Pliny's time.

LICENCE, [*licentia*, Lat.] in law, an authority given to a person to do some lawful act. A licence is a personal power, and therefore cannot be transferred to another. If the person licensed abuse the power given him, in that case he becomes a trespasser.

LICENTIATE, [*licentiat*, low Lat.] in England, usually means a physician who has a licence to practise, granted by the College of Physicians.

LICENTIATE, a degree in Spanish universities. The greatest number of the officers of justice in Spain are distinguished by no other title than that of licentiate. To pass licentiate in common law, civil law, and physic, they must have studied seven years, and in divinity ten.

LICHEN, **LIVER-WORT**: in botany, a genus of the cryptogamia algae class and order. Male flowers; vesicles conglomerated, extremely small, crowded or scattered on the disk, margin, or tips of the fronds: female flowers on the same, or on a distinct plant; receptacle roundish, flattish, convex, concave, sub-revolute affixed to the margin, often differing from the frond in colour, within containing the seeds disposed in rows. This is a very numerous genus: many of the species are of considerable use, particularly in the art of dyeing.

L. CAPERATUS, or **WRINKLED LIVERWORT**, abounds on the surface

surface of rocks, stones, trees, and pales; it also flowers throughout the year. In Ireland, and the northern parts of the Isle of Man, it is employed for dyeing wool of an orange-colour. If serge be previously infused, and boiled in urine, or steeped in a solution of green vitriol, and then dyed with this plant, it will assume a fine russet-brown tinge; but, if it be simply immersed in a decoction of the wrinkled liverwort, the stuff will acquire a lemon-shade.

L. PUSTULATUS, or **SPOTTED LIVERWORT**, is found on rocks in Wales, and the northern parts of Britain; it flowers during the whole year. According to Linnæus, a beautiful red colour may be prepared from this species; and Dr. Withering states, that it may be converted into an excellent black pigment.

L. CALICARIS, or **BEAKED LIVERWORT**, grows sometimes upon trees, but more frequently on rocks, near the sea-coast. It is smooth, glossy, and whitish, producing flat or convex shields, very near the summits of the segments, which are acute and rigid; and, being often reflected by the growth of the shields, appear under their limbs like a curved beak. This plant yields a fine red colour; and, in this respect, promises to become a substitute for the famous lichen roccella, orchal, which is imported from the Canary Islands, and sometimes sold at the price of 80*l.* per ton.

L. APHTHOSUS, or **GREEN GROUND-LIVERWORT**; it grows on moist rocks, in shady, stony, and mossy, places, and, like most of the preceding species, is in flower from January to December. An infusion of this plant is made in milk, and given by the country people to children affected with the thrush. A decoction of it, in large doses, operates powerfully both as a purgative and as an emetic; it is said to be a good vermifuge.

L. ISLANDICUS, or **ESCULENT ICELAND LIVERWORT**, abounds not only in the Highlands and Lowlands of Scotland, but is also found in some of the more northern parts of England and Wales. The inhabitants of Iceland boil this beneficial plant in several waters, then dry, and make it into bread. They likewise prepare from it a kind of gruel, which is mixed with milk; but the first decoction is never used; as it is strongly purgative. A jelly, or thick mucilage, made of the Iceland Liverwort, is recommended by Haller and Scopoli, as an excellent domestic remedy in consumptions. In Germany, a very durable brown dye is obtained by first boiling linen-yarn, for one hour, in a solution of alum and cream of tartar; then adding to this liquor the dried Iceland Liverwort, and suffering it to boil for half an hour at the least, when the yarn is again to be immersed for a quarter of an hour or longer, stirring it properly, and afterwards plunging it in a weak, cold solution of copperas, or vitriol of iron. But the Iceland lichen also imparts a very excellent black to white woollen yarn, by previously boiling it for one hour in a liquor made of the dried plant, and an equal quantity of copperas, in pure water; then removing it from this brown dye, and again boiling it for fifteen minutes in a strong decoction of log-wood: thus the wool assumes a deep black colour, which presents no other shade.

L. PULMONARIUS, **LUNGWORT-LIVERWORT**, **HAZEL-RAG**, or **HAZEL-CROTTLES**, which abounds on the trunks of old trees, especially those of oaks, and on heaps of stones, in moist shady situations. It has an astringent, bitter taste; and is used in Siberia as a substitute for hops, though it renders the ale narcotic, and occasions the head-ach. This plant was formerly much esteemed in consumptive cases. According to Dr. Ratty, woollen cloth dyed with the lungwort, acquires a durable orange-colour.

L. PLICATUS, **OFFICINAL STRINGY LIVERWORT**, or **TREEMOSS**, which grows on the branches of trees in thick woods, and is in flower from January to December. It was formerly used as an astringent to prevent hæmorrhages, and to cure ruptures. Linnæus observes, that the Laplanders successfully apply the treemoss to their feet, with a view to relieve the excoriations occasioned by too great exercise. Professor Kalms remarks, that if this vegetable be collected from fir or birch-trees, it communicates a green colour to wool, previously boiled in alum-water.

LICHTENBERG, a town and castle of France, in the department of the Lower Rhine, and late province of Alsace, twelve miles N. N. W. of Haguenau. Lon. 7. 35. E. Lat. 48. 55. N.

LICHTENBURG, a town of Franconia, in the margravate of Cullenbach. Lon. 12. 0. E. Lat. 50. 26. N.

LICHTENFELS, a town of Franconia, in the bishopric of Bamberg, on the Mayne. Lon. 11. 10. E. Lat. 50. 20. N.

LICHTENSTEIN, a town of Switzerland, in Tockerberg.

LICHTSTALL, a handsome town of Switzerland, in Basle. Lon. 7. 57. E. Lat. 47. 40. N.

LICNON, in the Dionysian solemnities, the mystical van of Bacchus; a thing so essential to all the solemnities of this god, that they could not be duly celebrated without it.

LICOLA, a lake of Naples, formerly famous for plenty of excellent fish; but in 1538 an explosion of a volcano changed one part of it into a mountain of ashes 1000 feet high, and four miles in circumference, and the other into a morass. It was anciently called Lucrinus Lacus.

LICONIA, in botany, a genus of the digynia order, and pentandria class of plants. Petals five, inlaid in the pit of the nectarium at its base; the capsule is bilocular and seed-bearing.

LICORICE, [*γλυκύριζα*; *liquoricia*, Ital.] a sweet-tasted root. See **GLYCYRRHIZA**.

LICTORS, [Lat.] among the ancient Romans, were officers established by Romulus, who attended the consuls when they appeared in public. The duties of their office were these: 1. Submotio, or clearing the way for the magistrate they attended: this they did by word of mouth; or, if there was occasion, by using the rods they always carried along with them. 2. Animadversio, or causing the people to pay the usual respect to the magistrate; as, to alight, if on horseback, or in a chariot; to rise up, uncover, make way, and the like. 3. Præitio, or walking before the magistrates: this they did, not confusedly, or all together, nor by two or three abreast, but singly following one another in a straight line. They also preceded the triumphal car in public triumphs; and it was also part of their office to arrest criminals, and to be public executioners in beheading, &c. Their ensigns were the fasces and securis. As to the number of lictors allowed each magistrate, a dictator had twenty-four; a master of the horse six; a consul twelve; a prætor six; and each vestal virgin, when she appeared abroad, had one.

LICULA, in botany, a genus of the appendix palmæ. Natural order, Palms. Flowers all hermaphrodite; calyx and corolla three-parted; nectary sertiform; drupe. There is but one species, viz. *L. spinosa*, a native of Macassar and Celebes.

LIDDEL, DUNCAN, M. D. professor of mathematics and medicine in the university of Helmstadt, was born in 1561 at Aberdeen, where he received the first part of his education. About the age of eighteen, he went to the university of Frankfort, where he spent three years in studying mathematics and philosophy. From Frankfort he proceeded to Breslaw, where he made uncommon progress in mathematics, under Professor Paul Wittichius. After a year he returned to Frankfort, where he studied physic for three years. In the Academia Julia, established at Helmstadt by Henry, Duke of Brunswick, he was promoted to the mathematical chair, which he occupied for nine years, with much credit to himself and to the Julian Academy. In 1596 he obtained the degree of M. D. began to teach physic, and by his teaching and writings became the chief support of the medical school at Helmstadt; was employed as first physician at the court of Brunswick, and had much practice among the principal inhabitants. Having been several times elected dean of the faculties both of philosophy and physic, he, in 1604, was chosen pro-rector of the university. But neither academical honours, nor the profits of an extensive practice, abroad, could make him forget his native country. In 1600 he took leave of the Academia Julia; and after travelling through Germany and Italy, at length settled in Scotland. He died in 1613, in the fifty-second year of his age. By his last will he bestowed certain lands near Aberdeen upon the university there, for the education of six poor scholars. His works are, 1. Disputationes Medicinales, Helmstadt, 1603, 4to. 2. Ars Medica Succinctè et Perspicuè Explicata, Hamburgi, 1607, 8vo. dedicated to King James VI. and divided into five books, viz. Introductio in totam Medicinam; De Physiologia; De Pathologia; De Signorum Doctrinâ; De Therapeuticâ. 3. De Febris, Libri tres, Hamburgi, 1610, 12mo. 4. Tractatus de Dente Aureo, Hamburgi, 1628, 12mo. This last tract he published to refute a ridiculous story then current, of a poor boy in Silesia, who, at seven years of age, having lost some of his teeth, brought forth to the astonishment of his parents, a new tooth of pure gold. Jacobus Horstius, M. D. et prof. in the Academia Julia, had published a book, which he dedicated to the Emperor Rudolphus II. to
4 prove

prove that this wonderful tooth was a prodigy sent from heaven to encourage the Germans then at war with the Turks, &c. The imposture was soon after discovered to be a thin plate of gold, skillfully drawn over the natural tooth by an artist of that country, to excite the public admiration and charity. 5. *Artis Conservandi Sanitatem, libri duo*, Aberdeen, 1651, 12mo; a posthumous work. His style is plain and perspicuous, and sometimes elegant.

LIDKOPING, a town of Sweden, in W. Gothland, on the S. side of Lake Wenner, eighty miles S. W. of Orebro.

LIECHTENAU, a town of Franconia, in the margravate of Anspach. Lon. 9. 5. E. Lat. 48. 43. N.

LIEGE, a late principality and bishopric of Germany, in the circle of Westphalia, now annexed to France.

LIEGE, a town of France, capital of the department of the Ourte, as it formerly was of the bishopric of Liege, fifteen miles S. of Maestricht, and sixty-two S. W. of Cologne. Lon. 5. 40. E. Lat. 50. 37. N.

LIEGE, in law, properly signifies a vassal, who holds a kind of fee, that binds him in a closer obligation to his lord than other people. The term seems to be derived from the French *lier*, to bind; on account of a ceremony used in rendering faith or homage; which was by locking the vassal's thumb or his hand in that of the lord, to shew that he was fast bound by his oath of fidelity. Cujas, Vignere, and Bignon, choose rather to derive the word from the same source with *leudis* or *leodi*, *i. e.* loyal or faithful. But Du Cange agrees with those who derive it from *liti*, a kind of vassals, so firmly attached to their lord, on account of lands or fees held of him that they were obliged to do him all manner of service, as if they were his domestics. He adds, this was formerly called *litigium servitium*, and the person *litige*. In this sense, the word is used, lege. Edward. cap. 29. *Judei sub tutela regis ligeas debent esse*, that is, wholly under his protection. By liege homage, the vassal was obliged to serve his lord towards all, and against all, excepting his father. In which sense, the word was used in opposition to simple homage; which last only obliged the vassal to pay the rights and accustomed dues to his lord; and not to bear arms against the emperor, prince, or other superior lord; so that liegeman was a person wholly devoted to his lord, and entirely under his command *Omnibus*, &c. *Reginaldus, rex Insularum, salutem. Sciatis quod deveni homo ligeus domini regis Angliæ Johannis, contra omnes mortales quamdiu vivero*, &c. MS. penes W. Dugdale. But it must be observed, there were formerly two kinds of liege homage: the one, by which the vassal was obliged to serve his lord, against all, without exception even of his sovereign; the other, by which he was to serve him against all, except such other lords as he had formerly owed liege homage to. In the old English statutes, lieges, and liege people, are terms peculiarly appropriated to the king's subject; as being *liges*, *ligi*, or *ligati*, obliged to pay allegiance to him; 3 Henry VI. 14, Henry VIII. &c. though private persons had their lieges too. Vide Lib. Rames.

LIENTERY, [from *λεων*, *læve*, smooth, and *ελεγον*, *intestinum*, gut,] a particular looseness, or diarrhœa, wherein the food passes so suddenly through the stomach and guts, as to be thrown out by stool with little or no alteration. See MEDICINE.

LIEOU-KIEOU, a kingdom of Asia, consisting of thirty-six islands subject to China, forming a powerful and extensive empire; the inhabitants of which are civilized. They are situated between Corea, Formosa, and Japan. Each island has a particular name, the largest called Lieou-Kieou, is about 146 miles long, and 38 broad. The S. E. part of it, where the court resides, is called Cheouli; and Kint-ching, the capital city, is situated in it. The king's palace, which is reckoned twelve miles in circumference, is built on a neighbouring mountain. It has four gates corresponding to the four cardinal points; and that which fronts the W. forms the grand entry. The view which this palace commands is most extensive and delightful. Lon. 127. 30. E. Lat. 26. 2. N.

LIESSE, a town of France, in the department of Aisne, and late province of Picardy, seven miles and a half E. N. E. of Laon.

LIEUTAUD, JOSEPH, M.D. counsellor of state and first physician at the court of France, was born at Aix in Provence, and resided principally there till he took his degree. After this he studied for some years at Montpellier. He returned to Aix, where he soon acquired extensive practice, and became eminent for his literary abilities. He resided there till 1750, when he was invited

to act as physician to the royal infirmary at Versailles. There he practised with such reputation and success, that he soon arrived at the head of his profession; and in 1774, upon the death of M. Senac, he was appointed archiater. He published many valuable works; particularly, 1. *Elementa Philologiæ*. 2. *Précis de la Médecine*. 3. *Pratique Précis de Matière Médicale*. 4. *Essays Anatomiques*. 5. *Synopsis Universæ Præceos Medicinæ*. 6. *Historia Anatomico-Médica*. He died at Versailles in 1780, aged 78.

LIEUTENANT, [from *lieu*, a place, and *tenir*, to hold,] an officer who supplies the place, and discharges the offices, of a superior in his absence. Of these, some are civil, as the lords-lieutenants of kingdoms and counties; others military, as the lieutenant-general, lieutenant-colonel, &c.

LIEUTENANT, in the land-service, is the second commissioned officer in every company of both foot and horse, next to the captain, and takes the command upon the death or absence of the captain.

LIEUTENANT-COLONEL, the second officer of a regiment, who commands in the absence of the colonel.

LIEUTENANT-GENERAL is the next in command after the general; and provided he should die or be killed, the order is, that the oldest lieutenant-general shall take the command. This office is the first military dignity after that of a general. One part of their function is, to assist the general with their counsel: they ought, therefore, if possible, to possess the same qualities with the general himself; and the more, as they often command armies in chief. Lieutenant-generals have been multiplied of late in Europe, in proportion as the armies have become numerous. They serve either in field or in the sieges, according to the dates of their commissions. In battle, the oldest commands the right wing of the army, the second the left wing, the third the centre, the fourth the right wing of the second line, the fifth the left wing, the sixth the centre, and so on. In sieges the lieutenant-generals always command the right of the principal attack, and order what they judge proper for the advancement of the siege during the 24 hours they are in the trenches; except the attacks, which they are not to make without an order from the general-in-chief.

LIEUTENANT-GENERAL OF ARTILLERY ought to be a very good mathematician, and an able engineer; to know all the powers of artillery; to understand the attack and defence of fortified places, in all its different branches; how to dispose of the artillery in the day of battle to the best advantage; to conduct its march and retreat; as also to be well acquainted with all the numerous apparatus belonging to the train, and to the laboratory, &c.

LIEUTENANT, LORD, OF IRELAND, before the Union, was properly a viceroy; and had all the state and grandeur of a king of England, except being served upon the knee. He had the power of making war and peace, of bestowing all the offices under the government, of dubbing knights, and of pardoning all crimes except high treason: he also called and prorogued the parliament, but no bill could pass without the royal assent. He was assisted in his government by a privy council; and on his leaving the kingdom, he appointed the lords of the regency, who governed in his absence.

LIEUTENANT OF ARTILLERY. Each company of artillery hath four; one first and three second lieutenants. The first lieutenant hath the same detail of duty with the captain; because in his absence he commands the company: he is to see that the soldiers are clean and neat; that their clothes, arms, and accoutrements, are in good and serviceable order; and to watch over every thing else which may contribute to their health. He must attend to their being taught the exercise, see them punctually paid, their messes regularly kept, and visit them in the hospitals when sick. He must assist at all parades, &c. He ought to understand the doctrine of projectiles and the science of artillery, with the various effects of gunpowder, however managed or directed; to enable him to construct and dispose his batteries to the best advantage; to plant his cannon, mortars, and howitzers; so as to produce the greatest annoyance to an enemy. He is to be well skilled in the attack and defence of fortified places; and to be conversant in arithmetic, mathematics, mechanics, &c.

LIEUTENANT OF ARTILLERY, SECOND, is the same as an ensign in an infantry regiment, being the youngest commissioned officer in the company, and must assist the first lieutenant in the de-

tail of the company's duty. His other qualifications should be equal with those of the first lieutenant.

LIEUTENANT OF A SHIP OF WAR, the officer next in rank and power to the captain, in whose absence he is charged with the command of the ship, and the execution of whatever orders he may have received from the commander relating to the king's service.

LIEUTENANT, REFORMED, he whose company or troop is broke or disbanded, but himself continued in whole or half pay, still preserving his right of seniority and rank in the army.

LIEUTENANTS, LORDS, OF COUNTIES, are officers, who, upon any invasion or rebellion, have power to raise the militia, and to give commissions to colonels and other officers, to arm and form them into regiments, troops, and companies. Under the lords lieutenants, are deputy lieutenants, who have the same power; these are chosen by the lords lieutenants, out of the principal gentlemen of each county, and presented to the king for his approbation.

LIFE, in a peculiar sense, denotes the animated state of living creatures, or that space of time during which the soul is united to the body. Longevity has always been highly estimated by man; hence the art of preserving life has become an important study, and ought to form part of the education of every individual. There is, however, a period at which mankind cease to grow; and beyond which our existence continues for a limited time. Thus, if a person attain his full growth at the age of fifteen, he generally dies at that of sixty; provided that no accidents intervene, by which the vital principle be affected, and prematurely extinguished. According to the calculations of others, every animal body is by nature destined to live eight times the length of its growth. From the most accurate political accounts, made by comparing the bills of mortality published in different countries and climates, we shall insert the following result: Of one thousand persons living in large cities, no less than thirty-five or thirty-six die annually; while, in country places, or small towns, only from twenty-eight to thirty deaths happen in a similar period. Among one thousand children, five die during parturition; and scarcely half that number in child-bed; but about three hundred are computed to fall victims to a perverse mode of education, though suckled by their mothers; and not less than five hundred, or one-half of all that are born, if reared by wet-nurses. The mortality of infants, indeed, has increased to a most alarming degree in this luxurious age; as the plurality of them is carried off by convulsions, and difficult teething. Among a hundred and fifteen dead persons, there is only one woman deceased in child-bed; and, of four hundred mothers, one only by previous pains. A greater proportion of boys than of girls die of the natural small-pox. There are always to be found more aged persons in hilly or mountainous countries, than in low situations; and it is proved by the most authentic computation, that of three thousand one hundred and twenty-five, only one individual survives the hundredth year. From the same source the following is the most probable chance which persons may have for the duration of their lives, after a certain fixed period, namely:

	Years.	Months.
A new-born infant will probably live	34	6
A person of 1 year old.....	41	9
3.....	45	7
5.....	46	4
10.....	44	9
15.....	41	6
20.....	38	3
25.....	35	3
30.....	32	3
35.....	29	8
40.....	26	6
45.....	23	0
50.....	20	11
55.....	17	0
60.....	14	2
65.....	11	5
70.....	8	11
75.....	6	8
80.....	4	10
85.....	3	3
90.....	2	0

The proportion of the female sex to that of males, with respect to the number of deceased, is as 100 to 108. Previously to the sixtieth year, the chance of survivorship is in favour of women; but, after that age, men generally survive them. Married women, on the whole, live longer than those in a state of celibacy. From observations made for the space of fifty years it is evident that most persons die in the months of March, August, and September; but the fewest in November, December, and February. In populous cities, however, such as London and Paris, death makes the greatest havoc during the winter. One-half of the human race is doomed to dissolution, before they have completed the seventeenth year of their age; but, after this critical period, the survivors' chance of life becomes more valuable with every year: hence, for instance, a person thirty years old, according to the preceding calculation, will probably live thirty-two years longer; so that he may attain the age of sixty-two; whereas a youth of fifteen, though he have a chance of living forty-one and a half years longer, will nevertheless arrive only at the fifty-sixth or fifty-seventh year of his age. Conformably to the observations of Boerhaave, the most healthy children are born in the months of January, February, and March: indeed, the greatest number of births takes place during the two months last mentioned. The proportion of boys, annually born is to that of girls as a hundred and four to a hundred; but, on the other hand, a greater number of the former die during infancy than of the latter; so that about the age of puberty both sexes are nearly equal. Among sixty-five or seventy infants, there is generally but one instance of twins. The number of marriages, compared to that of the whole population of a country, is as a hundred and seventy-five to a thousand. Four children are generally computed to arise from each married couple; but in towns only thirty-five children from ten families. Lastly, it is proved from the records of the most experienced physicians, that, among a hundred persons living in cities, throughout the year, only twenty are indisposed, or confined to their beds for one month; or twenty-four for the space of a fortnight.

LIFE ANNUITIES. See **ANNUITIES**, and **SURVIVORSHIP**.

LIFE-RENT, in Scotch law. When the use and enjoyment of a subject is given to a person during his life, it is said to belong to him in life-rent.

LIFFEY, a river of Ireland which, after passing through the Leinster aqueduct, under the grand canal, is precipitated from the rocks of Leixlip, forming a beautiful cataract; and hence gliding through the county and city of Dublin, falls into Dublin Bay.

LIFFORD, a town of Ireland, in Donegal. Lon. 5. 45. W. Lat. 54. 47. N.

LIGAMENT, [*ligamentum*, from *ligo*, Latin,] in its general sense, denotes any thing that ties or binds one part to another. It is particularly used in anatomy, to denote a strong compact substance, serving to join two bones together. See **ANATOMY**.

LIGATURE, [*ligatura*, Latin,] in surgery, a cord, band, or string, or the binding of any part of the body with a cord, band, or fillet, &c. whether of leather, linen, or any other matter. Ligatures are used to extend or replace bones that are broken or dislocated; to tie the patients down in lithotomy and amputations; to tie up the veins in phlebotomy, on the arteries in amputations, or in large wounds, to secure the splints that are applied to fractures; to tie up the processes of the peritoneum with the spermatic vessels in castration; and, lastly, in taking off warts or other excrescences by ligature.

LIGATURE, in the Italian music, signifies a binding together of notes. Hence syncopes are often called ligatures, because they are made by the ligature of many notes.

LIGATURES, among printers, are types consisting of two letters or characters joined together, as *ff*, *ff*, *fi*.

LIGHT, [*leoght*, Sax.] the medium of vision; that which renders objects visible. The nature of light hath been subject of speculation from the earliest ages of philosophy. Some of the most ancient philosophers doubted whether objects became visible by means of any thing proceeding from them, or from the eye of the spectator. The fallacy of this notion must soon have become apparent, because, in that case men ought to see as well in the night as in the day. The opinion was therefore qualified by Empedocles and Plato; who maintained, that vision was occasioned by particles continually flying off from the surfaces of bodies, which met with others proceeding from the eye; but

Pythagoras

Pythagoras ascribed it solely to the particles proceeding from the external objects, and entering the pupil of the eye. Among the moderns there have been two celebrated opinions, viz. the Cartesian and Newtonian. According to the former, light is an invisible fluid present at all times and in all places, but which requires to be set in motion by an ignited or otherwise properly qualified body in order to make objects visible to us. "Huygens," (says Dr. Thomson of Edinburgh,) "considered it as a subtle fluid filling space, and rendering bodies visible by the undulation into which it is thrown. According to his theory, when the sun rises it agitates this fluid, the undulations gradually extend themselves, and at last striking against our eye we see the sun. This opinion was adopted also by Euler, who exhausted the whole of his consummate mathematical skill in its defence." (Syst. of Chem. 1802, vol. i. p. 240.) The Newtonians maintain, that light is not a fluid per se, but consists of a vast number of exceedingly small particles shaken off in all directions from the luminous body with inconceivable velocity by a repulsive power; and which most probably never return again to the body from which they were emitted. These particles are also said to be emitted in right lines by the body from which they proceed; and this rectilinear direction they preserve until they are turned out of their original path by the attraction of some other body near which they pass, and which is called inflection; by passing through a medium of different density, which is called refraction, or by being thrown obliquely or directly backward by some body which opposes their passage, and which is called reflection; or, lastly, till they are totally stopped by the substance of any body into which they penetrate, and which is called their extinction. (See OPTICS.) A succession of these particles following one another in an exactly straight line is called a ray of light; and this ray, in whatever manner it hath its direction changed, whether by refraction, reflection, or inflection, always preserves its rectilinear course; neither is it possible by any art whatever to make it pass on in the segment of a circle, ellipsis, or other curve. From some observations on the eclipses of Jupiter's satellites, and also on the aberration of the fixed stars, it appears that the particles of light move at the rate of little less than 200,000 miles in a second. See ASTRONOMY. To this doctrine concerning the nature of light several objections have been made; the most considerable of which is, That in this case, as rays of light are continually passing in different directions from every visible point, they must necessarily interfere with and destroy each other in such a manner as entirely to confound all distinct perception of objects, if not to destroy the sense of seeing altogether; not to mention the continual waste of substance which a constant emission of particles must occasion in the luminous body, and which since the creation ought to have greatly diminished the sun and stars, as well as increased the bulk of the earth and planets by the vast quantity of particles of light absorbed by them in such a long period of time. In answer to this, Mr. Melville gives some ingenious illustrations concerning the extreme subtilty of light, or the smallness of the particles of which it consists, and of which few persons, even of those who admit the hypothesis, have any idea. He observes, that there is probably no physical point in the visible horizon that does not send rays to every other point, unless where opaque bodies interpose. Light, in its passage from one system to another, often passes through torrents of light issuing from other suns and systems, without ever interfering or being diverted with its course, either by it, or by the particles of that elastic medium which some phenomena gives us reason to suppose are diffused through all the mundane space. To account for this fact and others similar to it, he concludes that the particles of which light consists must be incomparably rare, even when they are the most dense; that is, that the semidiameters of the two nearest particles, in the same or in different beams, soon after their emission, are incomparably less than their distance from one another. This difficulty concerning the non-interference of the particles of light is not solved by supposing with Mr. Bosovich and others, that each particle is endued with an insuperable impulsive force; because, in that case, their spheres of impulsion would even be more liable to interfere, and they would on that account be more likely to disturb one another. The difficulty, according to Mr. Cantoo, will nearly vanish, if a very small portion of time be allowed between the emission of every particle and the next that follows in the same direction. Suppose,

for instance, that one lucid point of the sun's surface emits 150 particles in a second, which are more than sufficient to give continual light to the eye without the least appearance of intermission; yet still the particles of which it consists, will on account of their great velocity be more than 1000 miles behind each other, and thereby leave room enough for others to pass in all directions. To determine whether light consists of particles emitted from the luminous body, or only in the vibrations of a subtle fluid, it has been attempted to find out its momentum, or the force with which it moves. The first who set about this matter with any tolerable pretensions to accuracy was M. Mairan. Hartsocker and Homberg, had indeed pretended, that in certain cases this momentum was very preceptible; but M. Mairan proved, that the effects mentioned by them were owing to currents of heated air produced by the burning-glasses used in their experiments, or to some other causes overlooked by these philosophers. To decide the matter therefore, he began with trying the effects of rays collected by lenses of four and six inches diameter, and thrown upon the needle of a compass; but the result was nothing more than some tremulous motion from whence he could draw no conclusion. After this, he and Mr. du Fay constructed a kind of mill of copper, which moved with an exceeding slight impulse; but though they threw upon it the focus of a lens of seven or eight inches diameter, they were still unable to draw any conclusions from the result. M. Mairan afterwards procured a horizontal wheel of iron, three inches in diameter, having six radii, at the extremity of each of which was a small wing fixed obliquely. The axis of the wheel, which was also of iron, was suspended by a magnet. The wheel and the axis together did not weigh more than thirty grains; but though a motion was given to this wheel when the focus of the burning-glass was thrown upon the extremities of the radii, yet it was so irregular, that he could not but conclude that it was occasioned by the motion of the heated air. He then intended to have made his experiment in vacuo, but he concluded that it was unnecessary: for, besides the difficulty of making a vacuum, he was persuaded that there was in our atmosphere a thinner medium which freely penetrates even glass itself, the existence of which he imagined that he had fully proved in his treatise on the aurora borealis. Mr. Michell some years ago endeavoured to ascertain the momentum of light in a manner still more accurate. The instrument he made use of consisted of a very thin plate of copper, a little more than an inch square, which was fastened to one end of a slender harpsichord-wire about ten inches long. To the middle of this was fixed an agate-cap, such as is commonly used for small mariner's compasses, after the manner of which it was intended to turn; and at the other end of the wire was a middling sized shot corn, as a counterpoise to the copper-plate. The instrument had also fixed to it in the middle, at right angles to the length of the wire, and in an horizontal direction, a small bit of a very slender sewing needle, about one-third or perhaps half an inch long, which was made magnetical. In this state the whole instrument might weigh about ten grains. It was placed on a very sharp-pointed needle, on which the agate-cap turned extremely freely; and to prevent its being disturbed by any motion of the air, it was inclosed in a box, the lid and front of which were of glass. This box was about twelve inches long, six or seven inches deep, and about as much in width; the needle standing upright in the middle. At the time of making the experiment, the box was so placed, that a line drawn from the sun passed at right angles to the length of it: and the instrument was brought to range in the same direction with the box, by means of the magnetical bit of needle above mentioned, and the magnet properly placed on the outside, which would retain it, though with extremely little force, in any situation. The rays of the sun were now thrown upon the copper-plate from a concave mirror of about two feet diameter, which, passing through the front-glass of the box, were collected into the focus of the mirror upon the plate. In consequence of this the plate began to move, with a slow motion of about an inch in a second of time, till it had moved through a space of about two inches and a half, when it struck against the back of the box. The mirror being removed, the instrument returned to its former situation by means of the little needle and magnet; and the rays of the sun being then again thrown upon it, it again began to move, and struck against the back of the box as before; and this was repeated three or four times with the same success.

success. The instrument was then placed the contrary way in the box to that in which it had been placed before, so that the end to which the copper-plate was affixed, and which had lain, in the former experiment, towards the right hand, now lay towards the left; and the rays of the sun being again thrown upon it, it began to move with a slow motion, and struck against the back of the box as before; and this was repeated once or twice with the same success. But by this time the copper-plate was so much altered in its form, by the extreme heat which it underwent in each experiment, and which brought it nearly into a state of fusion, that it became very much bent, and the more so as it had been unwarily supported by the middle, half of it lying above and half below the wire to which it was fastened. By these means it now varied so much from the vertical position, that it began to act in the same manner as the sail of a windmill, being impelled by the stream of heated air which moved upwards, with a force sufficient to drive it in opposition to the impulse of the rays of light. If we impute (says Dr. Priestley) the motion produced in the above experiment to the impulse of the rays of light, and suppose that the instrument weighed ten grains, and acquired a velocity of one inch in a second, we shall find that the quantity of matter contained in the rays falling upon the instrument in that time amounted to no more than one 1200 millionth part of a grain, the velocity of light. From this it will follow, that light exceeds the velocity of one inch in a second in the proportion of about 1,200,000,000 to 1. The light was collected from a surface of about three square feet, which reflecting only about half what falls upon it, the quantity of matter contained in the rays of the sun incident upon a square foot and an half of surface in one second of time, ought to be no more than the twelve-hundred-millionth part of a grain, or, upon one square foot only, the 1800 millionth part of a grain. But the density of the rays of light at the surface of the sun is greater than at the earth in the proportion of 45,000 to 1; there ought, therefore, to issue from one square foot of the sun's surface in one second of time, in order to supply the waste by light, one 40,000th part of a grain of matter; that is, a little more than two grains in a day, or about 4,754,000 grains, or 670 pounds avoirdupoise nearly, in 6000 years: a quantity which would have shortened the sun's semi-diameter no more than about ten feet, if it was formed of the density of water only." The Newtonians, besides the answer just given to the most formidable objections of their opponents, have endeavoured to prove the impossibility of light being a vibration in any fluid. Sir Isaac Newton in his *Principia*, demonstrates, that no rectilinear motion can be propagated among the particles of a fluid unless these particles lie in right lines; and that all motion propagated through a fluid diverges from a rectilinear progress into the unmoved spaces. Hence he concludes, "a pressure on a fluid medium (i. e. a motion propagated by such a medium beyond any obstacle, which impedes any part of its motion), cannot be propagated in right lines, but will be always inflecting and diffusing itself every way, to the quiescent medium beyond that obstacle. The power of gravity tends downwards; but the pressure of water rising from it tends every way with an equal force, and is propagated with equal ease, and equal strength, in curves, as in straight lines. Waves, on the surface of the water, gliding by the extremes of any very large obstacle, inflect and dilate themselves, still diffusing gradually, into the quiescent water beyond that obstacle. The waves, pulses, or vibrations, of the air, wherein sound consists, are manifestly inflected, though not so considerably as the waves of water; and sounds are propagated with equal ease, through crooked tubes and through straight lines; but light was never known to move in any curve, nor to inflect itself at all." To this Mr. Rowning adds another proof: "The Cartesian notion of light (says he), was not that it is propagated from luminous bodies by the emission of small particles, but that it was communicated to the organ of sight by their pressure upon the *materia subtilis*, with which they supposed the universe to be full. But according to this hypothesis, it could never be dark; because, when a fluid sustains any pressure, if that fluid fills all the space it takes up, absolutely, without leaving any pores, which is the case of the supposed *materia subtilis*, then that pressure must necessarily be communicated equally and instantaneously to every part. And therefore, whether the sun were above or below the horizon, the pressure communicated, and consequently the light, would be the same. And farther, as the pressure would

be instantaneous, so would the light, which is contrary to what is collected from the eclipses of Jupiter's satellites." But whatever side we take concerning the nature of light, many, indeed almost all circumstances concerning it, are incomprehensible, and beyond the reach of human understanding. There are several bodies which have the property of absorbing the rays of light, of retaining them for some time, and of again evolving them unchanged, and unaccompanied by sensible heat. Thus, in an experiment of Du Fay, a diamond exposed to the sun, and immediately covered with black-wax, shone in the dark, on removing the wax, at the expiration of several months. Bodies possessing this property, are called solar phosphori; such are Canton's, Baldwin's, Homberg's, and the Bolognian phosphori. To the same class belong several natural bodies which retain light, and give it out unchanged. Thus, snow, the sea when agitated, putrid fish, and the glow-worm, are natural phosphori. These phenomena are independent of every thing like combustion; for artificial phosphori, after exposure to the sun's rays, shine in the dark when placed in the vacuum of an air-pump, or under water, &c, where no air is present to effect combustion. From solar phosphori, the extrication of light is facilitated by the application of an elevated temperature; and, after having ceased to shine at the ordinary temperature, they again emit light when exposed to an increase of heat. Several bodies, which do not otherwise give out light, evolve it, or become phosphorescent when heated. Thus, powdered fluate of lime becomes luminous when thrown on an iron-plate, raised to a temperature rather above that of boiling water. The yolk of an egg, when dried, becomes luminous on being heated; and so also does tallow during liquefaction. To exhibit the last mentioned fact, it is merely necessary to place a lump of tallow on a coal, heated below ignition, making the experiment in a dark room. Attrition also evolves light, in many instances, by the part rubbed becoming ignited. Thus, rock-crystal, and other hard stones, shine when rubbed against each other; and two pieces of common bonnet-cane, rubbed strongly against each other in the dark, emit a faint light; most probably from the silex they contain: and two pieces of borax have the same property much more remarkably. Light is disengaged in various cases of chemical combination. Whenever combustion is a part of the phenomena, this is well known to happen; but light is evolved also, in other instances, where nothing like combustion goes forwards. Thus, fresh-prepared pure magnesia, added suddenly to highly concentrated sulphuric acid, exhibits a red heat. Light is essentially necessary to vegetation: in our climate, it is seldom productive of injury by its excess, though the want of it is often pernicious. This fluid acts as a kind of stimulus on the more irritable parts of plants; as appears from the sun flower and others, that expand or bow when exposed to the rays of the sun: hence Dr. Darwin supposes there may be diseases in plants, arising from the excess of this stimulus, but which, he thinks, have hitherto been disregarded. To corroborate this conjecture, he specifies the Goat's-beard, or *Tragopogon* of Linnaeus, and some other vegetable productions, which close their flowers about noon, in order to prevent the influence of such stimulus. On the contrary, the absence or defect of light produces a disease called etiolation, or blanching, because vegetables deprived of that fluid become white. It has a similar effect on animal bodies; which, as Dr. Darwin has pointedly remarked, are in consequence rendered pale and inert: this is confirmed by the languid and etiolated countenances of the young ladies in some boarding-schools, where, from false motives of delicacy, they are secluded both from the light of the sun, and the invigorating influence of the air: it is still farther evinced in those studious persons, who pass their waking hours in unventilated apartments, especially during a considerable part of the night. But, though such etiolation be naturally injurious to vegetation, it has been artificially employed with success, in rendering certain plants esculent, by depriving them of their acrimony, cohesion, and colour. This method is chiefly practised on celery, by earthing up that plant nearly to the top; on sea-kale, by covering it entirely with horse-litter or straw; and, lastly, on lettuces and endive, by tying the root-leaves together with a bandage. Dr. T. Thomson, after enumerating the general properties of light, concludes thus: "Such are the properties of light as far as they have been examined. They are sufficient to convince us, that it is a body, and possesses many qualities in common with other bodies. It is attracted by them,

and combines with them precisely as other bodies do. But it is distinguished from all other "substances, by possessing three peculiar properties of which they are destitute: The 1st is the power which it has of exciting in us the sensation of vision, by moving from the object seen and entering the eye. The phenomena of colours," (See OPTICS,) "and the prismatic spectrum, indicate the existence of seven different species of light; but to what the difference of these species is owing, has not been ascertained. We are altogether ignorant of the component parts of every one of these species. The second peculiar property of light is the prodigious velocity with which it moves, whenever it is separated from any body with which it was formerly combined." "This velocity it acquires in a moment, and in all cases, whatever the body be from which it separates. The third and not the least singular of its peculiar properties, is, that its particles are never found cohering together so as to form masses of any sensible magnitude. This difference between light and other bodies can only be accounted for, by supposing that its particles repel each other. This seems to constitute the grand distinction between light and other bodies. Its particles repel each other, while the particles of other bodies attract each other; and accordingly are found cohering together, in masses of more or less magnitude." Syst. of Chem. vol. I. p. 252, 253.

LIGHT, SOURCES OF. Dr. Thomson, in his Syst. of Chem. Vol. I. p. 253, enumerates four different sources from which light is emitted in a visible form: viz. 1. THE SUN and STARS. See ASTRONOMY. 2. COMBUSTION. 3. HEAT; and, 4. PERCUSSION. See these articles; and ELECTRICITY, FLINT, STEEL, LAMP, &c. and for several other properties of light, see OPTICS. In Sweden a very curious phenomenon has been observed on certain flowers by M. Haggern, lecturer in natural history. One evening he perceived a faint flash of light repeatedly dart from a marigold. Surprised at such an uncommon appearance, he resolved to examine it with attention; and, to be assured it was no deception, he placed a man near him, with orders to make a signal at the moment when he observed the light. They both saw it constantly at the same moment. The light was most brilliant on marigolds of an orange or flame colour; but scarcely visible on pale ones. The flash was frequently seen on the same flower two or three times in quick succession; but more commonly at intervals of several minutes: and when several flowers in the same place emitted their light together, it could be observed at a considerable distance. This phenomenon was remarked in July and August at sun-set, and for half an hour, when the atmosphere was clear; but after a rainy day, or when the air was loaded with vapours, nothing of it was seen. The following flowers emitted flashes, more or less vivid, in this order: 1. The marigold, *galendula officinalis*. 2. Monk's hood, *trapaolum majus*. 3. The orange lily, *lilium bulbiferum*. 4. The Indian pink, *tagetes patula* et erecta. To discover whether some little insects or phosphoric worms might not be the cause of it, the flowers were carefully examined, even with a microscope, without any such being found. From the rapidity of the flash, and other circumstances, there seems to be something of electricity in this phenomenon. It is well known, that when the pistil of a flower is impregnated, the pollen bursts away by its elasticity, with which electricity may be combined. M. Haggern, after having observed the flash from the orange lily, the anthers of which are a considerable space distant from the petals, found that the light proceeded from the petals only; whence he concludes, that this electric light is caused by the pollen, which, in flying off is scattered on the petals. Whatever be the cause, the effect is highly curious.

LIGHTS, in painting, are those parts of a piece which are illuminated, or that lie open to the luminary, by which the piece is supposed to be enlightened; and which, for this reason, are painted in bright vivid colours. In this sense, light is opposed to shadow. The doctrine of lights and shadows makes that part of painting called *chiaro-oscuro*.

LIGHT, in the manege, a term used in various senses: thus a light horse, is a swift runner: but the same term is also given to a horse that is well made, though he is neither swift nor active; for we here consider only the shape and make of the horse, without regard to his qualities. We call a coach-horse light, when he stirs nimbly, and dreads the whip.

LIGHTER, a large, open, flat-bottomed vessel, generally manned with oars, and employed to carry goods to or from a ship when she is to be laden or delivered.

when she is to be laden or delivered.

LIGHTFOOT, JOHN, D. D. a very learned English divine, born in March 1602, at Stoke upon Trent in Staffordshire, and educated at Cambridge, where he was thought the best orator of the under-graduates in the university. He became chaplain to Sir Rowland Cotton; who being a perfect master of the Hebrew language, engaged Lightfoot in that study; to which he applied himself with extraordinary vigour, and quickly made great progress in that language. In 1628, he married the daughter of William Crompton, of Stonepark, Esq. and in 1629, gave the public a notable specimen of his advancement in those studies, by his *Erubhim*, or *Miscellanies Christian and Judaical*, in 1629. He was then only 27 years of age; and appears to have been well acquainted with the Latin and the Greek fathers, as well as with the classics. These first-fruits of his studies were dedicated to Sir Rowland Cotton; who, in 1631, presented him to the rectory of Ashley in Staffordshire, which he resigned to his brother in 1642, and removed to London, where he was chosen minister of St. Bartholomew, behind the Exchange. During the civil war he complied with the ruling party, and became member of the assembly of divines, at Westminster, in which he was a frequent speaker. In 1653, he was appointed master of Catherine-hall, Cambridge, and in 1655 he served the office of vice-chancellor, having taken the degree of D. D. in 1652, with great applause. He executed the office of vice-chancellor with exemplary diligence, and at the commencement, supplied the place of professor of divinity, then undisposed of. At the same time he was engaged with others in perfecting the Polyglott Bible, then in the press. At the Restoration he offered to resign the mastership of Catherine-hall; but as he had acted from no spirit of opposition to the king and government, a confirmation was granted him from the crown, both of the place and of his living. He died Dec. 6, 1675. His works which are a treasure of biblical learning, were collected and published first in 1684, in two volumes folio. The second edition was printed at Amsterdam, 1686, in 2 vols. folio, containing all his Latin writings, with a Latin translation of those which he wrote in English. At the end of both these editions there is a list of such pieces as he left unfinished. It is the chief of these, in Latin, which make up the third volume, added to the two former, in a third edition of his works, by John Lensden, at Utrecht, in 1699, fol. They were communicated by Mr. Strype, who, in 1700, published another collection of these papers, under the title of "Some genuine Remains of the late pious and learned Dr. John Lightfoot."

LIGHTFOOTIA, in botany, a genus of the polygamia diœcia class and order. Calyx four-leaved; corolla none: female and hermaphrodite, stigma sessile; berry umbilicated, one-celled, with from three to six seeds. It has three species, all shrubs.

LIGHTHOUSE, a high building, at the top of which lights are hung to guide ships at sea.

LIGHTNING, a bright and vivid flash of fire, suddenly appearing in the atmosphere, and commonly disappearing in an instant, sometimes attended with clouds and thunder, and sometimes not. Lightning was looked upon as sacred both by the Greeks and Romans, and was supposed to be sent to execute vengeance on the earth. Hence persons killed with lightning, being thought hateful to the gods, were buried by themselves, lest the ashes of other men should be polluted by them. Some say they were suffered to rot where they fell, because it was unlawful for any man to approach the place. For this reason the ground was hedged in, lest any person should be polluted by it. All places struck with lightning were fenced round, from an opinion that Jupiter had either taken offence at them, and fixed upon them the marks of his displeasure, or that he had thus pitched upon them as sacred to himself. The ground thus fenced about was called by the Romans *bidental*. Lightning was much observed in augury, and was a good or bad omen, according to the circumstances attending it. The phenomena of lightning are always surprising, and sometimes very terrible; neither is there any kind of natural appearance in which there is more diversity, not two flashes being ever observed exactly similar. In a serene sky, the lightning, in this country at least, almost always hath a kind of indistinct appearance without any determinate form, like the sudden illumination of the atmosphere occasioned by firing a quantity of loose gunpowder: but

when accompanied with thunder, it is well defined, and hath very often a zig-zag form. Sometimes it makes one angle, like the letter V, sometimes it hath several branches, and sometimes it appears like the arch of a circle. But the most formidable and destructive form which lightning is ever known to assume is that of balls of fire. The motion of these is very often easily perceptible to the eye; but wherever they fall, much mischief is occasioned by their bursting, which they always do with a sudden explosion like that of fire-arms. Sometimes they will quietly run along, or rest for a little upon any thing, and then break into several pieces, each of which will explode; or the whole ball will burst at once, and produce its mischievous effects only in one place. The next to this in its destructive effects is the zig-zag kind; for that which appears like indistinct flashes, whose form cannot be readily observed, is seldom or never known to do hurt. The colour of the lightning also indicates in some measure its power to do mischief; the palest and brightest flashes being most destructive; such as are red, or of a darker colour, commonly doing less damage. Besides these kinds of lightning, it is not uncommon to see flashes unattended by any report. These are always of the sheet kind; they happen very frequently in windy weather; when the sky is clear; and likewise when the sky is cloudy immediately before a fall of rain or snow. The general reason of these appears to be, that the electric fluid is the medium by which the vapours are suspended in the atmosphere; and of consequence, every separation of vapour, whether as rain, snow, or hail, must be attended with what is called a discharge of electrical matter. The reason why this kind of lightning is never attended with any report is, that there is no particular object against which the force of the flash is directed: but it dissipates itself among the innumerable conducting bodies with which the atmosphere always abounds. It is, however, in a manner impossible to explain the various ways in which this subtle fluid acts. We know not, for instance, in what state it is, when acting as a medium of connection between the air and vapour, nor in what its discharge into other parts of the atmosphere properly consists. At any rate, we see that a flash of lightning, however limited its extent may appear, diffuses its effects over a great space of atmosphere; for after one of these silent flashes, it is no uncommon thing to observe the sky become obscure, though it had been quite serene before: or if it had been cloudy, to see rain or snow begin to fall in a very few minutes. See METEOROLOGY. A very surprising property of lightning, the zig-zag kind especially when near, is its seeming omnipresence. If two persons are standing in a room looking different ways, and a loud clap of thunder accompanied with zig-zag lightning happens, they will both distinctly see the flash, not only by that indistinct illumination of the atmosphere which is occasioned by fire of any kind; but the very form of the lightning itself, and every angle it makes in its course, will be as distinctly perceptible, as if both had looked directly at the cloud from whence it proceeded. If a person happened at that time to be looking on a book, or other object which he held in his hand, he would distinctly see the form of the lightning between him and the object at which he looked. This property seems peculiar to lightning, and to belong to no other kind of fire whatever. Electricity has pointed out the nature of this curious and terrific phenomenon, and the identity of the electric matter and lightning is now established beyond a doubt. See ELECTRICITY. The different forms of the flashes are all exemplified in those of electrical sparks. Where the quantity of electricity is small, and consequently incapable of striking at any considerable distance, the spark appears straight, without any curvature or angular appearance: but where the electricity is very strong, and of consequence capable of striking an object at a pretty considerable distance, it assumes a crooked or zig-zag form. The reason of this appearance, both in these sparks and in the lightning, is, that the more fluid electric matter hath to pass through the denser and less fluid atmosphere with great rapidity; and in fact, this is the way in which all the more fluid substances pass through those that are less so, at least when their velocity becomes considerable. If bubbles of air or steam pass very gently up through water, their course from the bottom to the top of the vessel will differ very little, if at all, from a straight line; but when they are impelled by a considerable force, as in air blown from a bellows, or the bubbles of a steam which arises in boiling water, their course is then marked by waved and crooked lines, and the deflection of the

bubbles to the right or left will be precisely in proportion to their ascending velocity, and to the weight of the water by which they are resisted. In the case of air blown through water, however, or steam ascending from the bottom of a vessel of boiling water, though the course of the bubbles is waved and crooked, it is never angular as in lightning. The reason is, that there is no proportion between the capacity of the air for yielding to the impetus of lightning, and the velocity with which the latter is moved. From Mr. Robins's experiments in gunnery, it appears, that the air cannot yield with a velocity much greater than 1200 feet in a second, and that all projectiles moving with a greater degree of velocity meet with a violent resistance. But if we suppose lightning to move only with one-half the velocity of light, that is, near 100,000 miles in a second, or even with that of 1000 miles in a minute, which most probably is the case, its motion in the fluid atmosphere will meet with a resistance very little inferior to what air would meet with in passing through the most solid bodies. The smallest difference of the resistance of the atmosphere on either side, must determine the lightning to that side; and in its passage to that new place where the resistance is least, it must pass on a straight line, making an angle with its former course, because the atmosphere is altogether incapable of yielding with such rapidity as the electric matter requires, and therefore resists like a solid rock. The case is otherwise in the former examples; for though a small difference in the resistance forces the bubbles of air or steam to deviate from side to side, yet there is always a considerable proportion between the capacity of water for yielding, and that force by which the bubbles urge it to yield; so that though it does make a resistance sufficient to prevent the bubbles from moving in a straight line, yet it also perceptibly yields at all times, and therefore the tract of the bubbles is formed by a number of curves and not angles. Hence we may understand the reason why the zig-zag kind of lightning is so dangerous, namely, because it must overcome a very violent resistance of the atmosphere; and wherever that resistance is in the smallest degree lessened, there it will undoubtedly strike, and at a very considerable distance too. It is otherwise with that kind which appears in flashes of no determinate form. The electric matter of which these are composed, is evidently dissipated in the air by some conducting substances present there; and of consequence, though a man, or other conducting body, happened to be very near such a flash, he would not be struck or materially injured by it, though a zig zag flash, in such circumstances, would probably discharge its whole force upon him. Though the zig-zag kind is dangerous, yet the most destructive kind is that which assumes the form of balls. These are produced by an exceeding great power of electricity gradually accumulated till the resistance of the atmosphere is no longer able to confine it. In general, the lightning breaks out from the electrified cloud by means of the approach of some conducting substance; either a cloud, or some terrestrial substance: but the fire-balls seem to be formed, not because there is any substance at hand to attract the electric matter from the cloud, but because the electricity is accumulated in such quantity that the cloud can no longer contain it. Hence such balls fly off slowly, and have no particular destination. Their appearance indicates a prodigious commotion and accumulation of electricity in the atmosphere, without a proportionable disposition in the earth to receive it. This disposition, however, is perpetually altered by a thousand circumstances, and the place which first becomes most capable of admitting electricity will certainly receive a fire-ball. Hence this kind of lightning moves slowly backwards and forwards in the air for a considerable time, and then suddenly falls on one or more houses, according to their being more or less affected with an electricity opposite to that of the ball at the time. It will also run along the ground, break into several parts, and produce several explosions at once. It is very difficult to imitate lightning of this kind in electrical experiments. The only cases, in which it hath been done in any degree, are those in which Dr. Priestley made the explosion of a battery pass for a considerable way over the surface of raw flesh, water, &c. and in Mr. Arden's experiment, when a fire-ball ascended to the top of an electrified jar, and burst it with a violent explosion. In these cases, if, while the electric flash passed over the surface of the flesh, it had been possible to interrupt the metallic circuit by taking away the chain, the electric matter discharged from the battery would have been precisely

precisely in the situation of one of the fire-balls above-mentioned, *i. e.* it would have been at a loss for a conductor. The negative side of the battery was its destination; but to that it would not have easily got, because of the great quantity of atmosphere which lay in its way, and the incapacity of the neighbouring bodies to receive it. But, while the electric matter was thus stationary for want of a conductor, if any person standing near, or touching the negative side of the battery, presented a finger to that seemingly inoffensive luminous body, he would instantly be struck very violently; because a free communication being now made by means of his body, the powers by which the electric fluid is impelled from one place to another would instantly urge it upon him. But if we suppose a person, who hath no communication with the battery, to present his finger to the same body, he may perhaps receive a slight spark from it; but not a shock of any consequence, because there is not a perfect communication by means of his body with the place to which the electric fire is destined. Hence we may account for the seemingly capricious nature of lightning, but especially of that kind which appears in the form of balls. Sometimes it will strike trees, high houses, steeples, and towers, without touching cottages, men, or other animals, who are in the neighbourhood. In such cases, people would be apt to say, that the neighbourhood of these higher objects preserved the others from the stroke; but with little reason, since low houses, men walking in the fields, cattle, nay the surface of the earth itself, have all been struck, while high trees and steeples in the neighbourhood have not been touched. In like manner, fire-balls have passed very near certain persons without hurting them, while they have, as it were, gone considerably out of their way to kill others. The reason of all this is, that in thunder-storms there is constantly a certain zone of earth considerably under the surface, to which the lightning is directed because it hath an electricity opposite to that of the lightning itself. Those objects, therefore, which form the most perfect conductors between the electrified clouds and that zone of earth, will be struck by the lightning, whether they are high or low. Lightning, in severe thunder-storms, is supposed to proceed from the earth, as well as from the clouds but this hath never been well ascertained, and indeed from the nature of the thing it seems very difficult to be ascertained; for the motion of the electric fluid is so very quick, that it is altogether impossible to determine, by means of our senses, whether it goes from the earth or comes to it. In fact, there are many thunder-storms, in which it doth not appear that the lightning touches any part of the earth, and consequently can neither go to it nor come out from it. In these cases, it flashes either from an electrified cloud to one endowed with an opposite electricity, or into some conducting substances in the atmosphere. But if not only the clouds, but the atmosphere all the way betwixt them and the earth, and likewise for a considerable space above the clouds, are electrified one way, the earth must then be struck. The reason of this will appear from a consideration of the principles of Electricity. And from the same principles, it will appear, that in many cases the fluid will proceed from the earth, the cloud being in a negative state. For a further illustration of this subject, and for the methods of preserving buildings, &c. from lightning, See **ELECTRICITY**. For the effects of lightning in the production of thunder, See **THUNDER**. See also Dr. Franklin's Experiments and Observations on Electricity; Dr. Priestley's History of Electricity, in which this interesting subject is perspicuously treated; and Lord Mahon's Principles of Electricity.

LIGHT-ROOM, a small apartment, inclosed with glass-windows, near the magazine of a ship of war. It is used to contain the lights by which the gunner and his assistants are enabled to fill the cartridges with powder to be ready for action.

LIGNE, a town of France, in the department of Gemappes, and late province of Austrian Hainault, 12 miles N. W. of Mons.

LIGNET, among goldsmiths, a longitudinal hollow iron-mould, made for receiving melted masses of gold or silver. It has a large hollow for the former, and a small one for the latter. See **INGOT**. This word is by some derived from *lignum*, wood; ingots of gold and silver having been probably at first thrown into lignets made of hollow hard wood.

LIGNICENSIS TERRA, in the materia medica, a fine yellow bole dug in many parts of Germany, particularly about

Emeric in Westphalia, and used in cordial and astringent medicines.

LIGNIERE, or **LIGNIERES**, a town of France, in the department of Cher, and late province of Berry, 24 miles S. of Bourges. Lon. 2. 24. E. Lat. 46. 47. N.

LIGNUM VITÆ, [*Lat.*] guaiacum; a very hard wood. See **GUAIACUM**.

LIGNY, a town of France, in the department of the Meuse, and late duchy of Bar, 9 miles S. E. of Bar Le Duc. Lon. 5. 26. E. Lat. 48. 39. N.

LIGON, a sea-port of Siam in Malacca, capital of a territory so named, on the E. coast. Lon. 100. 5. E. Lat. 7. 40. N.

LIGOR, a kingdom of Asia, with its capital of the same name, subject to Siam.

LIGUEIL, a town of France in the department of Indre and Loire, 21 miles S. E. of Tours. Lon. 0. 52. E. Lat. 47. 3. N.

LIGULA, in natural history, a genus of the vermes intestinalia. Body linear, equal, long; the fore-part obtuse: the hind-part acute, with an impressed dorsal suture. The two known species, are *L. intestinalis*, and *L. abdominalis*; the former is found in the intestines of the merganser and guillemot: about a foot long, and exactly resembling a piece of tape: of the latter there are, at least, eight varieties described as inhabiting the intestines of fish: they are found principally in the mesentery, emaciating the fish they infest, and causing them to grow deformed.

LIGULATE, among botanists, an appellation, given to such floscules as have a straight end turned downwards, with three indentures, but not separated into segments.

LIGURE, in Hebrew antiquity, was the first stone in the third row of the high priest's breast-plate, and had the name of Gad inscribed on it. Exod. xxviii. 19. It is said to have been spotted like the ounce. Some suppose it to be the jacinth.

LIGURIA, in ancient geography, a country of Italy, bounded on the S. by the Mediterranean sea, on the N. by the Appennine mountains, on the W. by part of Transalpine Gaul, and on the E. by Etruria.

LIGURIA, or **LIGURIAN REPUBLIC**, the modern name given to the late republic of Genoa; the ancient name of this state was also Liguria.

LIGURIANS, the ancient inhabitants of Liguria. There is a great disagreement among authors concerning their origin, though most probably they were descended from the Gauls. Some carry up their origin as far as the fabulous heroes of antiquity; while others trace them from the Ligyes, a people mentioned by Herodotus as attending Xerxes in his expedition against Greece. They are by some ancient geographers placed in Colchis; by others, in Albania. They were subdued by the Romans about B. C. 211.

LIGUSTICÆ ALPES, that part of the Alps, which borders on the late Ligurian republic; now called the Maritime Alps.

LIGUSTICUM, **LOVAGE**; in botany, a genus of the digynia order, and pentandria class of plants; natural order, Umbellatæ. Fruit oblong, five-grooved on both sides; corolla equal, with involute entire petals. There are eight species.

L. LEVISTICUM, the **COMMON LOVAGE**, is a native of the Appennine mountains in Italy. It has a thick fleshy, deeply penetrating perennial root, crowned by very large, many-parted, radical leaves, with broad lobes, having incisions at top, upright, strong channelled stalks, branching six or seven feet high, and all the branches terminated by yellow flowers in large umbels. The root agrees nearly in quality with that of Angelica: the principal difference is, that the lovage-root has a stronger smell, and somewhat less pungent taste, accompanied with a more durable sweetness, the seeds being rather warmer than the root; but although certainly capable of being applied to useful purposes, is not regarded in the present practice.

LIGUSTICUM MARE, the N. part of the Tyrrhene Sea; now called the Gulf of Genoa.

LIGUSTRUM, **PRIVET**; in botany, a genus of the monogynia order, and diandria class of plants; natural order, Separiæ. Corolla four-cleft; berry four-seeded. The known species are four.

LIGYES, an ancient nation of Asia, who inhabited the country between the Phasis and Caucasus; though some place them elsewhere. Herodot. vii. 72. See **LESQUIS**, and **LIGURIANS**.

LIONS,

LIHONS, a town of France, in the department of Somme; 9 miles S. S. W. of Peronne, and 18 E. of Amiens.

LIKE, or SIMILAR QUANTITIES, in algebra, such as consist of the same letter, thus $3abx$ and $5abx$ are like quantities, but $3a^2bx$ and $5abx$ are unlike, a being found twice in one, and only once in the other. See **ALGEBRA**.

LIKE, in geometry, the same as similar. See **SIMILAR**, and **GEOMETRY**.

LI-KIANG-TOU, a city of China of the first rank, in the province of Yan-nan, 1150 miles S. W. of Peking. Lon. 117. 50. E. from Ferro. Lat. 26. 52. N.

LILACH, or LILAC, in botany. See **SYRINGA**.

LILIETHAL, a town of Saxony, in Meissen.

LILIUM, the **LILY**; in botany, a genus of the monogynia order, and hexandria class of plants; natural order, Coronarie. Corolla six-petaled, bell-shaped, with a longitudinal nectareous line; capsule, the valves connected by cancellated hairs. There are eleven species, with many varieties, all bulbous-rooted, herbaceous, flowery perennials, rising with erect annual stalks three or four feet high, garnished with long narrow leaves, and terminated by clusters of large, bell-shaped, hexapetalous flowers of exceeding great beauty, of white, red, scarlet, orange, purple, and yellow colours. All the species are propagated by sowing the seeds; and if care be taken to preserve these seeds from good flowers, very beautiful varieties are often produced. The roots of the white lily are emollient, maturing, and greatly suppurative. They are used externally in cataplasms for these purposes. The common form of applying them is boiled and bruised; but some prefer roasting them till tender, and then beating them to a paste with oil, in which form they are said to be excellent against burns. Gerard recommends them internally against dropsies.

L. KAMTSCHATENSE, or KAMTSCHATKA LILY, called there **SARANNE**, makes a principal part of the food of the Kamtschatkans. Its root are gathered by the women in August, dried in the sun, and laid up for use: they are the best bread of the country; and after being baked are reduced to powder, and serve instead of flour in soups and several dishes. They are sometimes washed, and eaten as potatoes; are extremely nourishing, and have a pleasant bitterish taste. Our navigators boiled and eat them with their meat. The natives often parboil and beat them up with several sorts of berries, so as to form a very agreeable confection. Provisionally it is an universal plant there, and all the grounds bloom with its flower during the season. Another remarkable circumstance is, that while fish are scarce the saranne is plentiful; and when it is scarce the rivers abound with fish. A species of mouse saves the Kamtschatkan women a great deal of trouble. The saranne forms part of their winter provisions; they not only gather them in the proper season, and lay them up in their magazines, but bring them out in sunny weather to dry them, lest they should spoil. The natives search for their boards, but leave part for the owners, being unwilling to suffer such useful caterers to perish.

LILLERS, a town of France in the department of the Straits of Calais, and late province of Artois; 6 miles N. W. of Bethune.

LILLY, WILLIAM, a noted English astrologer, born in Leicestershire in 1602. After receiving a common education he came to London, and became book-keeper to the master of the salters' company, on whose death he married his widow, with a fortune of 1000*l*. In 1632 he became the pupil of Evans the astrologer, and soon excelled his master. He was employed by both parties during the civil wars, and even Charles I. is said to have made use of him. Lilly was certainly consulted respecting the king's projected escape from Carisbrook castle. He, however, gained more from the parliament-party; and the predictions contained in his almanacks had a wonderful effect upon the soldiers and common people. In 1648, he published his *Treatise of the three Suns* seen in the preceding winter, and also an astrological judgement upon a conjunction of Saturn and Mars. This year the council of state gave him 50*l*. and a pension of 100*l*. per annum, which he received for two years, and then resigned on some disgust. In June 1660, he was taken into custody by order of the parliament, by whom he was examined concerning the king's executioner, who he affirmed was cornet Joyce. The same year he sued out his pardon under the great seal of England. The plague raging in

London, he removed with his family to his estate at Hershams; and in October 1666 was examined before a committee of the house of commons concerning the fire of London, which happened in September that year. After this, he studied physic, and, by means of Mr. Ashmole, obtained from Archbishop Sheldon a license to practise it. He adopted for his son, by the name of Merlin junior, one Henry Coley, a tailor, and gave him the property of his almanack, after it had been printed for 36 years. He died in 1681, of a palsy. Mr. Ashmole erected a monument over his grave in the church of Walton upon Thames. His *Observations on the Life and Death of Charles, late King of England*, if we overlook the astrological nonsense, may be read with as much satisfaction as more celebrated histories: Lilly not only being well informed, but strictly impartial. This work, with the *Lives of Lilly and Ashmole*, written by themselves, were published in one vol. 8vo. in 1774, by Mr. Burman. His principal works are, 1. *Christian Astrology*, 4to. 2. *A Collection of Nativities*. 3. *Observations on the Life and Death of Charles, late king of England*. 4. *Annus Tenebrosus, or the Black Year*. Besides these he published several other pieces.

LILY, in botany. See **LILIUM**.

LILYBÆUM, in ancient geography, a city of Sicily, seated on the most westerly cape of Sicily, and said to have been founded by the Carthaginians, on their expulsion from Motya by Dionysius tyrant of Syracuse. No remains of this once stately city are now to be seen, except some aqueducts and temples; though it was standing in Strabo's time.

LILYE, WILLIAM, the grammarian, was born in 1466, at Oldham in Hampshire; and in 1486, was admitted a semi-commoner of Magdalen college, in Oxford. Having taken the degree of A. B. he left the university, and travelled to Jerusalem. Returning thence, he continued five years in Rhodes, where he studied the Greek, several learned men having retired thither after the taking of Constantinople. From Rhodes he travelled to Rome, where he improved himself in the Greek and Latin languages, under Sulpitius and P. Sabinus. He then returned to London, where for some time he taught a private grammar-school, being the first person who taught Greek in that city. In 1510, when Dr. Colet founded St. Paul's school, Lilye was appointed the first master; at which time he was married and had many children. In this employment he had laboured twelve years, when, being seized by the plague, which then raged in London, he died in Feb. 1523, and was buried in St. Paul's. He had the character of an excellent grammarian, and a successful teacher of the learned languages. His principal work is "*Brevissima Institutio, seu Ratio Grammaticæ Cognoscendæ*;" Lond. 1513, very often reprinted, and commonly called *Lilye's Grammar*. The English rudiments were written by Dr. Colet, dean of St. Paul's; and the preface to the first edition, by cardinal Wolsey. The Latin syntax was chiefly the work of Erasmus. The rest was written by Lilye. See Ward's preface to his edition of *Lilye's Grammar*, 1732.

LIMA, a province, or as some geographers style it, an audience, of South America in Peru, bounded on the N. by Quito, E. by the Andes, S. by the province of Charcos, and W. by the South Pacific Ocean. It was erected in 1542, and contains one archbishopric, viz. Lima, which has fifteen jurisdictions, and four bishoprics, viz. Arequipa with six jurisdictions, Truxillo with seven, Guamanga with nine, and Cusco with fourteen. Near the mountains it abounds with very large tawny tigers, panthers, and other wild beasts, as fierce as those of Africa.

LIMA, a city of Peru, of which it is the capital, in the above province, with an university. It gives name to the principal audience of Peru. Lima is seated in a large, pleasant, fertile plain, on a small river near the sea. Lon. 68. 45. W. Lat. 12. 15. S.

LIMALE, a town of France, in the department of the Dyle, and late province of Aul-trian Brabant, 15 miles S. E. of Brussels. Lon. 4. 42. E. Lat. 50. 42. N.

LIMASSOL, or LIMASSO, a town of Cyprus, in the S. of the island. Of the ancient city nothing but ruins remain; though it was a celebrated place, even under the government of the dukes. King Richard I. the conqueror of the last of these vassals of the empire, razed it in 1191, and it was never rebuilt. It was anciently called Amathus, or Amathonte; fancus, as Pausanias tells us, for its temple of Venus and Adonis.

LIMAX, the **SLUG**, or **NAKED SNAIL**; a genus of the class and order *vermes mollusca*. Body oblong, fitted for crawling, with a kind of muscular coat on the upper part; belly plain. They have four tentacula, or horns, situated above the mouth, which they extend or retract at pleasure. This reptile is always destitute of shell; but, besides that its skin is more clammy and of a greater consistency than that of the snail; the black naked slug has a furrowed cloak, almost as thick and as hard as leather, under which it withdraws its head as within a shell. The head is distinguished from the breast by a black line. In its head and back the snail-stone is found; which is a small pearly and sandy stone, of the nature of lime-stones. There are sixteen species, distinguished chiefly by their colour. One of the varieties, *L. Agrestis*, is that which has been recommended to be swallowed by consumptive persons; it is half an inch long, and when touched it sticks as if dead to the fingers. A black slug powdered over with snuff, salt, or sugar, falls into convulsions, casts forth all its foam, and dies. See **REPRODUCTION**.

LIMBAT, a periodical wind common in Cyprus, and of great service in moderating the excessive heat of the climate. According to Abbe Mariti, it begins to blow at 8 A. M. the first day; increases as the sun advances till noon; then gradually weakens, and at three falls entirely. On the second day it rises at the same hour; but it does not attain its greatest strength till 1 P. M. and ceases at four. On the third day it begins as before; but falls at five. On the five succeeding days, it follows the same progression as on the third; but a little before it ceases, becomes extremely violent. At the end of five days it commences a new period like the former. These winds arise in the beginning of summer, last during the period when the heat is most insupportable, and end about the 15th of September.

LIMBORCH, PHILIP, a learned writer among the Remonstrants, born at Amsterdam in 1633. After having made great proficiency in his studies, he was, in 1655, licensed to preach, which he did first at Haarlem. He was chosen minister of Goudja, whence he was called to Amsterdam, and appointed professor of divinity, in which office he acquired great reputation. He had an admirable genius, and a tenacious memory; and corresponded with the most eminent men of his age. His letters to Mr. Locke are printed with those of that celebrated author. He was a sincere divine, lived an example of every virtue, and preserved his vigour of body and mind till he died, in 1712, aged 79. He wrote many works, the principal of which are, 1. *Amica Collatio de Veritate Religionis Christiana: cum Erudito Judæo*, in 12mo. 2. *A Complete Body of Divinity*, according to the Opinions and Doctrines of the Remonstrants. 3. *A History of the Inquisition*; since translated into English by Dr. Samuel Chandler. He also published the works of Episcopius, who was his great uncle by the mother's side.

LIMBURG, a late province of the Austrian Netherlands, annexed to France in 1796, and included in the department of the Ourte. It was bounded by the duchy of Juliers on the N. and E. by Luxemburg on the S. and by the late bishopric of Liege on the W. being about 30 miles long, and 25 broad. It consists of good arable and pasture land; and has plenty of wood, and some iron-mines.

LIMBURG, a town of France, in the department of Ourte, and late capital of the duchy, 15 miles S. E. of Liege, and 17 S. of Aix la Chapelle. Lon. 6. S. E. Lat. 50. 40. N.

LIMBUS, in the church of Rome, is used in two different senses: 1. The *Limbus Patrum*, or limb of the patriarchs, is said to be the place where the patriarchs waited the redemption of mankind: in this place they suppose our Saviour's soul continued from the time of his death to his resurrection. 2. The *limbus* of infants dying without baptism, is a place supposed to be distinct both from heaven and hell; since, say the Catholics, children dying innocent of any actual sin, do not deserve hell; and, by reason of their original sin, cannot be admitted into heaven; although our Saviour himself expressly says, "Of such is the kingdom of heaven."

LIME, a calcareous earth obtained from marble, chalk, gypsum, and several other earths. It predominates in most stones which can be scratched or pared with a knife. The lime is prepared by burning the substances in a white heat. Lime may be obtained perfectly pure by burning those crystallized limestones

called calcareous spars, which are perfectly white and transparent, and also by burning some pure white marbles. It may be procured also in a state of purity by dissolving oyster-shells in muriatic acid, filtering the solution, mixing it with ammonia as long as a white powder continues to fall, and filtering again. The liquid is now to be mixed with a solution of carbonate of soda: the powder which falls being washed and dried, and heated violently in a platinum crucible, is pure lime. Pure lime is of a white colour, moderately hard, but easily reduced to a powder. It has a hot burning taste, and in some measure corrodes and destroys the texture of those animal bodies to which it is applied. Its specific gravity is 2.3. It tinges vegetable blues, green, and at last converts them to yellow. If water be poured on newly burnt lime, it swells and falls to pieces, and is soon reduced to a very fine powder. Much heat is evolved, and in the dark a phosphorescent light is seen. This process is called *slacking the lime*. When slacked lime is weighed, it is found to be heavier than it was before.

This additional weight is owing to the combination of part of the water with the lime; which water may be separated again by the application of a red heat; and by this process the lime becomes just what it was before being slacked. Hence the reason of the heat evolved during the slacking of lime. Part of the water combines with the lime, and thus becomes solid; of course it parts with its caloric of fluidity, and probably also with a considerable quantity of caloric, which exists in water even when in the state of ice: for when two parts of lime and one part of ice (each at 32°) are mixed, they combine rapidly, and their temperature is elevated to 212°. The elevation of temperature during the slacking of barytes and strontian is owing to the same cause. In the conversion of limestone into lime, carbonic acid gas escapes in abundance, and by the addition of this gas lime is again converted to limestone. Lime when simply exposed to the open air gradually attracts moisture, and falls to powder; after which it soon becomes saturated with carbonic acid, and is again converted into carbonate of lime or unburnt limestone. Water, at the common temperature of the atmosphere, dissolves about the $\frac{1}{350}$ part of its weight of lime. This solution is called *lime-water*. It is limpid, has an acid taste, and changes vegetable blue colours to green. One ounce troy of lime-water contains about one grain of lime. It is usually formed by throwing a quantity of lime in powder into pure water, allowing it to remain for some time in a close vessel, and then decanting the transparent solution from the undissolved lime. When lime-water is exposed to the air, a stony crust soon forms on its surface, composed of carbonate of lime; when this crust is broken it falls to the bottom and another succeeds it; and in this manner the whole of the lime is soon precipitated, by absorbing carbonic acid from the air. Lime is not acted on by light, neither does it combine with oxygen. Sulphur and phosphorus are the only simple combustibles with which it unites. Sulphuret of lime may be formed by mixing its two component parts, reduced to a powder, and heating them in a crucible. They undergo a commencement of fusion, and the taste becomes acid. When it is exposed to the air, or moistened with water, it obtains a greenish-yellow colour, sulphureted hydrogen is formed, and the sulphuret is converted into a hydrogenated sulphuret, which exhales a very fetid odour of sulphureted hydrogen gas. This hydrogenated sulphuret may be formed also by boiling a mixture of lime and sulphur in about ten times its weight of water, or by sprinkling quicklime with sulphur, and then moistening it; the heat occasioned by the slacking of the lime is sufficient to form the combination. When this hydrogenated sulphuret is exposed to the air, it imbibes oxygen: which combine at first with the hydrogen, and afterwards with the sulphur, and converts the compound into sulphate of lime. For the affinities of lime, see **CHEMISTRY**. The chief uses of lime are, 1. As an ingredient in the formation of mortar as a cement in building. Mortar is composed of quicklime and sand reduced to a paste with water. When dry it becomes as hard as stone, and as durable; and adhering very strongly to the surfaces of the stones which it is employed to cement, the whole wall becomes in fact nothing else than one single stone. But this effect is produced very imperfectly unless the mortar be very well prepared. The lime ought to be pure, completely free from carbonic acid, and in the state of a very fine powder: the sand should be free from clay, and partly in the state of fine sand, partly in that of gravel: the water should be pure: and if previously saturated with lime, so

much the better. The best proportions, according to the experiments of Dr. Higgins, are three parts of fine sand, four parts of coarse sand, one part of quicklime recently slacked, and as little water as possible. The stony consistence which mortar acquires, is owing partly to the absorption of carbonic acid, but principally to the combination of part of the water with the lime. This last circumstance is the reason that if to common mortar one-fourth part of lime, reduced to powder without being slacked, is added, the mortar, when dry, acquires much greater solidity than it otherwise would do. When a little manganese is added to mortar, it acquires the important property of hardening under water; so that it may be employed in constructing those edifices which are constantly exposed to the action of water. Limestone is often combined with manganese: in that case it becomes brown by calcination. 2. As a manure, it is of the most extensive utility: we shall, therefore, concisely state the properties of the best limestone, as well as the proportionate quantities in which it is to be spread on lands; and at the same time point out those soils that are really meliorated, and likewise such as receive no benefit from its application. Formerly an opinion generally prevailed, that the most efficacious lime for manuring lands, was produced from the hardest calcareous stones, which most intimately approached the nature of marble: modern experience, however, has amply refuted this supposition. It appears, indeed, that there are two sorts; namely, magnesian and calcareous limestone; the latter of which is attended with the most beneficial consequences, while the former is highly injurious to land. This remarkable fact was first published by S. Tennant, Esq. in the "Philosophical Transactions of the Royal Society," for 1799; who, being informed of the two species, made various experiments, in which their respective properties were clearly ascertained. The barren, or magnesian lime, is found in various parts of England, but especially in the county of Nottingham, where a quarry of it is worked to the extent of thirty or forty miles; also in the counties of Derby and Northumberland, in the latter of which it is known by the characteristic name of hot, in contradistinction to the mild, or calcareous lime, that abounds in all parts of Britain. The magnesian lime may be farther distinguished from that made of pure calcareous stone, by its slow and difficult solution in acids. The hardness or softness of limestone, however, is of no importance, provided it be pure, that is, free from sand, clay, or other substances, which render the mass less fertilizing. When the stone is dug out of the earth, it should be conveyed to a kiln, into which coals or turf must be put in alternate layers with the limestone, and the latter thoroughly calcined. With respect to the length of time the materials should be exposed to the fire, it has been found by experiment, that lime burnt in four hours, has a much greater disposition to recover its carbonic acid gas from the atmosphere, than that which has been burning for the space of twenty-four hours; and, as the excellence of this manure is supposed to depend on its re-attraction of the gas, the process of calcination ought to be regulated accordingly. In this state it was called quicklime, and should be spread as speedily as possible, immediately before the plough; so that the greater part may be slacked in the soil. The proportion used, depends much on the custom of the country; but should more properly be adapted to the nature of the land. In the county of York, thirty-six bushels only are carted on an acre; in Wales, a quantity somewhat larger; in Ireland, from five to six hundred bushels are spread on every English statute acre; and in various parts of England, very small portions are injudiciously scattered: for it is the opinion of the most experienced agriculturists, that three or four hundred bushels at the least (if the price be not too high) should be allowed to each acre; especially when the soil has long been in an uncultivated state. One good liming is, in such cases, decidedly preferable to small quantities frequently repeated. In common situations, however, where the land does not abound in putrescible matters, and is not vitiated by acids, Mr. Young is of opinion, that 160 bushels per acre will produce a considerable effect; but, on stiff strong clays, he thinks at least double, or triple, that quantity ought to be allowed. If lime be applied without any other manure, it is said to exhaust the most fertile particles of the soil. Some agriculturists, therefore, suggest the propriety of forming small heaps, and covering them with earth: as soon as the soil has, by its moisture, slacked the lime, the heaps are to be opened, and as much dung buried in

each as the earth will cover. A more economical and judicious method, is that stated by Mr. Andrews, in fourth vol. of *Annals of Agriculture*. He directs about 140 loads (each containing 40 bushels,) of moist dung to be heaped up in the month of December, when 200 bushels of lime are to be well incorporated. The whole is then suffered to lie for three months, after which the heap is to be well stirred: when the harvest is completed, the compost is to be spread on a pea-stubble, and plowed in for barley; but, if the season should not favour the purpose, he directs these labours to be performed after the first frost that occurs. Mr. Andrews farther observes that, in consequence of such management, his barley-crops have, upon an average of twelve years, amounted annually to four quarters and six bushels per acre. The advantages arising from this treatment, are, 1. The total destruction of the seeds of weeds, so that the land on which this mixture had been spread, was uniformly the clearest; and, 2. The increased fermentation of the dung, by which its fertilizing properties are more speedily excited. Lastly, the expence of the lime was to him 10s. per acre; and its beneficial effects continued for four years. The soils peculiarly susceptible of improvement, by means of lime, are: 1. Rich black or brown friable crumbling loams, which abound with vegetable matter; its general putrescency being accelerated by the lime, such land is so greatly meliorated as to yield crops, which they could never have produced by the application of any other manure. 2. On low, rich, drained meadows, that have formerly been bogs, and the black soil of which abounds with vegetable fibres. 3. On old sheep-walks, heaths, and commons, which have been under grass for time immemorial, and are first to be converted into arable land; but lime will not be of any advantage, after they have been cultivated for several years. And, though such manure will produce favourable effects upon old lay-soils, abounding in vegetable particles, yet when the latter are putrefied by liming, and exhausted by repeated cropping, it will be of no service. 4. On moory, boggy, mountainous land; and, according to Dr. Hunter, on black peat-earth. In his opinion, lime prevents the spontaneous growth of heath, and produces a new family of vegetables, especially white clover. He farther remarks, that the greatest improvements ever made on moors, in any country, have probably been effected by means of lime. There prevails, however, a diversity of opinions on this subject, which we are unable to reconcile. In the 16th vol. of the *Transactions of the Society for the Encouragement of Arts, &c.* Thomas Davis, Esq. (stewards to the Marquis of Bath,) states that, though lime is the only proper manure for such soil, which is thus qualified to produce crops of corn for the first three or four years, after converting it into arable or meadow land; yet this manure loses its meliorating properties in the course of ten years; and he never found a second liming to be productive of any beneficial effects. 5. On all other waste soils that have been over-run for ages with furze, heath, broom, fern, bushes, or wood; and which, though richly stored with vegetable food, have contracted an acidity, in consequence of their long rest, and the spontaneous growth of roots. On the contrary, lime is of little service on poor, light, and thin soils; or such as are on a quarry of lime or other stone, especially after they have borne crops for a considerable number of years. Nor is it productive of any advantage on strong, stony land; on wet, cold loams, which have not been sufficiently drained; or similar clays that are tenacious of moisture; but Mr. Arthur Young is of opinion, that large quantities of well drained lime, laid on very stiff clay, would be attended with a favourable effect; though he candidly adds, that it never has been tried to his satisfaction. As a medicine, lime is of considerable use: and has lately been employed with success in the fevers of America. It is, however, chiefly prescribed in a state of solution, when it is called lime-water, prepared by gradually mixing half a pound of new quick-lime with twelve pints of boiling distilled water. The whole is suffered to stand in a covered vessel for one hour, when it is poured off, and preserved in close bottles. Lime-water was formerly in great repute as a solvent of the stone, and a remedy in scrophulous affections. It has likewise been used both externally and internally for cutaneous eruptions; though we by no means approve of its indiscriminate use, which may be attended with dangerous effects. On account of its astringent properties, this preparation has also been successfully prescribed in cases of diabetes, or immoderate flow of urine; and other disorders.

orders proceeding from laxity or weakness of the solids. At present, it is chiefly used for washing foul or ill-conditioned ulcers. Notwithstanding these useful qualities of lime, it is, if accidentally swallowed, or inhaled in any quantity, one of the most fatal poisons. Hence, persons employed in lime-works become subject to blood-spitting, asthma, painful constipations of the bowels, and consumption: their countenance turns unnaturally pale; and, after languishing for years, these unhappy victims die in a sleepless state. Bread adulterated with lime, absorbs all those juices of the stomach, which ought to promote digestion; obstructs the alimentary canal; occasions almost constant thirst; and at length produces the most violent colics, fevers, and death. As soon, therefore, as it may be discovered, that a person has taken into the stomach either lime or gypsum, the first step will be to administer an emetic, consisting of one and a half or two ounces of vinegar of squills, and twenty or thirty grains of ipecacuanha in powder: large draughts of sour whey should next be given, to facilitate the operation of the medicine. In order to counteract the causticity of lime in the stomach and intestines, it will be advisable to drink, alternately, a mixture of vinegar and water, lemonade, or similar acidulated beverage, for one day; and, on the other, to make use of mucilaginous decoctions, such as barley or rice-water, gruel, fat broths, oils, or sweet whey in which a small quantity of white soap has been dissolved; to eat salads with a large proportion of oil and vinegar, and ripe sub-acid fruit. To complete the cure, it will perhaps be requisite to administer, according to circumstances, emollient or laxative clysters.

LIME-TREE, in botany. See **TILIA**.

LIMERICK, a county of Ireland, in the province of Munster, bounded on the E. by Tipperary, W. by Kerry, N. by the Shannon, and S. by Cork. It is fruitful and populous; the soil requiring little or no manure in most places: besides excellent pasture for cattle it produces rich crops of all kinds of corn, with rape and some hemp.

LIMERICK, or **LOUGH-MEATH** a market-town, borough, and bishop's see, of Ireland, the metropolis of the above county, as well as of the province of Munster. It is seated on the Shannon, 50 miles N. of Cork, and 94 S. W. of Dublin. Lon. 8. 30. W. Lat. 52. 35. N.

LIMEUM, a genus of the class and order heptandria digynia. Calyx five-leaved; petals five, equal; capsule globular, two-celled. There are three species, herbaceous plants of the Cape.

LIMIT, in a restrained sense, is used by mathematicians for a determinate quantity to which a variable one continually approaches; in which sense the circle may be said to be the limit of its circumscribed and inscribed polygons. In algebra, the term limits is applied to two quantities, one of which is greater, and the other less, than another quantity: and in this sense it is used in speaking of the limits of equations, whereby their solution is much facilitated. Let any equation, as $x^3 - px^2 + qx - r = 0$ be proposed; and transform it into the following equation:

$$\left. \begin{aligned} y^3 + 3cy^2 + 3c^2y + c^3 \\ - py^2 - 2pey - pe^2 \\ + qy - re \end{aligned} \right\} = 0,$$

where the values of y are less than the respective values of x , by the difference e . If you suppose e to be taken such as to make all the co-efficients of the equation of y positive, viz. $e^3 - pe^2 + qe - r$, $3e^2 - 2pe + q$, $3e - p$; then there being no variation of the signs in the equation, all the values of y must be negative; and consequently the quantity e , by which the values of x are diminished, must be greater than the greatest positive value of x : and, consequently, must be the limit of the roots of the equation $x^3 - px^2 + qx - r = 0$. It is sufficient, therefore, in order to find the limit, to enquire what quantity substituted for x , in each of these expressions $x^3 - px^2 + qx - r$, $3x^2 - 2px + q$, $3x - p$, will give them all positive; for the quantity will be the limit required. Having found the limit that surpasses the greatest positive root, call it m . And if you assume $y = m - x$, and for x substitute $m - y$, the equation that will arise will have all its roots positive: because m is supposed to surpass all the values of x , and consequently $m - x (=y)$ must always be affirmative. And, by this means, any equation may be changed into one that shall have all its roots affirmative. Or, if $-n$ represent the limit of the negative roots, then by assuming $y = x + n$ the proposed equation shall be trans-

formed into one that shall have all its roots affirmative; for, $+n$ being greater than any negative value of x , it follows that $y = x + n$ must be always positive. What is here said of the above cubic equation, may be easily applied to others; and of all such equations, two limits are easily discovered, viz. a , which is less than the least; and e , found as above, which surpasses the greatest root of the equation. Mr. Maclaurin, in his treatise on Algebra, has given complete information on this subject.

LIMITS OF A PLANET, its greatest excursion from the ecliptic, or, which is the same thing, the points of its greatest latitude.

LIMITATION, in law, signifies a certain space of time allowed for bringing actions in. Thus by the statute of the 21 Jac. I. c. 16, it is ordained, that all writs of formedon, &c. for title to lands in being, must be sued out within twenty years after the title arose, and actions of debt upon the case, actions upon a stated account, of detinue, trover and trespass, must be commenced within six years after the cause of action, and not afterwards: actions of assault and battery must be brought within four years after the cause of action; and for slander, within two years. Though an action may be barred by statute, yet a fresh promise will revive it. It is said, that twenty years possession of land is a good title in a person to maintain an action of ejectment, though he be not at that time actually possessed thereof: but where the plaintiff is out of possession more than such a number of years, it will bar him the statute. See **PRESCRIPTION**.

LIMITATION OF ESTATE, is the length of time an estate is to continue in the possession of a person or family. As where a person grants lands to a person and his heirs male, and on default of such issue, to his heirs female; here the daughters cannot inherit so long as there is a male heir, because the estate is first limited to the heirs male.

LIMITED PROBLEM, a problem that admits but of one solution, as to make a circle pass through three given points, not lying in the same right line.

LIMMA, in music, an interval in the scale of the ancients, expressed by $\frac{2}{3}$ or $\frac{5}{4}$.

LIMMAT, a river of Switzerland which rises in the Alps, 11 miles S. of Glarus, and joins the Aar three miles N. of Baden.

LIMME, a town of Kent, near Hithe, four miles from Romney, formerly a port, till choaked up by the sands.

LIMNÆ, in ancient geography; 1. a fortified town on the borders of Laconia and Messina: 2. Another in the Thracian Chersonesus.

LIMNING, the art of painting in water-colours, in contradistinction to painting which is done in oil-colours. Limning is the most ancient kind of painting. Till John Van Eyck found out the art of painting in oil, the painters all painted in water and in fresco. When they used boards, they usually glued a fine linen-cloth over them, to prevent their opening; then laid on a ground of white; and lastly mixed up their colours with water and size, or with water and yolks of eggs, well beaten with the branches of a fig-tree, the juice whereof thus mixed with the eggs; and with this mixture they painted their pieces. In limning, all colours are proper, except the white made of lime, which is only used in fresco. The azure and ultramarine must always be mixed with size or gum; but there are always applied two layers of hot size before the size-colours are laid on: the colours are all ground in water each by itself; and, as they are required in working, are diluted with size-water. When the piece is finished, go over it with the white of an egg well beaten; and with varnish, if required. To limn, or draw a face in colours: having all the materials in readiness, lay the prepared colour on the card even and thin, free from hairs and spots over the place where the picture is to be. The ground being laid, and the party placed in a due position, begin the work which is to be done at three sittings. At the first you are only to dead-colour the face, which will require about two hours. At the second sitting, go over the work more curiously, adding its particular graces or deformities. At the third sitting, finish the whole; carefully remarking whatever may conduce to render the piece perfect, as the cast of the eyes, moles, scars, gestures, and the like. See **DRAWING**, and **PAINTING**.

LIMODORUM, in botany, a genus of the gymandria diandria class and order: natural order, Orchideæ. Nectary one-leaved, concave, pedicelled, within the lowest petal. Thirteen species are enumerated.

LIMOGES,

LIMOGES, an ancient trading town of France, capital of the department of Upper Vienne; lately in the province of Guienne, and capital of Limosin, 50 miles N. E. of Perigueux, and 110 E. of Bourdeaux.

LIMONIA, in botany, a genus of the decandria monogynia class and order. Calyx five-parted; petals five; berry three-celled; seeds solitary. There are seven species, of which *L. pentaphylla*, five-leaved limonia, is an elegant fragrant shrub of Coromandel; the flowers are exquisitely fragrant, and are produced all the year.

LIMOSELLA, in botany, a genus of the didynamia angiospermia class and order; natural order, Preciae. Calyx five-cleft; corolla five-cleft, equal; stamina approximating by pairs; capsule one-celled, two-valved, many-seeded. There are two species, *L. aquatica*, common mud-wort, or bastard plantain; and *L. diandra*.

LIMOSIN, a province of France, bounded on the N. by La Marche, E. by Auvergne, S. by Quercy, and W. by Perigord and Angoumois. It was divided into the Upper and Lower; the former of which is very cold, but the latter temperate. It now forms the department of Upper Vienne.

LIMOUX, a town of France, in the department of Aude, and late province of Languedoc. It is famed for its wine, called la Blanquette de Limoux, or the Perry of Limoux, and has a cloth-manufacture. Lon. 2. 16. E. Lat. 50. 24. N.

LIMPURG, a barony of Germany, in Franconia, inclosed almost entirely within Suabia, and seated on the S. of Hall. It is about 15 miles long, and 8 broad. Gaildorf and Shonburg, near which is the castle of Limpurg, are the chief towns.

LIMPURG, a town of Germany, formerly in the electorate of Treves, but now annexed to France. It is seated on the Lhon. Lon. 8. 13. E. Lat. 50. 18. N.

LINCHAN, a town of China, in Honan.

LINCHANCHI, a town of Mexico, in Yucatan, 10 miles from Selem. Lon. 87. 50. W. Lat. 20. 40. N.

LINCIE, or **LINKE**, a strong town of France, in the department of the North, and late province of French Flanders, 10 miles S. W. of Dunkirk.

LINCOLN, or **LINCOLN-SHIRE**, a maritime county of England, 77 miles long and 48 broad, bounded on the E. by the German ocean, W. by Nottingham, N. by Yorkshire, and S. by Rutland, Northampton, and Cambridge shires. The principal rivers are the Humber, Trent, Witham, Nenn, Welland, Ankam, and Dun. It is divided into three parts, Lindsey, Kesteven, and Holland; the air of which last is unwholesome, on account of the fens and marshes. The soil of the N. and W. parts is very fertile, and abounds in corn and pastures. The E. and S. parts are not proper for corn; but abound with fish and fowls, particularly ducks and geese. By its inland navigation, this county has communication with the rivers Mersey, Dee, Ribble, Ause, Darwent, Severn, Thames, Avon, &c. which navigation, including its windings, extends above 500 miles through different counties.

LINCOLN, the capital of the above county. The name is derived by some from Lindi Colonia, the colony of Lindum, contracted first to Lindocolonia, and afterwards to Lincoln, which seems a very probable etymology. Formerly it had 52 churches, which are now reduced to 14. Though the other churches are mean, the cathedral is a most magnificent piece of Gothic architecture. It has a prodigious large bell, called Tom of Lincoln, near five tons in weight, and 23 feet in compass. Such is the magnificence and elevation of the cathedral, that the monks thought the sight of it must be very mortifying to the devil; whence it came to be said of one who was displeased, that he looked like the devil over Lincoln. The Roman North gate remains entire under the modern name of Newport Gate. It is one of the noblest of this sort in Britain. It is a vast semicircle of stone of very large dimensions laid without mortar, connected only by their uniform shape. Lincoln is 32 miles N. E. of Nottingham, and 144 N of London. Lon. 0. 17. W. Lat. 53. 16. N.

LINCOLN, a county of Kentucky, S. E. of Washington county. Stanford is the capital.

LINCOLN, a large maritime county in the district of Maine; having Canada, on the North.

LINCOLN, a county of N. Carolina, in Morgan district.

LINCOLNTOWN, a town of N. Carolina, capital of Lincoln county; 718 miles S. by W. of Philadelphia.

LINCONIA, in botany, a genus of the pentandria digynia class and order. Petals five, with a nectareous excavation at the base; capsule two-celled. It has but one species, viz.

L. ALOPECUROIDEA, a native of the Cape of Good Hope, in watery places among the mountains.

LINCTUS, [from *lingo*, to lick,] a medicine to be licked up by the tongue.

LINDAU, an imperial city of Germany, in Suabia, on an island in the lake of Constance, connected with the continent by a bridge; 46 miles E. N. E. of Zurich.

LINDERA, in botany, a genus of the hexandria monogynia class and order. Corolla six-petaled; capsule. There is only one species, viz.

L. UMBELLATA, a native of Japan.

LINDERNIA, in botany, a genus of the didynamia angiospermia class and order; natural order, Personata. Calyx five-parted; corolla ringent, with the upper lip very short; stamina the two lower with a terminating tooth, and a sub-lateral anther; capsule one-celled. The species enumerated are three.

LINDEN-TREE. See **TILIA**.

LINDISFARN, the ancient name of Holy Island; so called from the rivulet Lindi, or Landi, which here runs into the sea, and from the Celtic word *fahren*, i. e. recess.

LINDKOPING. See **LINKIOPING**.

LINDO, in modern geography, a city of Rhodes, anciently called Lindus, stands at the foot of the hill. A bay, of considerable wideness and depth, serves as a harbour. Ships find good anchorage there in 20 fathoms water, being safely sheltered from the S. W. winds, which constantly prevail through the severest season of the year. Before the building of Rhodes, Lindus was the harbour which received the fleets of Egypt and Tyre. It was enriched by commerce. Mr. Savary says, a judicious government, by taking advantage of its harbour and happy situation, might yet restore it to a flourishing state.

LINDSEY, the third and largest division of Lincolnshire. It is situated in the north part of the county, and on the east and north it is washed by the sea, into which it projects with a large front. It had its name from Lincoln, which stands in it, and was by the Romans called Lindum, by the Britons Lindcoit, and by the Saxons Lindocollvne.

LINDUM, an ancient town of Britain, on or near the site of Lincoln, possessed by the Horesti; mentioned by Richard of Cirencester, along with Alauna and Victoria, as the three principal cities of that people. If the conjectures of the moderns be just, that Alauna was Alnwick, Lindum, Lincoln, and Victoria, Perth, the dominions of the Horesti must have been very extensive.

LINDUS, in ancient geography, a town of Rhodes, situated on a hill on the W. side of the island. It was built by Tlepolemus the son of Hercules, according to Diodorus Siculus; by Lindas, one of the Heliades, grandsons of Apollo, according to Strabo.

LINE, [*linea*, Latin,] in geometry, a quantity extended in length only, without any breadth or thickness. It is formed by the flux, or motion of a point. See **FLUXIONS**, and **GEOMETRY**.

LINE also denotes a French measure containing the 12th part of an inch, or the 144th part of a foot. Geometricians conceive the line subdivided into six points.

LINE, in genealogy. See **CONSANGUINITY**, **DESCENT**, and **INHERITANCE**.

LINE, in the art of war, is the disposition of an army ranged in order of battle, with the front extended as far as may be, that it may not be flanked.

LINE, **EQUINOCTIAL**. See **ASTRONOMY**, **EQUATOR**, **EQUINOCTIAL**, and **GEOGRAPHY**.

LINE, **FISHING**. See **FISHING-LINE**.

LINE OF **MEASURES**, is used by Oughtred, to denote the diameter of the primitive circle in the projection of the sphere in plano, or that line in which the diameter of any circle to be projected falls. In the stereographic projection of the sphere in plano, the line of measures is that line in which the plane of a great circle perpendicular to the plane of the projection, and that oblique circle

ele which is to be projected, intersects the plane of the projection; or it is the common section of a plane passing through the point of sight and the centre of the primitive at right angles to any oblique circle which is to be projected, and in which the centre and pole of such circle will be found.

LINE OF DIRECTION on the earth's axis, in the Pythagorean system of astronomy; the line connecting the two poles of the ecliptic and of the equator when they are projected on the plane of the former.

LINE OF DIRECTION, in mechanics, that wherein a body actually moves, or would move, if it were not hindered. It also denotes the line that passes through the centre of gravity of the heavy body to the centre of the earth, which must also pass through the fulcrum, or support of the heavy body, without which it would fall. See **MECHANICS**.

LINE OF GRAVITATION, of any heavy body, a line drawn through its centre of gravity, and according to which it tends downwards.

LINE OF THE SWIFTEST DESCENT, of a heavy body, is the cycloid. See **CYCLOID**.

LINEs ON GUNTER'S SCALE, are the line of numbers, line of artificial sines, line of artificial tangents, line of artificial versed sines, line of artificial sines of rhumbs, line of artificial tangents of the meridian-line, and line of equal parts. See **GUNTER'S LINE**.

LINEs OF THE SECTOR, are the line of equal parts, or line of lines, line of chords, line of sines, line of tangents, line of secants, line of polygons, line of numbers, line of hours, line of latitudes, line of meridians, &c. See **SECTOR**. Several of these lines are put on the plane scale.

LINE, HORIZONTAL, in geography and astronomy, a line drawn parallel to the horizon of any part of the earth.

LINE, MERIDIAN. See **GEOGRAPHY**, and **ASTRONOMY**.

LINE OF BATTLE is the disposition of the fleet in the day of engagement, on which occasion the vessels are usually drawn up as much as possible in a straight line, to gain and keep the advantage of the wind, and to run the same board. See **NAVAL TACTICS**.

LINEs, in Heraldry. See **HERALDRY**.

LINE, SHIP OF THE, a vessel large enough to be drawn up in the line, and to have a place in a sea-fight.

LINEA ALBA, in anatomy, the concourse of the tendons of the oblique and transverse muscles of the abdomen; dividing the abdomen in two, in the middle. It is called *linea*, line, as being straight; and *alba*, from its colour, which is white.

LINEAMENT, [*lineamentum*, Lat.] among painters, is used for the outlines of a face.

LINEAR, [*linearis*, Lat.] that is composed of lines; having the form of lines.

LINEAR NUMBERS, in mathematics, such as relate to length only; such is a number which represents one side of a plain figure. If the plain figure be a square, the linear figure is called a root.

LINEAR PROBLEM, that which may be solved geometrically by the intersection of two right lines. This is called a simple problem, and is capable but of one solution.

LINEN, [*linum*, Lat.] in commerce, cloth chiefly made of flax. Linen was not worn by the Jews, Greeks, or Romans, as any part of their ordinary dress. Under-tunics of a finer texture, supplied the place of shirts: hence the occasion for frequent bathing. Alexander Severus was the first emperor who wore a shirt; but the use of so necessary a garment did not become common till long after him. The linen-manufacture was probably introduced into Britain with the first settlements of the Romans. The flax was certainly first planted by that nation in the British soil. The plant itself indeed appears to have been originally a native of the east. The woollen drapery would naturally be prior in its origin to the linen; and the fibrous plants from which the threads of the latter are produced, seems to have been first noticed and worked by the inhabitants of Egypt. In Egypt, indeed, the linen-manufacture appears to have been very early: for even in Joseph's time it had risen to a very considerable height. From the Egyptians the knowledge of it proceeded probably to the Greeks, and from them to the Romans. Even at this day the flax is still imported from the eastern nations; the western kind being a degenerate

species. To succeed in the linen-manufacture, one set of people should be confined to plowing and preparing the soil, sowing and covering the seed, weeding, pulling, rippling, and taking care of the flax till it is lodged at home: others should be employed in drying, breaking, scutching, and heckling, the flax, to fit it for the spinners; and others in spinning and reeling it, to fit it for the weaver: others should be concerned in taking due care of the weaving, bleaching, beetling, and finishing, the cloth for the market. It is reasonable to think, that if these several branches of the manufacture were carried on by distinct dealers in Scotland and Ireland, where our home-made linens are manufactured, the several parts would be better executed, and the whole would be afforded cheaper, and with greater profit.

LINEN, BLEACHING OF. See **BLEACHING**.

LING, in ichthyology. See **GADUS**.

LINGEN, a county of Germany, in Westphalia, S. of Munster.

LINGEN, the capital of the above county, seated on the Embs, twenty-seven miles E. S. E. of Covorden. Lon. 7. 30. E. Lat. 52. 34. N.

LINGET, [from *languet*; *lingot*, Fr.] a small mass of metal. See **INGOT**, and **LIGNET**.

LING-NAN, a city of China of the first rank, in the province of Yun-nan; 1217 miles S. S. W. of Peking.

LINGONES, an ancient people of Gallia Belgica, who inhabited the country lately called Bassigny, in Champagne, now in the department of the Upper Marne. Langres, or a town on the site of that city, was their capital. See **LANGRES**.

LING-TAO, a city of China of the first rank, in the province of Chen-si, 672 miles W. S. W. of Peking.

LINGUATULA, in zoology, a genus of the vermes intestinalis class and order. Body depressed, oblong; mouth placed before, surrounded with four passages. There is but one species, *L. serrata*, inhabiting the lungs of the hare.

LINIMENT, [*linimentum*, Lat.] in pharmacy, an ointment somewhat thinner than an unguent, and thicker than an oil, used for anointing different parts of the body. The materials proper for composing liniments are, fats, oil, balsams, and whatever enters the composition of unguents and plasters.

LINKIOPING, or **LINDKOPING**, a town of Sweden, capital of West Gothland, twelve miles N. W. of Skar, and 178 S. W. of Stockholm. Lon. 13. 5. E. Lat. 58. 35. N.

LINLITHGOW, a town of Scotland, in W. Lothian, or Linlithgowshire, sixteen miles W. of Edinburgh. Lon. 3. 34. W. Lat. 56. 0. N.

LINLITHGOW, or **LINLITHGOWSHIRE**. See **LOTHIAN, WEST**.

LINNEA, in botany, so named in honour of the celebrated Linnaeus, a genus of the didynamia angiospermia class and order; natural order, Aggregate. Calyx double, of the fruit two-leaved, of the flower five-parted, superior; corolla bell-shaped; berry three-celled. The only known species is *L. borealis*, a native of the north of Europe.

LINNEUS, SIR CHARLES, the justly celebrated reformer of botany and natural history, was born on May 24, 1707, in a village called Roeskult in Smaland, where his father, Nicholas Linnaeus, was then vicar. In his Latin works, printed in Sweden, he styles himself Carolus a Linné. This eminent man, whose talents enabled him to reform the whole science of natural history, accumulated, very early in life, some of the highest honours in medical science. He was made professor of physic and botany, in the university of Upsal, at the age of thirty-four; and at forty, physician to King Adolphus-Frederick. Linnaeus's taste for botany seems to have been imbibed from his father; who cultivated a garden plentifully stored with plants, by way of amusement. Young Linnaeus soon became acquainted with these, as well as with the indigenous ones in his neighbourhood. Yet from the narrowness of his father's income, Charles was on the point of being destined to a mechanical employment, though fortunately the design was overruled. In 1717, he was sent to school at Wexio; where, as his opportunities were enlarged, his progress in all his favourite pursuits was proportionably extended; and even at this early period he began to study the natural history of insects. Professor Stobæus, under whom he received the first part of his academical education at Lund, in Scania, favoured his inclination to natural history. He removed in 1728 to Upsal, where he contracted.

tracted a close friendship with Artedi, a native of Angermania, who had been four years a student in that university, and had a strong bent to natural history, particularly ichthyology. Soon after his residence at Upsal, he obtained the favour of several gentlemen of established character in literature. He was particularly encouraged in the pursuit of his studies by Dr. Olaus Celsius, then professor of divinity, and the restorer of natural history in Sweden; who, being struck with the accuracy of Linnæus, in describing the plants of the garden at Upsal, not only patronized him, but admitted him to his house, his table, and his library. Under his encouragement, Linnæus made such a rapid progress, that, in two years, he was thought qualified to give lectures occasionally from the botanic chair, in the room of Professor Rudbeck.

In 1731, the Royal Academy of Sciences at Upsal, with a view to improve the natural history of Sweden, at the instance of professors Celsius and Rudbeck, deputed Linnæus to make the tour of Lapland, and explore the natural history of that arctic region. He left Upsal the 13th of May, and took his route to Gevalia, the capital of Gesticria, forty-five miles from Upsal; travelled through Helsingland into Medelpadia, where he ascended a remarkable mountain, before he reached Hudwicksvald, the capital of Helsingland. Thence he went through Angermanland to Hernosand, a sea-port on the Bothnic Gulf, seventy miles from Hudwicksvald; where he visited the remarkable caverns on the summit of Mount Skula, at the hazard of his life. Arriving at Uma, in West Bothnia, he quitted the public road, and took his course through the woods westward, to traverse the most southern parts of Lapland. Though a stranger to the language and manners of the people, and without any associate, he trusted to the hospitality of the inhabitants, and experienced it fully. He mentions, with peculiar satisfaction, the innocence and simplicity of their lives. He reached the mountains towards Norway, and, after encountering great hardships, returned to West Bothnia; visited Pitä and Lulea, on the Gulf of Bothnia; from which last place he took a western route, proceeding up the river Lulea, and visited the ruins of the temple of Jockmock in Lappmark; thence he traversed the Lapland Desert, destitute of villages, cultivation, roads, or any conveniences; inhabited only by a few straggling people, originally descended from the Finlanders, and who settled in this country in remote ages, being entirely a distinct people from the Laplanders. In this district he ascended a mountain called Wallevari, where he found a singular and beautiful new plant (*Andromeda Tetragona*) when travelling within the arctic circle, with the sun in his view at midnight, in search of a Lapland hut. Thence he crossed the Lapland Alps into Finmark, and traversed the shores of the north sea as far as Sallero. These journeys were made on foot, attended by two Laplanders, as his interpreter and guide. In descending a river, he narrowly escaped perishing by the oversetting of the boat, and lost many of the natural productions he had collected. Linnæus spent the greater part of the summer in examining this arctic region, and those mountains on which, four years afterwards, the French philosophers secured immortal fame to Sir Isaac Newton. At length, after having suffered incredible fatigues and hardships, in climbing precipices, passing rivers in miserable boats, under the vicissitudes of extreme heat and cold, and often of hunger and thirst, he returned to Tornea in September. Having resolved to visit and examine the country on the E. side of the gulf: his first stage was to Ula in East Bothnia; thence to Old and New Carleby, eighty-four miles S. of Ula. He continued his route through Wasa, Christianstadt, and Biorneburgh, to Abo, a small university in Finland. As winter was now setting in apace; he crossed the gulf by the island of Åland, and arrived at Upsal in November, after having performed, mostly on foot, a journey of ten degrees of latitude in extent, exclusively of numberless deviations. In 1733, he visited and examined the mines in Sweden; and made himself so well acquainted with mineralogy and the domestic art, that he was qualified to give lectures on those subjects upon his return to the university. The outlines of his system on mineralogy appeared in the early editions of the *Systema Naturæ*; but he did not exemplify the whole until 1768. In 1734, he was sent by Baron Reuterholm, Governor of Dalecarlia, with several other naturalists in that province, to investigate the productions of that part of the Swedish dominions; and in this journey he first laid the plan of an excellent institution, which he afterwards executed, with the assistance of

many of his pupils, and published the result under the title of *Pan Suecus*, in the second volume of the *Amoenitates Academicæ*. After this expedition, Linnæus resided some time at Fahlun, the chief town in Dalecarlia; where he taught mineralogy, and practised physic; and was hospitably treated by Dr. More, the physician of the place. He contracted at this time an intimacy with a daughter of that gentleman, whom he married about five years afterwards. In this journey he extended his travels quite across the Dalecarlian Alps into Norway. In 1735, he travelled over many parts of Sweden, Denmark, and Germany, and fixed in Holland, where he chiefly resided until his return to Stockholm, about 1739. In 1735, he also took his degree of M. D. and published the first sketch of his *Systema Naturæ*, in a compendious way, in the form of tables, in twelve pages, folio. By this it appears, that he had, before he was twenty-four years old, laid the basis of that grand structure which he afterwards erected to the increase of his own fame, as well as of natural science. In 1736, he came to England, and visited Dr. Dillenius, at Oxford, whom he justly considered as one of the first botanists in Europe. He mentions his civilities, and the privilege he gave him of inspecting his own and the Sherardian collections of plants. He also visited Dr. Martyn, Mr. Rand, Mr. Miller, and Dr. Isaac Lawson; and contracted an intimate friendship with Mr. Peter Collinson, which was reciprocally increased by a multitude of good offices, and continued to the last without diminution. Dr. Boerhaave had given him letters to Sir Hans Sloane; but they did not procure him the reception he and the doctor merited. One of the most agreeable circumstances that happened to Linnæus in Holland, arose from the patronage of Mr. Clifford, in whose house he lived a considerable part of his time, and with whom he enjoyed pleasures and privileges scarcely at that time to be met with elsewhere in the world; that of a garden excellently stored with the finest exotics, and a library furnished with almost every botanic author of note. He was also recommended by Boerhaave to fill the place, then vacant, of physician to the Dutch settlement at Surinam; but he declined it on account of his having been born in so opposite a climate. Early in 1738, Linnæus had a long and dangerous fit of sickness; and upon his recovery went to Paris, where he was entertained by the Jussieus, then the first botanists in France. The opportunity this gave him of inspecting their Herbaria, as well as those of Surian and Tournefort, afforded him great satisfaction. He did not fail to avail himself of every advantage that access to the several museums of this country afforded him, in every branch of natural history; and the number and importance of his publications, during his absence from Sweden, demonstrate that fund of knowledge which he had accumulated before, as well as his extraordinary application. These were, *Systema Naturæ*, *Fundamenta Botanica*, *Bibliotheca Botanica*, and *Genera Plantarum*; the last of which is justly considered as the most valuable of all his works. What immense application had been bestowed upon it, the reader may easily conceive, on being informed, that before the publication of the first edition the author had examined the characters of 8000 flowers. The last book he published, during his stay in Holland, was the *Classes Plantarum*, which is a copious illustration of the second part of the *Fundamenta*. About the end of 1738, or beginning of 1739, he settled as a physician at Stockholm; where he seems to have met with considerable opposition, and was oppressed with many difficulties; but all of these at length he overcame, and got into extensive practice; and soon after his settlement, married Miss More. By the interest of Count Tessin, who was afterwards his great patron, and even procured medals to be struck in honour of him, he obtained the rank of physician to the fleet, and a salary for giving lectures on botany. And what was highly favourable to the advancement of his character and fame, was the establishment of the Royal Academy of Sciences at Stockholm; of which he was constituted the first president, and to which establishment the king granted several privileges, particularly that of free postage to all papers directed to the secretary. By the rules of the academy, the president held his place but three months. At the expiration of that term, Linnæus made his *Oratio de Memorabilibus in Insectis*, October 3, 1739; in which he endeavours to excite an attention to entomology, by displaying the many singular phenomena of insects, and by pointing out, in various instances, their usefulness to mankind, and to the economy of nature in general. In 1741, upon the resignation of Roberg, he

was constituted joint professor of physic, and physician to the king with Rosen, who had been appointed in 1740, on the death of Rudbeck. These two colleagues divided the medical departments between them; Rosen took anatomy, physiology, pathology, and the therapeutic part; Linnæus, natural history, botany, materia medica, the dietetic part, and the diagnosis morborum. During the interval of his removal from Stockholm to Upsal, in consequence of this appointment, he was deputed by the states, to make a tour to the islands of Oeland and Gothland, in the Baltic; attended by six pupils, commissioned to make such inquiries as might tend to improve agriculture and arts in the kingdom. The result of this journey proved fully satisfactory to the states, and was afterwards communicated to the public. On his return he pronounced before the university his oration, *De Peregrinationum intra Patriam Necessitate*, Oct. 17, 1741; in which he displays the usefulness of such excursions, by pointing out to the students the numerous objects which their country held out to their cultivation, in geography, physics, mineralogy, botany, zoology, æconomics, &c. This composition is esteemed one of the most pleasing and instructive of all his productions. Linnæus was now fixed in the situation best adapted to his character, taste, and abilities. Soon after his establishment, he got the academical house and garden, founded in 1657, put on a better footing. The whole had been in ruins ever since the fire in 1702; and when Linnæus was appointed professor, the garden did not contain above fifty exotic plants. His correspondence with the first botanists in Europe soon supplied him with great variety. He received Indian plants from Jussieu of Paris, and Van Royen of Leyden; European plants from Haller and Ludwig; American plants from the late Mr. Collinson, Mr. Catesby, and others; and many annuals from Dillenius. How much the garden owed to his diligence and care in a few years, may be seen by the catalogue entitled "*Hortus Upsaliensis, exhibens Plantas exoticas horto Upsaliensis Academicæ a sese (Linnæo) illatas ab anno 1742, in annum 1748; Additis Differentiis, Synonymis, Habitationibus, Hospitiis, Rariorumque Descriptionibus, in gratiam Studiosæ Juventutis*," Holm. 1748, 8vo. pp. 306, tab. 3. By this catalogue it appears, that he had introduced 1100 species, exclusively of all the Swedish plants, and of varieties; which last, in ordinary gardens, often amount to one-third of the whole. The preface contains a curious history of the climate at Upsal, and the progress of the seasons throughout the year. The fame which Linnæus had now acquired by his *Systema Naturæ*, of which a sixth edition, much enlarged, had been published at Stockholm in 1748, in 8vo. pp. 232, with eight tables explanatory of the classes and orders, had brought a conflux of every thing rare and valuable in every branch of nature, from all parts of the globe, into Sweden. The king and queen of Sweden had their separate collections of rarities; the former at Ulricksdahl; the latter, very rich in exotic insects and shells, procured at great expence, at the palace of Drottningholm; both of which our author was employed in arranging and describing. The Museum of the Royal Academy of Upsal had also been augmented by a considerable donation from the king, whilst hereditary prince, in 1746; by another from Count Gyllenborg in 1745; by a third from M. Grill, an opulent citizen of Stockholm. Linnæus from this time figured in a more elevated rank. His reputation had procured him honours from almost all the Royal Societies in Europe; and his own sovereign, King Adolphus-Frederick, sensible of his merit, honoured him with repeated marks of his distinction, by creating him a knight of the polar star, in 1753; and by ennobling him in 1757. His successor, Gustavus III. doubled his pension in 1776; and settled a liberal donation of landed property on Linnæus and his family. His emoluments kept pace with his fame and honours; his practice became lucrative; and he purchased a country-house and gardens at Hammarby, about five miles from Upsal. He received one of the most flattering testimonies of the extent and magnitude of his fame, that perhaps was ever shewn to any literary character, the state of the nation by which it was conferred, and all circumstances, being considered. This was an invitation to Madrid from the king of Spain, there to preside as a naturalist, with the offer of a pension for life of 2000 pistoles, letters of nobility, and the free exercise of his own religion: but, after the most polite acknowledgements of the singular honour done him, he returned for answer, "that if he had any merits, they were due to his own country." In 1755, the Royal

Academy of Sciences at Stockholm honoured him with one of the first premiums, agreeably to the will of Count Sparre; who had appointed two gold-medals, of ten ducats each, to be annually given by the academy to the authors of such papers, in the preceding year's Stockholm Acts, as should be adjudged most useful in promoting agriculture, and all branches of rural œconomy. This medal bore, on one side, the arms of the count, with this motto, "*Superstes in Scientiis Amor Frederici Sparre*." Linnæus obtained it for his paper "*De Plantis quæ Alpium Suecicarum Indigenæ, Magno Rei, Œconomicae et Medicæ Emolumento, Fieri Possint*;" wherein he recommended these plants as fit for culture in Lapland. This paper was inserted in the Stockholm Acts for 1754, Vol. XV. Linnæus also obtained the premium centum aureorum, proposed by the Imperial Academy of Sciences at Petersburg, for the best paper written to establish or disprove, by new arguments, the doctrine of the sexes of plants. It was an additional glory to Linnæus to have merited this premium from the Petersburg Academy, as a professor of that society had, with more than common zeal, endeavoured to overturn the whole Linnæan system of botany, by attempting to shew, that the doctrine of the sexes of plants had no foundation in nature. Linnæus, on the whole, enjoyed a good constitution, but was sometimes severely afflicted with a hemicrania, as well as with the gout. About the close of 1776, he was seized with an apoplexy, which left him paralytic; and, at the beginning of 1777, he suffered another stroke, which much impaired his mental powers. But the disease supposed to have been the immediate cause of his death, was an ulceration of the urinary bladder; of which, after a tedious indisposition, he died, Jan. 11, 1778, aged 71. His principal other works are, *Iter Oelandicum et Gotlandicum*; *Iter Scanicum*; *Flora Suecia*; *Materia Medica*; *Philosophia Botanica*; *Genera Morborum*: different papers in the *Acta Upsaliensia*, and the *Amœnitates Academicæ*. The last of his treatises was the *Mantissa Altera*, published in 1771; but before his death he had finished the greatest part of the *Mantissa Tertia*, afterwards completed and published by his son. On his death a general mourning took place at Upsal, and his funeral was attended by the whole university, and the pall supported by sixteen doctors of physic, all of whom had been his pupils. The king lamented his death in his speech to the States; and ordered a medal to be struck, of which one side exhibits Linnæus's bust and name, and the other Cybele, in a dejected attitude, holding in her left hand a key, and surrounded with animals and plants; with this legend, *Deam luctus angis amissi*; and beneath, *Post obitum Upsalia, die x. Jan. M.DCC.LXXVIII. Rege Jubente*. Nor was Linnæus honoured only in his own country. The late worthy professor of botany at Edinburgh, Dr. Hope, not only pronounced an eulogium in honour of him before his students, at the opening of his lectures in spring 1778, but also erected a monument to his memory, in the botanic garden there. As to the personal character of this illustrious naturalist, his stature was diminutive and puny; his head large, and its hinder part very high; his look was ardent, piercing, and apt to daunt the beholder; his ear insensible to music; his temper quick, but easily appeased. But his personal defects were amply compensated by the endowments of his mind. He possessed a lively imagination, a strong judgement, the most retentive memory, an unremitting industry, and the greatest perseverance in all his pursuits; as is evident from that continued vigour which he prosecuted the design he formed early in life, of totally reforming and renovating the whole science of natural history. This fabric he raised, and gave to it a degree of perfection unknown before; and had the pleasure of seeing it rise above all others, notwithstanding every discouragement and opposition. Neither has any writer more cautiously avoided that common error of building his own fame on the ruin of another man's. He every where acknowledged the merits of each author's system, and was sensible of the partial defects of his own. Those anomalies, which had principally been the objects of criticism, he well knew every artificial arrangement must abound with: and having laid it down as a firm maxim, that every system must finally rest on its intrinsic merit, he willingly committed his own to the judgement of posterity. Perhaps there is no circumstance of Linnæus's life which shews him in a more dignified light than his conduct towards his opponents. Disavowing controversy, he replied to none, numerous as they were at one period. He had a happy command of the

Latin tongue, which is the most useful language of science; and no man ever applied it more successfully, or gave to description such copiousness, united with such precision and conciseness. His ardour for the study of natural history led him to regret, that this study was not established, as a public institution, in universities; and he often displayed, in a lively and convincing manner, the relation it hath to the public good; to incite the great to countenance it; to encourage and allure youth into its pursuits, by opening its manifold sources of pleasure to their view, and shewing them how greatly this agreeable employment would add, in a variety of instances, both to their comfort and emolument. He also laboured to inspire the great and opulent with a taste for this study; and wished particularly that such as were devoted to an ecclesiastic life should share a portion of natural science; not only as a means of sweetening their rural situation, but as leading to discoveries, which only such situations could give rise to, and which the learned in great cities have no opportunities to make. Linnaeus lived to enjoy the fruit of his labour. Natural history arose in Sweden, under his culture, to a state of perfection unknown elsewhere: and was thence disseminated through all Europe. His pupils dispersed themselves all over the globe; the sovereigns of Europe established public institutions in favour of this study; and professorships were erected in various universities for cultivating it.

LINNET, in ornithology. See **FRINGILLA**.

LINNICH, a town of Germany, in the late duchy of Juliers, now annexed to France, and included in the department of the Roer: five miles N. N. W. of Juliers.

LINOCIERA, in botany, a genus of the diandria monogynia class and order. Calyx four-toothed; corolla four-petaled; anthers connecting two opposite petals at the base; berry two-celled.

LINOSA, an island near the coast of Tunis, 12 miles from Lampedosa, and about 12 miles in circumference. Lon 12. 31. E. Lat. 36. 50. N.

LINSEED, [*semen lini*, Latin,] the seed of the plant linum. Linseed steeped and bruised in water gives it very soon a thick mucilaginous nature, and communicates much of its emollient virtue to it. See **LINUM**.

LINSELLES, a town of France in the department of the North, 5 miles N. of Lisle.

LINSOCK, in the military art, a wooden staff, about three feet long, upon one end of which is a piece of iron, which divides in two, turning from one another, having each a place to receive the match, and a screw to keep it fast: the other end is pointed, and shod with iron, to stick in the ground. It is used by gunners, to fire the guns.

LINT, [*linetum*, Latin,] See **FLAX**, **LINEN**, and **LINUM**.

LINT, in surgery, is made into various forms, which acquire different names according to the difference of their figures. Lint, made up in an oval or orbicular form, is called a pledget; if in a cylindrical form, or in shape of a date, or olive-stone, it is called a dossil. These different forms are required for many purposes; as, 1. To stop blood in fresh wounds, by filling them up with dry lint before the application of a bandage: though, if scraped lint be not at hand, a piece of fine linen may be torn into small rags, and applied in the same manner. In very large hemorrhages the lint or rags should be first dipped in some styptic liquor, as alcohol, or oil of turpentine, or sprinkled with some styptic powder. 2. To agglutinate or heal wounds; to which end lint is very serviceable, if spread with some digestive ointment, balsam, or vulnerary liquor. 3. In drying up wounds and ulcers, and forwarding the formation of a cicatrix. 4. In keeping the lips of wounds at a proper distance, that they may not hastily unite before the bottom is well digested and healed. 5. They are highly necessary to preserve wounds from the injuries of the air. Surgeons of former ages formed compresses of sponge, wool, feathers, or cotton; linen being scarce: but lint is far preferable to all these, and is at present universally used.

LIN-TEIN, a town of China, of the second rank, in the province of Chan-tong, on the Grand Canal, 187 miles S. of Peking.

LINTEL, in architecture, a piece of timber that lies horizontally over door-posts and window jams, as well to bear the thickness of the wall over it, as to bind the sides of the wall together.

LINTERNUM, or **LITERNUM**, in ancient geography, a city of Campania, situated on the mouth of the Clanus, or Liturnus, between Cumæ and Vulturum.

LINTON, a town of England, in Cambridgeshire, 12 miles S. E. of Cambridge, and 48 N. N. E. of London.

LINTZ, the capital of upper Austria, 42 miles S. E. of Passau, and 100 W. of Vienna. Lon. 14. 3. E. Lat. 48. 15. N.

LINTZ, a town of Germany, in the late circle of the Lower Rhine, 23 miles S. S. E. of Cologne.

LINUM, **FLAX**; a genus of the pentagynia order and pentandria class of plants. Natural order Grinales. Calyx five-leaved; petals five; capsule ten-valved; seeds solitary, ten-celled. The species are twenty-five.

L. CATHARTICUM, the **PURGING FLAX**, hath leaves opposite and lanceolate; the stem bifurcated, and the corolla acute. This plant is not above four or five inches high, and is found wild upon chalky hills and in dry pleasure-grounds. Its virtue is expressed in its title; an infusion in water, or whey, of a handful of the fresh leaves, or a drachm of them in substance when dried, purges without inconvenience.

L. USITATISSIMUM, the **COMMON ANNUAL FLAX**, hath a taper fibrous root; upright, slender, unbranched stalks, two feet and a half high; garnished with narrow, spear-shaped, alternate grey-coloured leaves; and the stalks divided into footstalks at top, terminated by small blue crenated flowers in June or July; succeeded by large round capsules of ten cells, containing each one seed. This species ranks among the most valuable of the vegetable kingdom; as from the bark of its stalks is manufactured the lint or flax for making all sorts of linen-cloth; from the rags of the linen is made paper; and from the seeds is expressed lintseed-oil, so useful in painting, and other trades. The seeds are an excellent emollient and anodyne; they are used externally in cataplasms, to assuage the pain of inflamed tumours; internally, a slight infusion of them by way of tea, in coughs, is an excellent pectoral, and of great service in pleuritis, nephritic complaints, and suppressions of urine. For the cultivation, dressing, &c. of this species, see **FLAX**.

LINUS, in classical history, a native of Colchis, contemporary with Orpheus, and one of the most ancient poets and musicians of Greece. According to archbishop Ussher, he flourished about 1280 B. C. and he is mentioned by Eusebius among the poets who wrote before the time of Moses. Diodorus Siculus tells us, from Dionysius of Mitylene the historian, who was contemporary with Cicero, that Linus was the first among the Greeks who invented verses and music, as Cadmus first taught them letters. He likewise attributes to him an account of the exploits of the first Bacchus, and a treatise upon Greek mythology, written in Pelasgic characters, which were also those used by Orpheus, and by Pronapides, the preceptor of Homer. Diodorus says that he added the string lichanos to the Mercurian lyre; and ascribes to him the invention of rhyme and melody; which Suidas, who regards him as the most ancient of lyric poets, confirms. Mr. Marpurg, tells us, that Linus invented cat-gut strings for the use of the lyre, which, before his time, was only strung with thongs of leather, or with different threads of flax strung together. He had several disciples of great renown; among whom were Hercules, Thamyris, and, some add, Orpheus. Hercules, says Diodorus, in learning from Linus to play upon the lyre, being extremely dull and obstinate, provoked his master to strike him, which so enraged the young hero, that instantly seizing the lyre of the musician, he beat out his brains with his own instrument.

LION, in zoology. See **FELIS**. The roaring of the lion, says Mr. Sparrman, "consists in a hoarse inarticulate sound, which at the same time seems to have hollowness in it, something like that proceeding from a speaking-trumpet. The sound is between that of a German *u* and an *o*, being drawn to a great length, and appearing as if it came out of the earth; at the same time that, after listening with the greatest attention, I could not exactly hear from what quarter it came. The sound of the lion's voice does not bear the least resemblance to thunder, as M. de Buffon, tom. ix. p. 22, from the voyage of Boullage le Gouz, affirms it does."

LIONCELLES, in heraldry, a term used for several lions borne in the same coat of arms.

LION D' ANGERS, a town of France in the department of Maine and Loire, 10½ miles N. N. W. of Angers.

LIONS,

LIONS, a town of France in the department of the Eure, 9 miles N. of Andelys, and 15 E. of Rouen.

LIONS. See LYONS.

LIONS, GULF OF, a bay of the Mediterranean, extending from Spain and Italy, and which has given its name to the town, being often disturbed with tempests roaring like lions.

LION'S-TAIL, in botany. See LEONURUS.

LIPARA, in ancient geography, the principal of the islands called *Æolia*, situated between Sicily and Italy, with a cognominal town, so powerful as to have a fleet, and the other islands in subjection to it. Diodorus Siculus says, it was famous for excellent harbours and medicinal waters; and that it suddenly emerged from the sea about the time of Hannibal's death. The name is Punic, according to Bochart: and given it, because, being a volcano, it shone in the night. It is now called Lipari, and gives name to the

LIPARI, a cluster of islands in the Mediterranean, of which eleven are either inhabited or habitable; and rank in the following order, according to their sizes, viz. Lipari, Stromboli, Vulcano, Salini, Felicudi or Fenicusa, Alicudi or Alicor, Panari, Vacheleuse, Lisca, Dattolo, and Tila Navi. Pare, Rotto, and Ustica, are also considerable. Vulcano, a desert but habitable island, lies S. of Lipari: Salini lies W.N.W. of it: Felicudi nearly in the same direction, but 20 miles farther distant; and Alicudi, 10 miles S.W. of Felicudi, are inhabited. Panari is E. of Lipari; the famous Stromboli N.E. and both are inhabited. Basiluzzo was formerly inhabited; and Attalo might be inhabited; and Exambianca has some remains of ancient dwellings; but Escanera and many others are nothing but bare rocks. These islands lie N. of Sicily, between Lon. 14. 1. and 15. 12. E. and between Lat 38. 20. and 38. 40. N.

LIPARI, the largest, and most populous, of the above islands, and which gives name to the whole cluster. It is about fifteen miles in circumference, and abounds in corn, figs, and grapes; as well as in bitumen, sulphur, alum, and mineral waters. In this island oxen of a remarkably beautiful species are employed in plowing the ground. The ancient plough is still used. The mode of agriculture is very expeditious. One man traces a furrow, and another follows to sow in it grain and pulse. The ploughman, in cutting the next furrow, covers up that in which the seed has been sown: and thus the field is both plowed and sown at once. Vegetation is here more luxuriant, and animals more gay and healthy, than almost any where else. Near the city of Lipari, the traveller enters deep narrow roads, of a very singular appearance. The whole island is an assemblage of mountains, consisting of ashes or lava, discharged from the depths of the volcano by which it was at first produced.

LIPARI, an ancient and very strong city, capital of the above island. Lon. 15. 30. E. Lat. 38. 35. N.

LIPARIA, a genus of the diadelphia decandria class and order. Calyx five-cleft; corolla, wings two-lobed, below; stamina the larger, with three shorter teeth; legume ovate. There are five species, shrubs of the Cape.

LIPOTHYRIA, [*λίποθυρία* and *ὑστέρια*] fainting; it may arise from several causes; as too violent exercise, suppression of the menses, or other accustomed evacuations, &c. See MEDICINE.

LIPPA, a town of Hungary, 75 miles N. E. of Belgrade.

LIPPE, a county of Germany in Westphalia, lying W. of the bishopric of Paderborn. It is mountainous but fertile. The chief towns are Lippe, Detmold, and Lemgow; the chief rivers are the Lippe, Emmer, and Werra.

LIPPE, or LIPSTADT, the capital of the above county. Lon. 8. 30. E. Lat. 51. 43. N.

LIPPIA, a genus of the didynamia gymnospermia class and order. Calyx four-toothed; the capsule one-celled, three-valved, two-seeded; seed one. There are five species, shrubs of America.

LIPS, in anatomy, are the exterior edges or extremities of the mouth. Lips are subject to few disorders deserving notice, excepting that called the hare-lip, in which the upper part of the mouth is cleft, or slit, in a manner similar to that of a hare. If the division be so large that a piece appear to be wanting, no art can supply the deficiency; but, in slighter cases, the skin may be removed from the edges of the fissure, and the whole brought in contact, by means of a needle and waxed thread; after which the external part is dressed with balsam of Peru, or some similar vul-

nerary unguent. With proper care, the wound heals in a few days, when the bandages may be removed, and a slight scar only will remain. During the whole course of the operation, the patient must carefully avoid all motion of the part affected; his diet ought to be mild and nourishing, lest the wound be irritated, and an inflammation induced.

LIQUE, a town of France, in the department of the Straits of Calais and late province of Artois, 12 miles W. of St. Omer.

LIQUEFACTION, [*liquefactio*, Lat.] an operation by which a solid body is reduced into a liquid; or the action of fire or heat on fat and other fusible bodies, which puts their parts into a mutual intestine motion. The liquefaction of wax, &c. is performed by a moderate heat; that of sal tartari, by the mere moisture of the air. All salts liquefy; sand, mixed with alkalies, becomes liquefied by a reverberatory fire, in the making of glass. In speaking of metals, instead of liquefaction, we ordinarily use the word fusion.

LIQUID, [*liquidus*, Lat.] a fluid which has very little elasticity, or which is capable of little compression, and of which the surface takes the true level of the horizon. See FLUID.

LIQUIDS, among grammarians, are the five consonants, *l, m, n, r, and s*; called also, semi-vowels, while all the other consonants are mutes. They are called liquids from their sounding soft, and as it were melting in the mouth. Some grammarians enumerate no fewer than thirteen liquids. See ALPHABETS.

LIQUIDAMBAR, SWEET GUM-TREE; in botany, a genus of the polyandria order, and monœcia class of plants. Male calyx common, four-leaved; corolla none; filaments numerous: female calyx collected into a spherical form, four-leaved; corolla none; capsules collected into a sphere, two-valved, many-seeded. There are two species, both deciduous, viz.

1. *L. PEREGRINUM*, CANADA LIQUIDAMBAR, or SPLEEN-WORT-LEAVED GALE, a native of Canada and Pennsylvania. The young branches are slender, tough, and hard. The leaves are oblong, of a deep green colour, hairy underneath, and have indentures on their edges alternately very deep. The flowers come out from the sides of the branches, and they are succeeded by small roundish fruit, which seldom ripens in England.

2. *L. STYRACIFLUA*, the VIRGINIA, or MAPLE-LEAVED LIQUIDAMBAR; a native of the rich moist parts of Virginia and Mexico. It shoots in a regular manner to thirty or forty feet high, having its young twigs covered with a smooth, light-brown bark, while those of the older are of a darker colour. The leaves are of a lucid green, and grow irregularly on the young branches, on long footstalks. They resemble those of the common maple in figure; the lobes are all serrated; and from the base of the leaf a strong mid-rib runs to the extremity of each lobe that belongs to it. Both species may be propagated either by seeds or layers; but the first method is the best. 1. The seeds arrive from America in spring. A fine bed, in a warm well-sheltered place, should be prepared. If the soil be sandy, it should be wholly taken out near a foot deep, and the vacancy filled up with earth taken up 2 year before from a fresh pasture with the sward, as well rotted and mixed by being often turned, and afterwards mixed with a sixth part of drift or sea-sand. In a dry day early in March, let the seeds be sown, and the finest of this compost riddled over them a quarter of an inch deep. In hot weather the beds should be shaded, and watered often, but in very small quantities, only a very small sprinkling, at a time. Millar says, the seeds of these plants never come up under two years. But Hanbury says with this easy management, he hardly ever knew it longer than the end of May before the young plants made their appearance. The leaves emit their odoriferous particles in such plenty as to perfume the circumambient air; nay, the whole tree exudes such a fragrant transparent resin, as to have given occasion to its being taken for the sweet storax. These trees, therefore, are very proper to be planted singly in large opens, that they may amply display their fine pyramidal growth, or to be set in places near seats, pavilions, &c. The resin was formerly of great use as a perfume.

LIQUOR, [Lat.] a general name for any liquid preparation, but more particularly applied to such as are either fermented, or distilled: of the former class are, beer, ale, wine, &c. of the latter, are brandy, gin, rum, and other ardent spirits. The principal beverage amongst the Jews, as well as the Greeks and Romans, in their early state, was water, milk, and the juices of various plants infused therein. For a long time, under the commonwealth of

Rome, wine was so scarce, that in their sacrifices to the gods the libations were made with milk only. Wine did not become common there till A. U. C. 600, when vines began to be planted.

LIQUOR OF FLINTS, a combination of silica and an alkali, which is deliquescent in the air. It is now called silicated alkali.

LIQUORICE. See **GLYCYRRHIZA**.

LIRE, a town of France, in the department of the Two Nethes, and late province of Austrian Brabant, 12 miles S. E. of Antwerp.

LIRIODENDRON, the **TULIP-TREE**; in botany, a genus of the polygynia order, and polyandria class of plants; natural order, Coadunatæ. Calyx three-leaved; petals six; seeds imbricated in such a manner as to form a cone. There are two species.

L. TULIPIFERA, is a deciduous tree, native of most parts of America. It rises with a large upright trunk, branching forty or fifty feet high. The trunk, which often attains to a circumference of thirty feet, is covered with a grey bark. The branches, which are not very numerous, of the two years old wood, are smooth and brown; while the bark of the summer's shoots is smoother and shining, and of a bluish colour. They are very pithy. Their young wood is green, and when broken emits a strong scent. The leaves grow irregularly on the branches, on long footstalks. They are of a particular structure, being composed of three lobes, of which the inner one is shortened in such a manner that it appears as if it had been cut off and hollowed at the middle: the other two are rounded off. They are about four or five inches long, and as many broad. Their upper surface is smooth, and of a stronger green than the lower. They fall off pretty early in autumn; and the buds for the next year's shoots soon after begin to swell and become dilated. The flowers are produced with us in July, at the ends of the branches: they somewhat resemble the tulip, which occasions its being called the Tulip-tree. The number of petals of which each is composed, like those of the tulip, is six; and these are spotted with green, red, white, and yellow, thereby making a beautiful mixture. The flowers are succeeded by large cones, which never ripen in England. The tulip-tree, in those parts of America where it grows common, affords excellent timber for many uses; particularly, the trunk is frequently hollowed, and made into a canoe sufficient to carry many people; and for this purpose no tree is thought more proper by the inhabitants of those parts.

LIRIS, in ancient geography, a river of Italy in Campania, now called Garigliano.

LISBON, the capital of Portugal, is situated in the province of Estremadura, on the banks of the Tagus. It was anciently called Olisipo, Olisippo, and Ulyssipo, from Ulysses, who is said to have founded it; (Plin. and Solinus) but others derive these names from the Phœnician, Ulisubbo, or Olisippo, signifying in that tongue a pleasant bay, such as that on which this city stands. It first became considerable in the reign of King Emmanuel; since whose reign it hath been the capital of the kingdom, the residence of its monarchs, the seat of the chief tribunals, and offices of the metropolitan, the university, and the receptacle of the richest merchandize of the East and West Indies. Its air is excellent; being refreshed by delightful breezes, from the sea and the Tagus. The city extends two miles along the Tagus; but its breadth is inconsiderable. Like ancient Rome, it stands on seven hills; but the streets in general are narrow and dirty, and some of them very steep; and they are not lighted at night. The churches, in general are very fine; but the magnificence of the chapel royal is amazing. Lisbon has one of the finest harbours in the world; and there were a great number not only of fine churches and convents here, but also of other public buildings, and particularly of royal palaces, and others belonging to the grandees; but the greatest part of them, and of the city, were destroyed by a most dreadful earthquake, on Nov. 1, 1755, from which it will require a long time to recover. See **EARTHQUAKE**. Lisbon is 10 miles from the mouth of the Tajo, 178 W. by N. of Seville, and 235 S. by W. of Madrid. Lon. 9. 5. W. Lat. 38. 42. N.

LISBURN, a town of Ireland, in Antrim, 73 miles from Dublin. Lon. 6. 20. W. Lat. 54. 41. N.

LISANTHIUS, a genus of the pentandria monogynia class

and order. Calyx keeled; corolla with ventricose tube and curved division; stigma two-plated; capsule two-valved, two-celled. There are nine species, herbs of the West Indies.

LISIER, St. a town of France, in the department of Ariège, and late province of Couserans, 50 miles S. E. of Auch. Lon. 1. 15. E. Lat. 42. 56. N.

LISIEUX, a considerable town of France, in the department of Calvados, and late province of Upper Normandy. Lon. 0. 20. W. Lat. 49. 11. N.

LISLE, or **LILLE**, a large, rich, handsome, and strong town of France, in the department of the North, and late province of French Flanders, of which it was the capital. It is called L'Isle, i. e. the Island, because it was formerly insulated in a marsh, which has been since drained. Lon. 3. 9. W. Lat. 50. 38. N.

LISLE, **WILLIAM DE**, a most learned geographer France has produced, was born at Paris in 1675. He became first geographer to the king, royal censor, and member of the Academy of Sciences. He died in 1726. He published a great number of excellent maps, and wrote many pieces in the Memoirs of the Academy of Sciences.

LISLE, **JOSEPH NICHOLAS DE**, the celebrated French astronomer, born at Paris in 1688. He was the intimate friend of Newton and Halley, and was a member of most of the learned academies in Europe. In 1726, he was invited to Russia, and remained there till 1747. His principal work is his "Memoirs of the History of Astronomy." Unlike many modern French philosophers, he joined unaffected piety to the love of science. He died in 1768.

LISMORE, a borough and market-town of Ireland, in Waterford, anciently called Lessmore or Lios-more, Gael. i. e. the great inclosure, or large gardens, 6 miles N. E. of Cork. Lon. 7. 50. W. Lat. 52. 5. N.

LISMORE, one of the Hebrides, or Western Islands of Scotland, seated at the mouth of Loch-Linuhe, and is 10 miles long, and from one to two broad.

LISONZA, or **LISONZO**, a river of Austria, which rises in Carniola, near Gortz, and falls into the Adriatic near Trieste.

LISSA, an island of Maritime Austria, on the coast of Dalmatia, 30 miles in circumference, and 70 miles W. of Ragusa. Lon. 17. 0. E. Lat. 43. 22. N.

LISSA, a town of Poland, in the palatinate of Posna, of which it is the capital. Lon. 16. 0. E. Lat. 42. 15. N.

LISSUS, in ancient geography, the last town of Illyricum, towards Macedonia. It is now called Alessio, in Albania. Lon. 20. 0. E. Lat. 42. 0. N.

Lissus, a river of Thrace, running into the Ægean Sea, between Thasos and Samothracia.

LIST, in architecture, a little square moulding, otherwise called a fillet, listel, &c. See **ARCHITECTURE**, and Plate XIII.

LIST, in commerce, the border of cloth or stuff; serving not only to shew their quality, but to preserve them from being torn in fulling, dyeing, &c.

LIST, in gardening, a border used by gardeners, for securing their wall-trees.

LIST, or **LIST**, **SOLDIERS**, to enroll soldiers for the army. Persons listed either as volunteers, or by any kind of compulsion, must be carried within four days, but not sooner than twenty-four hours after, before the next justice of peace of any county, riding, city, or place, or chief magistrate of any city or town corporate (not being an officer in the army); and if before such justice or magistrate they dissent from such enlisting money, and also twenty shillings in lieu of all charges expended on them, they are to be discharged. But persons refusing or neglecting to return and pay such money within twenty-four hours, shall be deemed as duly listed, as if they had assented thereto before the proper magistrate; and they shall, in that case, be obliged to take the oath, or, upon refusal, they shall be confined by the officer who listed them till they do take it.

LISTEL. See **LIST**, and **ARCHITECTURE**.

LISTER, **MARTIN**, M. D. and F. R. S. nephew of the preceding, was born in Bucks, in 1638, and educated at Cambridge. He afterwards travelled into France; and at his return practised physic at York, and afterwards at London. In 1683, he was created M. D. and became fellow of the college of physicians in London. In 1698, he attended the earl of Portland, in his embassy

bassy from King William III. to France; of which journey he published an account at his return, and was afterwards physician to Queen Anne. He also published, 1. *Historia Animalium Angliæ*, 4to. 2. *Conchyliorum Synopsis*, fol. 3. *Cochlearum et Limachum Exercitatio Anatomica*, 4 vols. 8vo. 4. Many pieces in the *Philos. Trans.* and other works.

LITA, a genus of the class and order pentandria monogynia. Calyx five-cleft; corolla salver-shaped, tube long; five-cleft; capsule one-celled, two-valved; seeds numerous. There are two species, herbs of Guiana.

LITANY, [from *λειτουργία*, I beseech, the expression repeated by the people, in the service,] a form of supplicatory prayer. At first litanies were not fixed to any stated time, but were only employed as exigencies required. They were observed with ardent supplications and fastings, to avert the threatening judgments of fire, earthquakes, inundations, or hostile invasions. About A. D. 400, litanies began to be used in processions, the people walking barefoot, and repeating them with great devotion. The days on which these were used were called rogation-days: these were appointed by the canons of different councils, till it was decreed by the council of Toledo, that they should be used every month throughout the year; and thus by degrees they came to be used weekly on Wednesdays and Fridays, the ancient stationary days for fasting. To these the rubric of the church of England has added Sundays. Before the last review of the common prayer, the litany was a distinct service by itself, and used some time after the morning prayer was over; at present it is made one office with the morning-service, being ordered to be read after the third collect for grace, instead of the intermissional prayers in the daily service.

LITCHFIELD, a city of Staffordshire, in a low situation about three miles from the Trent. Its ancient name was *Licidfield*, i. e. field of carcases, from a great number of Christians having suffered martyrdom here in the persecution under Dioclesian. In the Saxons' time, it was a bishopric, and is now united with Coventry. Litchfield sends two members to parliament. It is 14 miles S. E. of Stafford, and 119 N. W. of London. Lon. 1. 44. W. Lat. 52. 54. N.

LITCHFIELD, a hilly county of Connecticut. Also the capital of the county, 201 miles N. E. by N. of Philadelphia.

LITERARY, [*literarius*, Lat.] respecting letters; regarding learning. Literary history, is an account of the state of learning and of the lives of learned men. Literary conversation, is talk about questions of learning. Literary is not properly used of missive letters. It may be said, this epistolary correspondence was political oftener than literary. Among the many charitable, philanthropic, and beneficent institutions, for which the present age is so eminently conspicuous, none surely merits the attention, and patronage of Literary Gentlemen, and Men of Letters, more than the Literary Fund, though but lately instituted, at the anniversary meeting held on the 7th May 1801, at the Free Masons's Tavern, London, to upwards of 1000l. a-year; and has been hitherto most faithfully administered. Sir James Bland Burgess Bart. was in the chair on that occasion; and the duke of Somerset presided at the last anniversary meeting, on the 7th May 1802. From this fund, "relief is given to men of genius, depressed by age, indisposition, or penury, with the most delicate regard to their feelings; and the institution is entirely managed without expence, as the council and committees transact the whole of the business gratuitously."

LITERARY PROPERTY, is that right which an author justly claims in his original literary compositions; so that no person may, without his permission, either publish the work, or receive any profit from the printed copies. The question relative to literary property has only within these few years been conclusively settled. The late Dr. Johnson was of opinion, that the bookseller, or he who purchases the copy-right of a book, acquires the sole right of printing it, and of selling the copies printed in conformity to the manuscript: but, at the same time, such purchaser has no right either to make any additions to, or to expunge any part from, the work, without previously obtaining the author's permission, who still preserves an interest in the performance. The Doctor farther maintained, that abridgements were strictly legal, however the property of the purchaser, or the reputation of the author, may be affected; because every work, that comes into the possession of

a reader, is liable to be examined, confuted, censured, translated and abridged. The right of abridging books is, therefore, established both by reason and the customs of trade. Independently of the copy-right naturally inherent by our common law, the statute 8 Ann. c. 19, declares the whole liberty of printing and re-printing a work, to be vested in an author, and his assigns, for the term of fourteen years, and no longer; such property is also protected by additional penalties and forfeitures. By the same statute it is farther enacted, that if an author be living at the expiration of that period, his original interest shall revert to him for a similar term of years. The 8 Geo. II. c. 13, and 7 Geo. III. c. 33, have judiciously extended the same privilege to the inventors of prints, and engravings, for the space of twenty-eight years.

LITERATI, [Lat.] in general denotes the learned. It is an epithet given to such persons among the Chinese, as are able to read and write their language. The Literati alone are capable of being made mandarins.

LITERATI, is also the name of a particular sect in religion or philosophy, consisting principally of the learned men of China, among whom it is called *jukiao*, i. e. learned. It had its rise A. D. 1400, when the emperor, to awaken the attention of the people to knowledge, which had been quite neglected during the civil wars, and to stir up emulation among the mandarins, chose 42 of their ablest doctors, and ordered them to compose a body of doctrine agreeable to that of the ancients, which was then the standard of the learned. This they accordingly did, though some allege, that they rather drew up a system of modern than of ancient doctrines. For instance, although they say, The Deity is a pure, perfect principle, without beginning or end; the source of all things and the cause of every being, who determines it to be what it is: yet they make God the soul of the world; and say, he is diffused through all matter, and produces all the changes that happen there. In short, it is not easy to determine, whether they resolve God into Nature, or lift up Nature into God. This doctrine introduced a refined kind of atheism. The work however, being composed by so many learned persons, and approved by the emperor, was received with great applause. Many were pleased with it, because it seemed to subvert all religion; others approved it, because the little religion that it left them could not give them much trouble. The court, the mandarins, persons of fortune and quality, &c. are generally literati; but a great part of the people still hold to their worship of idols. The literati freely tolerate the Mohammedans, because they adore, with them, the King of heaven, and Author of nature; but they bear a perfect aversion to all sorts of idolaters, and it was once resolved to extirpate them. But the disorder this would have occasioned prevented it, and they content themselves with condemning them, in general, as heretics; which they do solemnly every year at Pekin.

LITHANTHRAX, or **PIT-COAL**, is a black or brown, laminated, bituminous substance: not very easily inflammable, but, when once inflamed, burns longer and more intensely than any other substance. See **COAL**. Of this substance three kinds are distinguished by authors. The residuum of the first after combustion is black; the residuum of the second is spongy, and like pumice-stone; and the residuum of the third is whitish ashes. Some fossil-coal, by long exposure to air, falls into a greyish powder, from which alum may be extracted. Fossil-coal by distillation yields, 1. a phlegm or water; 2. a very acid liquor; 3. a thin oil like naphtha; 4. a thicker oil, resembling petroleum, which falls to the bottom of the former, and which rises with a violent fire; 5. an acid concrete salt; 6. an unflammable earth remains in the retort. These constituent parts of fossil-coal are very similar to those of amber and other bitumens. From some sorts of it a varnish may be made by fat oils. Fixed alkali has never been found in any species of it; nor sulphur, unless when mixed with pyrites. None of the species are electric per se. For exciting intense heats, as in furnaces for smelting iron-ore, and for operations where the acid and oily vapours would be detrimental, as in drying of malt, fossil-coals are previously charred, or reduced to coaks. See **COAKS**. Pit-coal affords tar, and, on that and other accounts, is ranked by modern chemists among vegetable substances.

LITHARGE, [*lithargyrum*, Lat.] a semi-vitreous oxide of lead usually in form of soft flakes, of a yellowish-reddish colour. If calcined lead be urged with a hasty fire, a current of air passing

over

over its surface, it melts into the appearance of oil, and on cooling concretes into litharge.

LITHIATE, [from *λίθος*, a stone,] a neutral salt, formed by the combinations of the lithic acid with various bases.

LITHIC ACID, an acid extracted from the urinary calculus.

LITHOCOLLA, a cement used by lapidaries for fastening precious stones together.

LITHOGRAPHY, [*λίθος* and *γραφω*,] the art or practice of engraving upon stones. See **ENGRAVING**.

LITHOLOGY, [from *λίθος*, a stone, and *λογία*, discourse,] the science which treats of stones and earths; or that branch of mineralogy, the object of which consists in the study of stones and earths. The celebrated M. Chaptal allots the second part of his *Elements of Chemistry* to Lithology; and divides the whole objects of it into three classes: viz. 1. Earths combined with acids; 2. Primitive Earths combined with each other; and, 3. Stony Mixtures.

LITHOMANCY, [*λίθος* and *μαντική*,] in antiquity, a species of divination performed with stones. Sometimes the stone called siderites was used; this they washed in spring-water in the night by candle-light; the person that consulted it was to be purified from all manner of pollution, and to have his face covered: this done, he repeated certain prayers, and placed certain characters in an appointed order; and then the stone moved of itself, and in a soft gentle murmur, or in a voice like that of a child, returned an answer.

LITHOMARGE, in mineralogy, is a species of the clay genus, and divided by Werner and others into two sub-species, viz. the friable and the indurated. Friable lithomarge or rock-marrow is white and massive; it occurs likewise as a crust, and disseminated. Its lustre is freely glimmering, is generally coherent, feels greasy, and adheres to the tongue. It is found in large quantities in the Saxon tin-veins. Indurated lithomarge is commonly white, but with many varieties of colour. It is found in many parts of Germany.

LITHOPHILA, a genus of the diandria monogynia class and order. Calyx three-leaved; corolla three-petaled; nectary two-leaved. There is one species, a native of Navaza.

LITHONTRIPTICS, [*λίθος* a stone, and *θρυπνίω*, to break,] Soap ley, taken at first in small doses, in broth free from fat, succeeds in most cases which require an alkaline solvent. The patient may begin with twenty drops, and gradually increase the dose. By repeating it three times a day for six, eight, or twelve months, the wished-for effects often follow.

LITHOPHYTA, the name of Linnæus's third order of Vermes. See **ZOOLOGY**.

LITHOSPERMUM, GROMWELL; a genus of the monogynia order, and pentandria class of plants; natural order, Asperitoidæ. Corolla funnel-shaped, with the throat perforated and naked; calyx five-parted. There are twelve species; which are common in corn-fields, in most parts of Europe.

L. OFFICINALE, the COMMON GROMWELL, grows in a dry gravelly soil. These seeds are reputed to be of service in calculus cases.

LITHOSTROTON, among the Romans, a pavement of Mosaic work, consisting of small pieces of cut marble of different kinds and colours.

LITHOTOMY, [*λίθος* and *τομή*,] the art or practice of cutting for the stone. See **SURGERY**.

LITHUANIA, or **LITWA**, a large country of Europe, anciently governed by its grand dukes, of whom Ringold, in the 13th century was the first. In the end of the 14th, the grand duke Jagello, united it to Poland, by his marriage with Hedwige, the widow of Lewis king of Poland and Hungary; and in 1569, the countries were still more closely united under one elective king. It is bounded on the S. by Volhina, on the W. by Little Poland, Polachia, Prussia, and Samogitia; on the N. by Livonia and Russia, which last bounds it on the E. It is 300 miles long and 250 broad. Its principal rivers are, the Dnieper, Dwina, Nieman, Priecz, and Bog. It is a flat country, is fertile in corn, abounds with honey, wood, pitch, &c. and feeds vast numbers of sheep. It has also excellent little horses, which are never shod, their hoofs being very hard. There are vast forests, in which are bears, wolves, elks, wild oxen, lynxes, beavers, &c. and eagles

and vultures are very common. In the forests, large pieces of yellow amber are frequently dug up. The country swarms with Jews, who though numerous in every other part of Poland, seem to have fixed their head-quarters in this duchy; and this, perhaps, is the only country in Europe where the Jews cultivate the ground. The peasants are in a state of the most abject vassalage. Lithuania was formerly divided into nine palatinates, and comprehended also Samogitia and Courland. Of the palatinates six are now annexed to Russia; viz. Polocz, Novogrodek, Witepsk, Brzesk, Miezislaw, and Minsk. The other three were Wilna, Troki, and Livonia. The chief towns are Memel and Insterburg.

LITISCONTESTATION, [from *lis*, Lat. a dispute or action at law, and *contestor*, to call to witness,] a process admitted to proof. *Litem contestari* literally signifies, to put in the plaintiff's claim and the defendant's answer.

LITMUS, or **LACMUS**, in the arts, is a blue pigment, formed from archil. It is brought from Holland at a cheap rate; but may be prepared by adding quick lime and putrefied urine, or spirit of urine distilled from lime, to the archil previously bruised by grinding. The mixture having cooled, and the fluid evaporated, becomes a mass of the consistence of a paste, which is laid on boards to dry in square lumps. The tincture of litmus is an excellent test in chemistry for detecting the presence of an acid or alkali. All acids, and salts with an excess of acid change the natural violet purple of litmus to a red. An alkali restores the natural colour of litmus made red by an alkali.

LITSCHAU, a town of Austria, seventy miles N. W. of Vienna.

LITTLETON, ADAM, an eminent lexicographer, descended from an ancient family in Shropshire. He was born in 1627, educated at Westminster school, and went to Oxford a student of Christ-church, whence he was ejected by the parliament's visitors in 1648. Soon after, he became usher of Westminster school, and in 1648 was made second master. After the restoration he taught a school at Chelsea, of which church he was admitted rector in 1664. In 1670 he took his degrees in divinity, being then chaplain to Charles II. In 1674, he became prebendary of Westminster, of which he was afterwards subdean. Besides the well known Latin and English Dictionary, he published several other works. He died in 1694. He was an universal scholar; and extremely charitable, humane, and affable.

LITTLETON, or **LYTTLETON**, SIR THOMAS, judge of the common pleas, was the eldest son of Thomas Westcote, Esq. of Devonshire, by Elizabeth, sole heiress of Thomas Littleton of Frankley in Worcestershire, at whose request he took the name and arms of that family. He was educated at Oxford or Cambridge; and was afterwards, by Henry VI. made steward of the court of the palace. In 1455, he was appointed king's serjeant; and in 1466, a judge of the common pleas, under Edward IV. In 1474 he was created knight of the Bath. He died in 1481; and was buried in the cathedral of Worcester, where a marble tomb, with his statue, was erected to his memory. He was author of the *Treatise upon Tenures*, on which Sir Edward Coke wrote a comment, well known by the title of *Coke upon Littleton*.

LITTORELLA, a genus of the monœcia tetrandria class and order. Male calyx four-leaved; corolla four-cleft; stamina long. No female calyx; corolla four-cleft; seed a nut. There is but one species.

LITURGY, [from *λαός* public, *εργον* work,] includes all the ceremonies belonging to public worship. In a more restrained signification, liturgy is used among the Romanists to signify the mass; and, in the churches of England, the Book of Common Prayer. All who have written on liturgies agree, that in the primitive days divine service was exceedingly simple, clogged with very few ceremonies, and consisting of but a small number of prayers: but, by degrees, they increased the number of external ceremonies, and added new prayers, to make the office look more awful and venerable to the people. At length things were carried to such a pitch, that it was found proper to put the service, and the manner of performing it, into writing. Liturgies have been different at different times, and in different countries. There are liturgies of St. Chrysostom, St. Peter, St. James, St. Basil, of the Maronites, of the Coptæ: the Armenian, Roman, Gallican, Ambrosian, Spanish, African, and English liturgies, &c. In the early ages of the churches, every bishop had a power to form a liturgy

liturgy for his own diocese; and if he kept to the analogy of faith and doctrine, all circumstances were left to his own discretion. Afterwards the whole province followed the metropolitan church, which became the general rule of the church; and this Lindwood acknowledges to be the common law of the church; intimating, that the use of several services in the same province, which was the case in England, was not to be warranted but by long custom. The liturgy of the church of England was composed in 1547, and established in the second year of Edward VI. In his fifth year, it was reviewed; because some things were contained in it, which shewed a compliance with the superstition of those times, and which were objected to by Calvin, and some learned men at home. Some alterations were made in it; the general confession and absolution were added, and the communion was made to begin with the ten commandments. The use of oil in confirmation and extreme unction were kept out; also prayers for souls departed, and what tended to a belief of Christ's real presence in the eucharist. This liturgy, so reformed, was established by act of 5 and 6 Ed. VI. cap. 1: abolished by queen Mary, (who enacted, that the service should stand as it was used in the last year of Henry VIII.) but re-established with a few alterations and additions, by 1 Eliz. cap. 2. Some farther alterations were introduced by order of king James I. in the first year of his reign; particularly in the office of private baptism, in several rubrics, &c. with the addition of five or six new prayers and thanksgivings, and all that part of the catechism which contains the doctrine of the sacraments. The book of common prayer, thus altered, remained in force from the first year of king James I. to the 14th of Charles II. The last review of the liturgy was in 1661, and the last act of uniformity enjoining the observance of it is 13 and 14 Car. II. cap. 4. Many applications have been since made from a review, but hitherto without success.

LITUUS, among the Romans, was the staff made use of by the augurs in quattering the heavens. It bore a great resemblance to the crosier of a bishop, but was shorter.

LITUS, was also an instrument of music in use in the Roman army, and was of a middle kind, betwixt the cornu and the tuba.

LIVADIA, a province of European Turkey, anciently called Achaia and Hellas, or Greece, properly so called; bounded on the N. by Epirus and Thessaly, from which it is separated by Mount Oeta, now Banina, and by the Euripus, now the strait of Negropont; on the E. by the Archipelago; on the S. by the Gulf of Engia, the isthmus of Corinth, and the Gulf of Lepanto; and on the W. by the Ionian Sea, and part of Epirus. Its extent is about 180 miles from N.W. to S.E.: its greatest breadth not above thirty-six. It is, in general, mountainous, but pleasant and fruitful. The province is at present divided into Livadia Proper, Stramulipia, and the duchy of Athens. The principal places are, Lepanto, anciently Naupactus; Livadia, anciently Lebadaia; Athens, now Sétines; Thebes, now Stibes; Lepsinia, anciently Eleusis; Castri, formerly Delphi; and Megara.

LIVADIA, the capital of the above province, is a large and populous place, about twenty-five miles from Lepanto. Lon. 23. 29. E. Lat. 38. 40. N.

LIVER, the largest and most ponderous of the abdominal viscera, which, in adults, weighs about three pounds. It is situated under, and connected with the diaphragm, by means of the suspensory and other ligaments; extends over the right side of the stomach, and serves for the purpose of secreting the bile. See ANATOMY. Plato, and others of the ancients, fix the principle of love in the liver; whence the Latin proverb, *Cogit amare jecur*: and in this sense Horace frequently uses the word, as when he says, *Si torrens jecur quaris Idoneum*. The Greeks, from its concave figure, called it *νεφελος*, vaulted or suspended; the Latins, *jecur*, *q. d. juxta cor*, as being near the heart. The French call it *foie*, from *foyer*, *focus*, a fire-place; agreeable to the doctrine of the ancients, who believed the blood to be boiled and prepared in it. Erasistratus, at first, called it *parenchyma*, i. e. effusion or mass of blood; and Hippocrates, by way of eminence, frequently calls it the hypochondrium. The liver of animals affords neither wholesome nor palatable food. The blood-vessels and biliary matters connected with this organ, render it still more objectionable, especially to plethoric persons. From its dry and earthy nature, it corrupts the chyle, and obstructs the vessels; hence it requires a great quantity of drink, and ought to be eaten only by the robust, whose powers of digestion are unimpaired.

LIVER, formerly the appellation given to several chemical preparations, whose colour resembled animal liver, as liver of sulphur, liver of antimony, &c. See SULPHUR.

LIVERDUN, a town of France, in the department of Meurthe, and late province of Lorraine, eight miles N. E. of Toul. Lon. 6. 5. E. Lat. 48. 45. N.

LIVERPOOL, or **LEVERPOOL**, a large, flourishing, and populous, sea-port town of Lancashire, consisting of at least 12,000 houses, and 80,000 inhabitants; although, so late as the year 1565, it was a mere fishing hamlet, containing only 138 householders and cottagers; while twelve barks, containing 223 tons, and navigated by seventy-five men, made up the sum of its maritime riches, and formed the embryo of its present commercial greatness. Respecting the antiquities of this town, hardly any thing is known with certainty; the only monument of the kind now standing is an old tower near the lower end of Water-street, the remains of which have long been used as a prison. The date of its erection is involved in obscurity; but it was long the residence of the Earls of Derby. In 1644, this town, then in the hands of the Commonwealth, was besieged by Prince Rupert, nephew to King Charles I. and taken, after a vigorous defence of one month, during which they often repulsed the besiegers with great slaughter. It was not till the year 1699, that Liverpool became a distinct parish; for before that time, it was only a hamlet to the parish of Walton, about three miles off, having only a parochial chapel of ease, the present church of St. Nicholas: it is now, however, become, with respect to extent of commerce, next to the metropolis: as by estimates which have been made, it appears that Liverpool navigates one-twelfth part of the shipping, and has one-fourth of the foreign trade of Great Britain; that it has one-half of the trade of London, and one-sixth of the general commerce of the kingdom. The slave-trade (now happily abolished) formed a considerable branch of the commerce of this port, and is computed to have employed one-fourth of the ships belonging to it; that it had five-eighths of Great Britain's share of this iniquitous traffic, and three-sevenths of that of Europe. The trade to Ireland is very considerable; to which country and the Isle of Man several packets, adapted for passengers, sail almost daily; many ships are also sent to the Greenland whale-fishery; the coasting-trade hence to London employs a great number; and many good ships have been built here, some for the East India trade. Liverpool communicates, by the rivers Mersey and Irwell, with Manchester; and by the river Weaver with the heart of Cheshire, particularly the salt-works of Northwich, Middlewich, Winstord, &c. The Sankey Canal facilitates the conveyance of coal from Ravenhead, and the Duke of Bridgewater's canal communicates with the Birmingham, Worcester, Staffordshire, and Grand Trunk, to London. The Leeds canal will unite Liverpool and Hull; and the Ellesmere canal has communicated with the Dee, and is shortly expected to do so with the Severn. The docks of Liverpool form a prominent feature of the town, and give this port a decided preference over most others in the kingdom: of these it has thirteen; five wet docks, in which the water is retained by large flood-gates, and the ships kept constantly afloat; three others, which are left dry at low water, and called dry docks; with five graving docks, in which vessels are repaired: there is also a small dock for the use of the Duke of Bridgewater's flats. The construction of the wet docks is laborious and expensive; that called the Old Dock (the first made in Liverpool,) is 200 yards long, and about 80 wide; with flood-gates 23 feet high, and 34 wide. Its site was a pool, which tradition says was formerly frequented by a bird of the cormorant kind, called a liver; and that hence the town was called Liverpool, and the liver adopted as its crest. The second-made was the Salthouse Dock, of an irregular form, but having a length of quay of 640 yards, with flood-gates of the same dimensions as those of the Old Dock. The next made was George's Dock, 250 yards long, and 100 broad; with flood-gates 25 feet high, and 38 wide; at the expense of 21,000*l.* To which succeeded the King's Dock, 290 yards long, and 90 broad; with flood-gates 25 feet high, and 42 wide; and finished at the expense of 20,000*l.* The last is that named the Queen's Dock, 270 yards long, and 130 broad; with flood-gates the same as the preceding; at the expense of 25,000*l.* Each of these wet docks has a master, with a salary of 100 guineas per annum, whose business is to superintend the management of the flood-gates, the docking and undocking of the ships at tide-time, &c. The docks have watch, scavengers,

and lamps, distinct from those of the town; and the ships are secured against accident by the prohibition of fires, combustible materials, &c. under suitable fines. Liverpool has many public buildings; among which are, the Exchange or Town-hall, first built in the year 1750, but the interior of which was destroyed by fire in 1795; since which it has been rebuilt in an elegant style, and is now appropriated to the purpose of the judicial and other offices for the police of the town; contiguous to this are the Exchange Buildings, an extensive range, newly built by subscription; in the centre of which is to be erected a monument, commemorative of the victories and death of the gallant Nelson; the prison, so large as to have at one time contained 2000 prisoners of war; the Corn Exchange, lately erected in Brunswick-street; the Custom House, centrally situated, but of mean appearance; the Tobacco Warehouse, rented by government at 506*l.* per annum, and capable of containing 7000 hogs-heads; the Infirmary, first opened in 1749, and receiving about 1500 patients annually, besides relieving a great number of out-patients; the two wings of this elegant structure are used as an hospital, for the maintenance of decayed seamen belonging to the town; contiguous to which is the Lunatic Hospital; the Blue-coat hospital, for 230 boys and 50 girls; the Poor House, a neat building; the Recovery Ward, for persons infected with fevers; the Alms-houses, an asylum for poverty and old age; the Dispensary, for supplying the afflicted poor with medicines and advice; the School for the Blind, in which music, the making of baskets, floor-cloth, foot-bears, &c. have been successfully taught to this unfortunate class of beings; there is also an institution for the restoring of drowned persons, and another called the Ladies' Charity, for the delivery and relief of poor married women in child-bed. To these may be added the Theatre, in Williamson's Square, built in 1772, at the expence of 6000*l.* but lately considerably enlarged; also the Panorama, Music Hall, and Freemason's Hall, in Bold-street. The coffee-houses and news-rooms are numerous, among which the Athenæum, Union, and especially the Lyceum, deservedly rank among the first public buildings of the town. Liverpool has twelve churches, namely, St. Nicholas, or the Old Church, St. Peter's, St. George's, St. Thomas's, St. Paul's, St. Anne's, St. John's, Trinity, St. James's, Christ Church, St. Mark's, and All Saints; some of which are neat, and others elegant; besides four chapels belonging to the establishment, and one Scotch Church or Kirk. The chapels belonging to different denominations of dissenters are numerous; of these are reckoned three Independent Chapels; two Presbyterian, or more properly Socinian; one Sandemanian; four Baptist; five Methodist; one Quaker's Meeting-house; with three Roman Catholic Chapels, and one Jewish Synagogue. Liverpool is situated on the eastern bank of the river Mersey, (which is defended by a fort and several batteries,) and is eighteen miles W. of Warrington, and 204 N. W. of London. Lon. 2. 30. W. Lat. 53. 22. N. Markets on Wednesday and Saturday.

LIVERWORT, in botany. See LICHEN.

LIVERY, in dress and equipage, a certain colour and form of dress, by which noblemen and gentlemen distinguish their servants. Liveries are usually taken from fancy, and continued in families by succession. The ancient cavaliers, at their tournaments, distinguished themselves by wearing the liveries of their mistresses: thus people of quality make their domestics wear their livery. The Romish church has also her several colours and liveries; white, for confessors and virgins, and in times of rejoicing; black, for the dead; red, for the apostles and martyrs; blue or violet, for penitents; and green, in times of hope.

LIVERY OF SEISIN, in law, signifies delivering the possession of lands, &c. to him who has a right to them. There are two kinds of livery and seisin; livery in law, where the feoffee being in view of the land, house, or other thing granted, says to the feoffee, on delivery of the deed, "I give to you yonder land, &c. to hold to you and to your heirs, so go into the same, and take possession accordingly." And livery in deed, is where the parties, or the attorneys by them authorized, coming to the door of the house, or upon some part of the land, declare the occasion of their meeting before witnesses, read the deed, or its contents, and in case it be made by attorney, the letter of attorney is also read, after which, if the delivery is of a house, the grantor, or his attorney, takes the ring, key, or latch, belonging to the door, or if it be a land, a turf, or clod of earth, and a twig of one of the trees, and delivering

them with the deed to the grantee or his attorney, says, "I A. B. do hereby deliver to you possession and seisin of this messuage or tenement, &c. to hold to you, your heirs and assigns, according to the purport, true intent, and meaning of this indenture, or deed of feoffment." After which the grantee enters first alone, and shutting the door, and then opening it, lets in others. Since the making the statute of uses, livery and seisin are not so much used as formerly; for a lease and release, a bargain and sale by deed inrolled, are sufficient to vest the grantee with possession, without the formality of livery.

LIVERYMEN, or LORDBY, are a number of men chosen from among the freemen of each company. Out of this body the common council, sheriff, and other superior officers for the government of the city are elected, and they alone have the privilege of giving their votes for members of parliament; from which the rest of the citizens are excluded.

LIVY, TITUS, the best of the Roman historians, was born at Patavium, or Padua. Few particulars of his life have been handed down to us. Coming to Rome, he acquired the notice and favour of Augustus, and long resided there. He had previously written dialogues, historical and philosophical, and some books on philosophy. It is probable, that he began his history as soon as he was settled at Rome; and he seems to have devoted himself so entirely to that great work, as to be perfectly regardless of his advancement. The distractions of Rome frequently obliged him to retire to Naples. He used to read parts of his history, while he was composing it, to Mæcenas and Augustus; and the latter conceived so high an opinion of him, that he appointed him to superintend the education of his grandson Claudius, afterwards emperor. After the death of Augustus, Livy returned to the place of his birth, where he was received with all imaginable honour and respect; and where he died, in the fourth year of Tiberius's reign, aged above seventy. Some say, he died on the same day with Ovid; it is certain he died the same year. Scarcely any man was ever more honoured, in life or after his death, than this historian. Pliny relates, that a gentleman travelled from Gades, in Spain, merely to see Livy. A monument was erected to Livy in the temple of Juno, where was afterwards founded the monastery of St. Justina; and where, in 1413, was discovered the following epitaph; *Ossa Titi Livii Patavina, &c. i. e.* "The bones of Titus Livius of Patavium, a man worthy to be approved by all mankind, by whose almost invincible pen, the acts and exploits of the invincible Romans were written." These bones are still preserved with high veneration, by the Paduans. The history of Livy is transmitted down to us exceedingly mutilated and imperfect. Its books were originally 142, of which only 35 are extant. The epitomes of it, from which we learn their number, all remain, except those of the 136th and 137th books. The encomiums bestowed upon Livy, by both ancients and moderns, are great and numerous. But his probity, candour, and impartiality, have distinguished him as a faithful historian; however, he has not escaped censure as a writer. His contemporary, Asinius Pollio, charged him with Patavinity; which word has been variously explained, but is generally supposed to relate to his style. Livy has been censured too, and perhaps with justice, for being too credulous, and loading his history with superstitious tales. But though he mentions that milk and blood were rained from heaven, or that an ox spoke, or a woman changed her sex; yet he candidly confesses, that he recorded only what made an indelible impression upon the minds of a credulous age. Livy's history has been often published with and without the supplement. The best editions are, that of Gronovius, cum notis variorum et suis, Lugd. Bat. 1679, 3 vols. 8vo.; that of Le Clerc, at Amsterdam, 1709, 10 vols. 12mo.; and that of Crevier, at Paris, 1735, 6 vols. 4to. A fragment of Livy's history, lately discovered, was published in 1773 by Dr. Bruns.

LIVIVS, ANDRONICUS, a comic poet, who flourished at Rome about B. C. 240. Though the character of a player was reckoned despicable among the Romans, Andronicus acted a part in his dramatical compositions, and engaged the attention of his audience, by repeating what he had laboured after the manner of the Greeks. He was the freed man of M. Livius Salinator, whose children he educated. His poetry was grown obsolete in the age of Cicero.

LIVONIA, a large province or duchy of the Russian empire; bounded on the N. by the Gulph of Finland, W. by that of Riga,

S. by Courland, and E. partly by Plescow, and partly by Novogorod. It is about 250 miles long from N. to S. and 150 broad. It is so fertile in corn, that it is called the granary of the north. It has several lakes, abounding in salmon, carp, pikes, flat-fish, &c. In the forests there are wolves, bears, elks, rein-deer, stags, and hares. The domestic animals are very numerous; but the sheep bear very coarse wool. Forests are numerous, and consist of birch-trees, pines, and oaks. All the houses are built with wood. The merchandizes which they send abroad are, flax, hemp, honey, wax, leather, skins, and potass. The Swedes were formerly possessed of this province, but were obliged to abandon it to the Russians after the battle of Pultowa; and it was ceded to them by the peace of 1722, which was confirmed by another treaty in 1742. It is divided into two provinces, viz. Letonia and Esthonia; and two islands called Oesel and Dagho, which are subdivided into several districts.

LIVONICA TERRA, a kind of fine bole used in the shops of Germany and Italy; found in Livonia, and some other parts. It is generally brought to us in little cakes, sealed with the impression of a church and an escutcheon, with two cross-keys.

LIVORNO, a town of France, in the military province of Piedmont; four miles N. of Crescentio.

LIVRE, [Fr.] a French coin equal nearly to our shilling, and containing twenty sols. See **MONEY**.

LIXA, or **LIXUS**, in ancient geography, a town on the coast of the Atlantic, near the Lixus. It is now called Larache, sixty-five leagues S. of Gibraltar.

LIXIVIUM, or **LEY**, [Lat.] signifies a solution of salts or ashes in water, for the different purposes of bleaching, washing, dyeing, &c. The ley may be made either of the vegetable or mineral alkali; the latter is often found native in some parts of the earth, as well as universally combined with the waters of the ocean; but the former is uniformly obtained from the ashes of burnt vegetables. Hence a lixivium may be prepared even from straw reduced to ashes, if more substantial plants cannot be procured on the spur of the occasion.

LIZARD, [*lacertus*, Lat.] See **LACERTA**.

LIZARD, or the **LIZARD POINT**, in geography, a cape of Cornwall, reckoned the most southern point of land in England, seated at the N. entrance of the British Channel. Lon. 5. 13. W. Lat. 49. 58. N.

LIZOU-TCHEOU, a city of China, of the first rank, in the province of Quang-si, 1037 miles S. S. W. of Pekin.

LLANBEDER, a town and river of South Wales, in Cardiganshire, twenty-four miles E. by N. of Cardigan, and 197 W. N. W. of London.

LLANDIEOVAWR, a town of Caermarthenshire, on the Towey, sixteen miles N. E. of Caermarthen. Lon. 4. 3. W. Lat. 51. 55. N.

LLANELLY, a town of Caermarthenshire, thirteen miles S. by E. of Caermarthen.

LLANIMDOVERY, a town of Wales, in Caermarthenshire, twenty-six miles N. E. of Caermarthen. Lon. 3. 53. W. Lat. 51. 56. N.

LLANRWST, a town of North Wales, in Denbighshire, 15 miles S. W. of Denbigh, and 222 N. W. of London. Lon. 3. 58. W. Lat. 53. 6. N.

LLANTRISSENT, an ancient town of Glamorganshire, 10 miles N. W. of Llandaff, and 116 W. of London. Lon. 3. 26. W. Lat. 51. 37. N.

LLANVILLING, a town of Montgomeryshire, fifteen miles N. of Montgomery. Lon. 3. 8. W. Lat. 52. 40. N.

LLAUGHARN, a well built trading town of Caermarthenshire, seven miles S. W. of Caermarthen, and 233 W. N. W. of London.

L. L. D. [*legum doctor*,] a doctor of the canon and civil laws.

LLOYD, NICHOLAS, a learned lexicographer, in the seventeenth century, born in Flintshire, and educated at Wadham college, Oxford. He was rector of Newington, near Lambeth, in Surrey, till his death, in 1680. His *Dictionarium Historicum* is a valuable work, to which Hoffman and Moreri are greatly indebted.

LO, St. a town of France, in the department of the Channel, on the Vire. Lon. 0. 53. W. Lat. 49. 6. N.

LOACII, in ichthyology. See **COBITIS**.

LOAD, or **LODE**, [from *ladan*, to lead,] a term used particularly in the tin-mines, for any regular vein or course, whether metallic or not; but most commonly for a metallic vein. Mines in general are veins or cavities within the earth, whose sides receding from or approaching to each other, make them of unequal breadths in different places, sometimes forming large spaces, which are called holes; these holes are filled, like the rest, with substances, which, whether metallic, or of any other nature, are called loads. When the substances forming these loads are reducible to metal, the loads are by the English miners said to be alive, otherwise they are termed dead loads. In Cornwall and Devonshire the loads all hold their course from east to west, though in other parts of England they frequently run from north to south. The miners report that the sides of the load never bear in a perpendicular, but always overhang either to the north or south above. The mines seems to have been so many channels through which the waters pass within the earth; and, like rivers, they have their small branches opening into them in all directions: these are by the miners termed the feeders of the load. Most mines have streams of water running through them; and when they are found dry, it seems owing to the water having changed its course, which it seems sometimes to have been compelled to do, by the load having filled up the course, and sometimes to have fallen into other more easy channels. The load is frequently intercepted by the crossing of a vein of earth or stone, or some other metalline substance; in which case it generally happens that one part of the load is moved to a considerable distance on one side. This transient load is, by the miners, termed a flogging; and the part of the load, which is moved, is by them said to be heaved. This fracture or heave of a load, according to Mr. Price, is produced by a subsidence of the strata from their primary positions, which he supposes to have been horizontal or parallel to the surface of the earth, and therefore should more properly be called a depression than a heave. This heaving of the load would be an inexpressible loss to the miner, did not experience teach him, that as the loads always run on the sides of the hills, so that the part heaved is always moved toward the descent of the hill, so that the miner, working toward the ascent of the hill, and meeting a flogging, considers himself as working in the heaved part; wherefore, cutting through the flogging, he works upon its back up the ascent of the hill, till he recovers the load, and vice versa.

LOAD is also used for nine dishes of ore, each dish being about half a hundred weight.

LOADED SHELL, an ingenious contrivance for saving the lives of people in imminent danger, on board a ship, when the vessel is either stranded, or in danger of being so, near the coast. It is a bomb-shell filled with lead, wherein a staple or ring is fixed, to which a rope is fastened; and the shell, thus loaded, being thrown on shore, fixes itself in the ground, and the other end of the rope being fastened to the ship, the persons on board are thereby enabled to haul themselves ashore. It was invented by John Bell, serjeant of the regiment of artillery, who obtained a premium for it of fifty guineas, in 1792, from the Society for the Encouragement of Arts, &c. after exhibiting its utility and practicability before a committee of the society. On this occasion a loaded shell, weighing about seventy pounds, was thrown on shore, from a small mortar fixed in a boat moored in the Thames, about two hundred yards from the coast. The shell falling about a hundred yards within land, buried itself about eighteen inches in the gravel, when Bell and his assistant, on a raft, floated by casks, properly ballasted, hauled themselves a-shore in a few minutes, by the rope affixed to the shell.

LOADSTONE, **LODESTONE**, or **LEDING-STONE**, the **MAGNET**. See **MAGNET**.

LOAM, [*lim*, *laum*, Sax. *limus*, Lat. from *limus*, a fen,] in mineralogy, a sub-species of the clay-genus; and of a yellowish grey colour, frequently spotted with yellow and brown. It occurs massive; is dull and sometimes weakly glimmering. It adheres pretty strongly to the tongue, feels greasy, and is not very heavy: it is generally mixed with sand and gravel, and also iron-ochre.

LOANS, in political œconomy; sums of money, generally of large amount, borrowed from individuals or public bodies, for defraying the extraordinary expences of the state. The first loans differed materially from those of subsequent periods, in being raised wholly

wholly on terminable annuities; and in having a particular fund assigned for each loan, by the supposed adequateness or insufficiency of which the interest required by the lenders was frequently influenced, as well as by other causes, which have since ceased to exist. During the reign of queen Anne, loans were chiefly raised on annuities for ninety-nine years, till 1711; when, by the establishment of the South Sea Company, a variety of debts were consolidated and made a permanent capital, bearing 6 per cent. interest. About this period lotteries were also frequently adopted for raising money for the public service, under which form a considerable premium was given, in addition to a high rate of interest. This mode of raising money was followed in 1712, 1713, and 1714. In the latter year, though the interest paid was equal to only 5*l.* 7*s.* 2*d.* per cent. on the sum borrowed, the premium allowed was upwards of 34*l.* per cent. but as peace was restored, and the legal rate of interest had been reduced to 5 per cent. it seems that a larger premium was allowed, for the sake of appearing to borrow at a moderate rate of interest. In the reign of George I. the interest on a considerable part of the public debts, was reduced to 5 per cent. and the few loans that were raised were, comparatively, of small amount; that of the year 1720, was obtained at little more than 4 per cent. interest. About 1730 the current rate of interest was 3½ per cent. and in 1736, government was enabled to borrow at 3 per cent. per annum. The extraordinary sums necessary for defraying the expenses of the war which began in 1739, were at first obtained from the sinking fund and the salt-duties; a payment from the bank, in 1742, rendered only a small loan necessary in that year, which was obtained at little more than 3 per cent. interest. In the succeeding years the following sums were raised by loans:

	Sum borrowed.		Interest.
	<i>l.</i>		<i>l. s. d.</i>
1743	1,800,000	.....	3 8 4
1744	1,800,000	.....	3 6 10
1745	2,000,000	.....	4 0 7
1746	2,500,000	.....	5 5 1
1747	4,000,000	.....	4 8 0
1748	6,300,000	.....	4 8 0

Loans of the seven years war.

1756	2,000,000	.....	3 12 0
1757	3,000,000	.....	3 14 3
1758	5,000,000	.....	3 6 5
1759	6,600,000	.....	3 10 9
1760	8,000,000	.....	3 13 7
1761	12,000,000	.....	4 1 11
1762	12,000,000	.....	4 10 9
1763	3,500,000	.....	4 4 2

Loans of the American war.

1776	2,000,000	.....	3 9 8
1777	5,000,000	.....	4 5 2
1778	6,000,000	.....	4 18 7
1779	7,000,000	.....	5 18 10
1780	12,000,000	.....	5 16 8
1781	12,000,000	.....	5 11 8
1782	13,500,000	.....	5 18 1
1783	12,000,000	.....	4 13 9
1784	6,000,000	.....	5 6 11

Loans of the war with the French republic.

1793	4,500,000	.....	4 3 4
1794	11,000,000	.....	4 10 7
1795	18,000,000	.....	4 15 8
1796	18,000,000	.....	4 14 9
1796	7,500,000	.....	4 12 2
1797	18,000,000	.....	5 14 1
1797	14,500,000	.....	6 6 10
1798	17,000,000	.....	6 4 9
1799	3,000,000	.....	5 12 5
1799	15,500,000	.....	5 5 0
1800	20,500,000	.....	4 14 2
1801	28,000,000	.....	5 5 5

Since the commencement of the war, which began in 1803, a considerable part of the extraordinary sums have been raised within the year, and hence the loans have been somewhat diminished.

LOANDA, a province of the kingdom of Angola, in Africa. It is an island about fifteen miles long, and three broad, and abounds in cattle, corn, and fruits. Loanda, its capital, is situated in Lon. 13. 5. Lat. 8. 30. S.

LOANGO, a kingdom of Africa, about 250 miles long and 183 broad. It is divided into four principal provinces, viz. Lovangiri, Loangomongo, Chilongo, and Piri. The inhabitants are very black, well-shaped, and of a mild temper. Every man marries as many wives as he pleases, who are obliged to get their husbands a livelihood, as is the practice all along the African coast. The women, therefore, cultivate the land, sow and reap. This country abounds with poultry, oxen, cows, sheep, goats, elephants, tigers, leopards, civet-cats, and other animals; so that it affords great quantities of elephants' teeth, and fine furs.

LOANGO, the capital of the above kingdom, and the city where the king resides, is called also Banza-Loangeri, and, in the language of the negroes, Boarie. Lon. 11. 45. E. Lat. 4. 15. S.

LOASA, a genus of the polyandria monogynia class and order. Calyx five-leaved; corolla five-petaled: nectary five-leaved: capsule turbinate, one-celled, three-valved, many-seeded. There is but one species, an annual of South America.

LOBBY, [*laube*, Ger.] in architecture, a small hall or waiting-room; it is also an entrance into a principal apartment, where there is a considerable space between that and a portico or vestibule; and the length or dimensions will not allow it to be considered as a vestibule or an anteroom. See **ANTICHAMBER**.

LOBE, [*λῶος*,] in anatomy, any fleshy protuberant part, as the lobes of the lungs, of the ears, &c.

LOBEL, **MATTIAS**, M. D. physician and botanist to king James I. was born at Lisle, in 1538. He published several esteemed works, viz. 1. *Plantarum seu Stirpium Historia*, folio: 2. *Dilucida simplicium Medicamentorum Explicationes*, et *Stirpium adversaria*, &c. fol. *Icones Stirpium*, 4to. *Balsami Exploratio*, 4to. *Stirpium Illustrationes*, 4to. He died at London, in 1616, aged 78.

LOBELIA, **CARDINAL FLOWERS**; a genus of the monogynia order, and syngenesia class of plants; natural order, Campanaceæ. The calyx quinquefid; corolla monopetalous, irregular; capsule inferior, bilocular, or trilocular. There are 42 species, herbaceous plants and chiefly fibrous-rooted perennials. They are easily propagated by seeds, offsets, and cuttings of their stalks. The tender kinds require the common treatment of other exotics. See **PLATE XCIX**.

LOBOS, two clusters of islands on the coast of Peru, about 21 miles from each other, distinguished into Windward and Leeward Lobos, and called also Sea Wolves or Seals Islands. Lat. 6. 25. to 6. 45. S.

LOBSTER. See **CANCER**.

LOCAL, [*locus*, Lat.] in law, something fixed to the freehold, or to a certain place; thus, real actions are local, since they must be brought in the country where they lie; and local customs are those peculiar to certain countries and places.

LOCAL MEDICINES, those destined to act upon particular parts; as fomentations, epithems, vesicatories, &c.

LOCAL PROBLEM, among mathematicians, such a one as is capable of an infinite number of different solutions, by reasons that the point which is to resolve the problem may be indifferently taken within a certain extent, as suppose any where within such a line, within such a plane figure, which is called a geometric locus, and the problem is said to be a local or indetermined one. See **LOCUS**. A local problem may be either simple, when the point sought is in a right line; plane, when the point sought is in the circumference of a circle; solid, when the point required is in the circumference of a conic section; or lastly, sur-solid, when the point is in the perimeter of a line of the second gender, or of a higher kind, as geometricians call it.

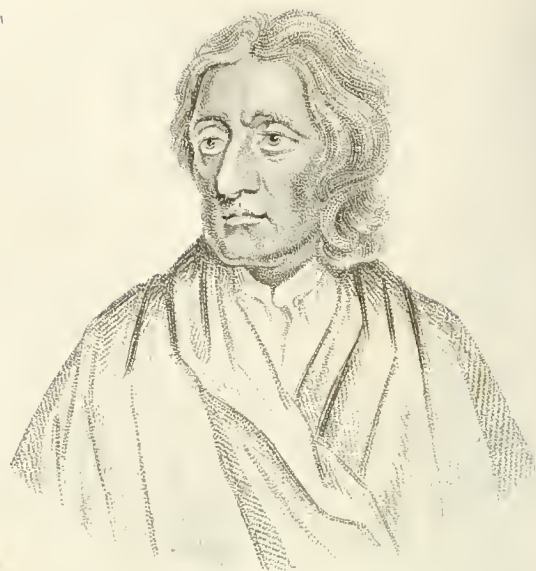
LOCARNO, **LUCARNO**, or **LUGARIS**, a town of Italia, late capital of a bailiwick. It is seated at the N. end of lake Maggiore, near the river Magie; 23 miles S. W. of Chiavenna, Lon. 8. 41. E. Lat. 46. 6. N.

LOCARNO LAKE. See **MAGGIORE**.

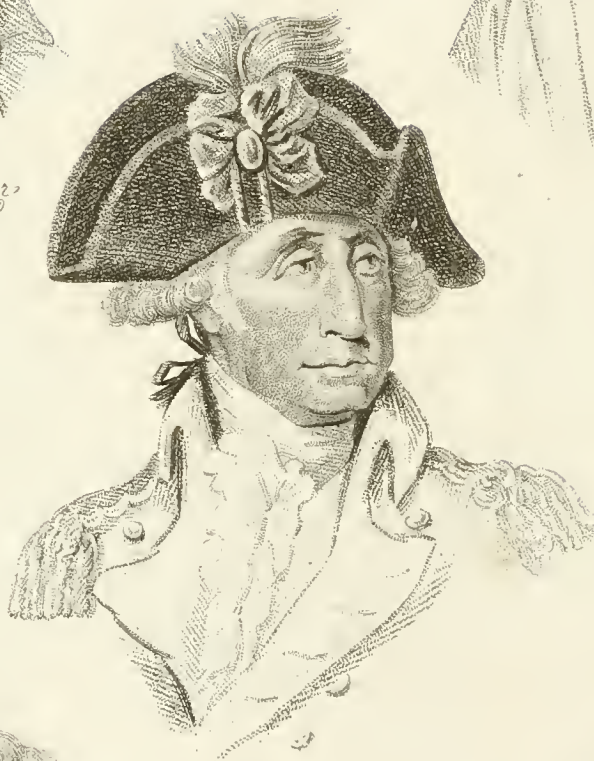
LOCHABER, a district of Scotland, in Inverness-shire. It derives



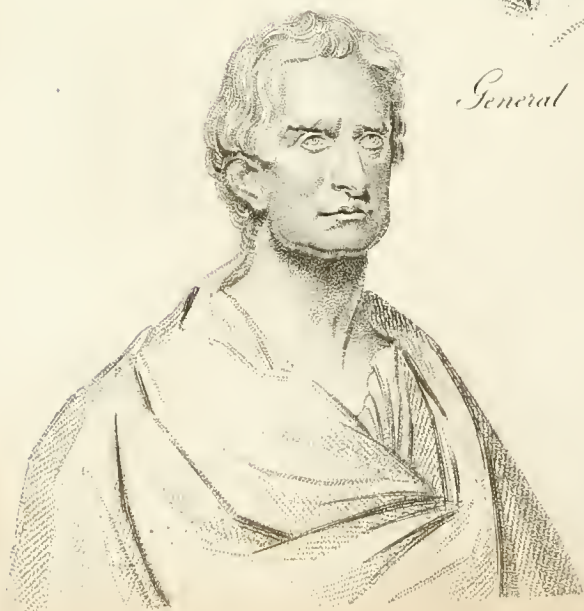
Thomas Pennant, Esq.



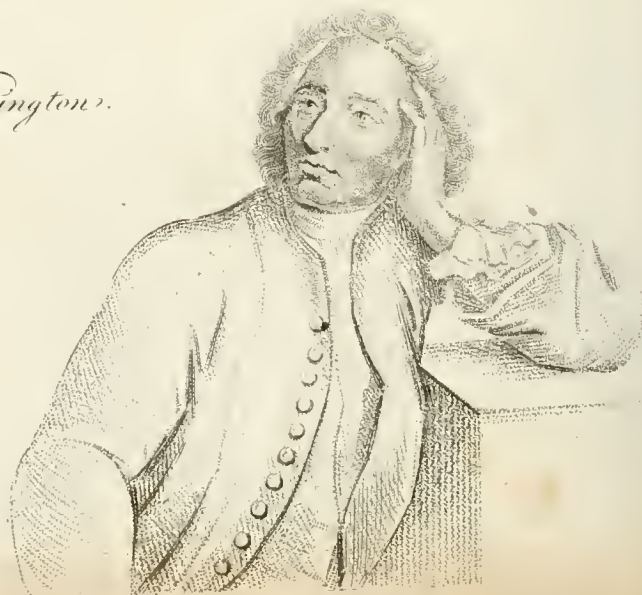
John Locke, Esq.



General Washington.



Isaac Newton.



Alexander Pope, Esq.

rives its name from the lake or loch Aber; and extends about 20 miles from E. to W. and 30 from N. to S. The country is barren, bleak, mountainous, and rugged.

LOCHEM, a town of Batavia, in the department of the Rhine, on the Borkel, ten miles E. of Zutphen. Lon. 6. 13. E. Lat. 52. 12. N.

LOCHER, or LOCHAR, a river of Scotland, in Dumfriesshire, which falls into the Solway Frith.

LOCHER Moss, an extensive morass of Scotland, in Dumfriesshire, twelve miles long and three broad. From the vast number of oak-trees that have been dug up in it, it is evident, that it has been anciently a great forest; and as canoes and anchors have been found in it, it is supposed to have been formerly covered by the sea.

LOCHES, a town of France, in the department of Indre and Loire, and late province of Touraine, twenty miles S. E. of Tours. Lon. 0. 51. E. Lat. 47. 10. N.

LOCHIA, in midwifery, a flux from the uterus consequent to delivery. See MIDWIFERY.

LOCH LEVEN, a spacious and beautiful lake of Kinross-shire, about fifteen miles in circumference and four in length, interspersed with islands of various appearance and extent. The lake abounds with trouts, eels, pikes, perches, &c. and the islands in it are frequented by herons, snipes, teals, swans, gulls, rails, kingfishers, &c.

LOCHMABEN, a town of Dumfriesshire, in Annandale, eight miles N. E. of Dumfries. Lon. 3. 19. W. Lat. 55. 19. N.

LOCH-NESS, a large lake of Inverness-shire twenty-four miles long and two broad, between Fort Augustus, and the Frith of Moray, into which its waters run. It never freezes, even in the most extreme cold. Sir John Pringle supposes this to be owing to its great depth, which, in some places, cannot be measured by a line of 500 fathoms; though in other places, he says, "its common soundings are from 116 to 125, and in one place to 135." Another cause, he assigns is, that "there is never any perfect calm upon the lake, and the wind, blowing always from one end to the other, makes such an undulation as must obstruct the freezing of the water." This water is laxative. Loch-Ness lies between 57° and 58° Lat. N.

LOCHRIDA, or OCRIDA, a large town of European Turkey, in Albania. It is 62 miles N. E. of Durazzo. Lon. 20. 40. E. Lat. 41. 40. N.

LOCHTA, a town of Sweden, with a good harbour on the Gulf of Bothnia, 90 miles S. of Tornea. Lon. 2. 4. 16. E. Lat. 64. 20. N.

LOCH TAY, a beautiful and extensive lake of Perthshire, in Breadalbane, fifteen miles long and one broad; the source of the river Tay. It abounds with salmon, trouts, char, pikes, perches, &c.

LOCK, [*loc*, Sax.] an instrument used for fastening doors, chests, &c. generally opened by a key. The lock is reckoned the master-piece in smithery; a great deal of art and ingenuity being required in contriving and varying the wards, springs, bolts, &c. and adjusting them to the places where they are to be used, and to the various occasions of using them. From the various structure of locks, accommodated to their different intentions, they acquire various names. Those placed on outer doors are called stock-locks; those on chamber-doors, spring-locks; those on trunks, trunk-locks, padlocks, &c. Of these the spring-lock is the most considerable, both for its frequency and the curiosity of its structure. Its principal parts are, the main-plate, the cover-plate, and the pin-hole. To the main-plate, belong the key-hole, top-hook, cross-wards, bolt-toe or bolt-knob, drawback-spring tumbler, pin of the tumbler, and the staples; to the cover-plate belong the pin, main-ward, cross-ward, step-ward or dap-ward; to the pin-hole belong the hook-ward, main cross-ward, shank, the pot or bread, bow-ward, and bit. As on the proper construction of locks the security of the most valuable kinds of property almost entirely depends, and as numberless devices are continually fallen upon to elude the utmost efforts of mechanical invention in this respect, it is an object of no small importance to invent a lock which it should be impossible to open except by its proper key. In the year 1784, the Society for the Encouragement of Arts, &c. conferred their silver-medal on Mr. Taylor, of Petworth, for his improvement on the latch or spring-bolts of common locks. This

is effected by simply reversing the tumbler, so that its curved side acts against two stubs fixed on the tail of the latch, and thrusts back the latter with ease; whether the knob be turned to the right or to the left, when the lock is opened. Mr. Taylor has also, behind the tail of the latch, fixed a guide containing a groove, in which runs a small friction-wheel, that serves to keep the latch in its direct situation, and at the same time to diminish its friction; the arms of his tumbler are somewhat contracted, in order that the latch or spring-bolt may move with greater facility. By this construction, the parts of the tumbler and latch, which are in contact, move in a line, so that they pass over the greatest space, under the smallest angle; and the lock itself may be constantly used for several years, without requiring the application of oil. The same Society also granted, in the same year, the sum of ten guineas to Mr. Marshal, for a secret escutcheon, which, when fixed to a lock, may be so repeatedly varied, that even the artist who made it, is unable to open the lock: the description of its mechanism may be seen in the third vol. of the Society's Transactions. Various patents have been obtained for the construction of locks, so as to prevent the possibility of picking them: the principal of these is Mr. Bramah's, registered in 1784; Mr. Spears's, in 1795, and Mr. Stainsbury's, in 1805. For a minute description of these we refer the curious reader to the fifth and eighth vols. of the Repository of Arts and Manufactures.

LOCK, or WEIR, in inland navigation, the general name for all those works of wood or stone, made to confine and raise the water of a river: the banks also which are made to divert the course of a river, are called by these names in some places. But the term lock is more particularly appropriated to express a kind of canal inclosed between two gates; the upper called by workmen the sluice-gate, and the lower called the flood-gate. These serve in artificial navigations to confine the water, and render the passage of boats easy in moving up and down the stream. See CANAL.

LOCKE, JOHN, a celebrated philosopher, was born at Wrington, in Somersetshire, in 1632, and educated at Westminster school, from whence he removed to Christ-church, Oxford, of which he became student. After taking his degrees in arts, he entered on the study of physic, in which he made great proficiency. Lord Ashley, afterwards earl of Shaftesbury, became his patron, and urged him to apply to the study of politics. Mr. Locke followed his advice, and rendered himself serviceable to his lordship and his party; who, having obtained the grant of Carolina, employed him in drawing up the constitution for the government of that province. Lord Shaftesbury being appointed chancellor in 1672, made Mr. Locke secretary of presentations, which place he lost the year following, when his patron was deprived of the great seal. He continued, however, his secretariship of the board of trade, of which lord Shaftesbury was president. In 1674 that commission was dissolved, and Mr. Locke being in an ill state of health went to Montpellier, and continued abroad till 1679, when he was sent for by lord Shaftesbury who was appointed president of the council: but in 1682 that nobleman, to avoid a prosecution for high treason withdrew to Holland, and was accompanied by his friend. In 1684 Mr. Locke was removed from his student's place at Christ church, by the king's command; and the year following the English envoy demanded him of the states of Holland, on suspicion of his being concerned in Mearmouth's rebellion, which occasioned him to keep private several months, during which he was employed in finishing his Essay on Human Understanding, which however was not published till after the Revolution, when he returned to England, and was made commissioner of appeals. In 1695 he was appointed one of the commissioners of trade and plantations, and he might have had other preferment, but the state of his health led him to decline the advantageous offers that were made him. He spent the latter years of his life at Oates, in Essex, the seat of Sir Francis and lady Masham, who invited him to reside in their family. Mr. Locke lived in as much ease as if the house had been his own: he found besides in lady Masham a friend and companion exactly suited to his taste; a lady of contemplation and studious turn, and particularly inured from her youth to deep and refined speculations in theology, metaphysics and morality: he had the additional satisfaction of seeing her only son bred up on the plan which he had laid down as the best method of education, the success of which seemed to sanction his judgement in the choice of

that method. He published his letters on Toleration, to promote the scheme which king William had so much at heart, of a comprehension with the dissenters. This drew him into a controversy which was scarcely ended, when he entered into another in defence of his Essays; but the asthma, his constitutional disease, increasing with his years, began to subdue him, and he became so interior, that in 1700 he resigned his seat at the board of trade. He could no longer bear the air of London, so as to insure a regular attendance. After this resignation he continued altogether at Oates, devoting himself to study particularly of the scriptures. In this retirement he also wrote several of his works, and died there in 1704. His remains were interred in the church of Oates, where a monument has been erected to his memory. His principal works are, an Essay on the Human Understanding, 2 vols. 8vo.; Letters on Toleration, 4to.; Treatise on Civil Government, 8vo.; and Thoughts concerning Education, 12mo. These with his Letters and miscellaneous pieces have been printed together in 3 vols. folio, and 9 vols. 8vo. (*Watkins.*)

LOCKMAN, an officer in the Isle of Man, who executes the orders of government, much like our sheriff depute.

LOCKMAN. See **LOKMAN**.

LOCOMOTION, [*locus* and *motus*, Lat.] power of changing place.

LOCRENAN, a town of France, in the department of Finistère, 8 miles N. W. of Quimper.

LOCRI, or **LOCRI EPIZEPHYRII**, in ancient geography, a town of the Brutii, on the Ionian Sea.

LOCRI, a country of Achaia, in Greece; twofold, and divided by mount Parnassus: into

1. **LOCRI CITERIOR**, occupied by the Locri Ozolæ, or Zephyrii, i. e. Western Locri, contained between Ætolia and Phocis, beginning at Naupactum, and running in a narrow slip of land, scarcely 200 stadia, along the sea to the borders of the Phocenses.

2. **LOCRI ULTERIOR** lay beyond Parnassus, running out towards Thermopylæ, and reaching to the Euripus of Eubœa; occupied by the Locri Opuntii, who dwelt on the Eubœan sea; and the Locri Epicnemidii, who occupied mount Cnemis; (*Strabo*), and these two were the Eastern Locri.

LOCULAMENTA, and **LOCULI**, in botany, cells or pockets: the internal divisions of a capsule, or other dry seed-vessel. These cells contain the seeds; and differ in number in different plants.

LOCULUS is also sometimes used to express the minute divisions in some species of antheræ, which contain the fine impalpable powder, supposed by the sexualists to be the principal agent in the generation of plants.

LOCUS GEOMETRICUS, a line by which a local or indeterminate problem is solved. See **LOCAL PROBLEM**. A locus is a line, any point of which may equally solve an indeterminate problem. Thus, if a right line suffice for the construction of the equation, it is called locus ad rectum; if a circle, locus ad circumulum; if a parabola, locus ad parabolam; if an ellipsis, locus ad ellipsin: and so of the rest of the conic sections. The loci of such equations as are right lines, or circles, the ancients called plain loci; and of those that are parabolas, hyperbolas, &c. solid loci. But Wolfius, and others, among the moderns, divide the loci more commodiously into orders, according to the number of dimensions to which the indeterminate quantities rise. Thus, it

will be a locus of the first order, if the equation be $x = \frac{ay}{e}$; a locus of the second or quadratic order, if $y^2 = ax$, or $y^2 = a^2 - x^2$; a locus of the third or cubic order, if $y^3 = a^2 x$, or $y^3 = a x^2 - x^3$, &c.

The better to conceive the nature of the locus, suppose two unknown and variable right lines AP, PM, Plate CI, fig. 1, 2, making any given angle APM with each other; and call the one as AP, x , drawn from the point A, and given in position; put $y = PM$, the other line, which continually moves, but always parallel to itself.

Example. Let the equation $y = \frac{bx}{a}$, express always the relation of the line; AP (x) to PM (y), which make any angle APM,

at pleasure with one another. In the line AP assume $AB = a$, and from B, draw $BE = b$, parallel to PM, and on the same side; then the indefinite line AE, is called in general a geometrical lo-

cus, and in particular the locus of the equation $y = \frac{bx}{a}$. For if

the right line MP be drawn from any one of its points M, parallel to BE, the similar triangles ABE, APM, will give always

this proportion, viz. $AB(a) : BE(b) :: AP(x) : PM(y) = \frac{bx}{a}$.

And, therefore, the right line AE, is the locus of all the points M. Moreover, if $yy = aa - xx$, express the relations of AB to PM, and the angle APM, be a right angle; then the circumference of a circle, whose radius is the right line $AB = a$, taken in AP, is called in general a geometrical locus, and in particular the locus of the equation $yy = aa - xx$. For if the perpendicular MP (y), be drawn from any point M of the circumference, then by the nature of the circle, we shall have always $PM^2(y y) = DP \times BP(aa - xx)$ supposing BD the diameter of the circle. Therefore, the locus of all the points M, is the circumference of a circle.

An equation only containing these two unknown quantities x and y , mixed with known ones, which expresses the relation of every variable quantity AP (x) to its correspondent variable quantity PM (y): the line passing through the extremities of all the values of y , i. e. through all the points M, is called a geometrical locus, in general, and the locus of that equation in particular.

All equations, whose loci are of the first order, may be reduced

to some one of the four following formulas: 1. $y = \frac{bx}{a}$. 2. $y =$

$\frac{bx}{a} + c$. 3. $y = \frac{bx}{a} - c$. 4. $y = c - \frac{bx}{a}$. Where the unknown

quantity y , is supposed always to be freed from fractions, and the fraction that multiplies the other unknown quantity x , to be reduced to this expression $\frac{b}{a}$, and all the known terms to c .

The locus of the first formula being already determined: to find that of the second, $y = \frac{bx}{a} + c$; in the line AP, fig. 3, take

$AB = a$, and draw $BE = b$, $AD = c$, and parallel to BE. On the same side AP, draw the line AE of an indefinite length towards E, and the indefinite straight line DM parallel to AE. Then the line DM is the locus of the aforesaid equation, or formula: for if the line MP be drawn from any point M thereof parallel to AQ, the triangles ABE, and APF, will be similar: and

therefore $AB(a) : BE(b) :: AP(x) : PF = \frac{bx}{a}$; and conse-

quently $PM(y) = PF\left(\frac{bx}{a}\right) + FM(c)$.

To find the locus of the third form, $y = \frac{bx}{a} - c$, proceed thus:

assume $AB = a$, fig. 4.; and draw the right lines $BE = b$, $AD = c$, and parallel to BE, the one on one side AP, and the other on the other side; and through the points A, E, draw the line AE of an indefinite length towards E, and through the point D, the line DM parallel to AE: then the indefinite right line GM shall be the locus sought; for we shall have always $PM = (y) = PF\left(\frac{bx}{a}\right) - FM(c)$.

Lastly, to find the locus of the fourth formula, $y = c - \frac{bx}{a}$; in AP, fig. 5, take $AB = a$, and draw $BE = b$, $AD = c$, and parallel to BE, the one on one side AP, and the other on the other side; and through the points A and E, draw the line AE indefinitely towards E, and through the point D draw the line DM parallel

parallel to AE. Then DG shall be the locus sought; for if the line MP be drawn from any point M thereof, parallel to AQ, then we shall always have $PM = FM - PF$, that is $y = c$

If either of the terms x or y be wanting, there will be two other formulas, viz. $y = c$, and $x = c$. To construct the first $y = c$, draw AD = c , fig. 6. parallel to PM, and toward the same part, and through D, draw DM, parallel to AP; DM will be the locus required. For AD, and PM, being opposite sides of a parallelogram, PM (y) is always equal to AD (c).

For the formula $x = c$, take AP = c , fig. 7, and draw PM, parallel to AQ, then the right line PM is the locus. For it is evident from the parallels, that QM (x) is always equal to AP (c), whatever may be the length of PM.

Hence it appears, that all the loci of the first degree are straight lines; which may be easily found, because all their equations may be reduced to some one of the foregoing formulas.

All loci of the second degree are conic sections, viz. either the parabola, the circle, ellipsis, or hyperbola: if an equation therefore be given, whose locus is of the second degree, and it be required to draw the conic section, which is its locus; first draw a parabola, ellipsis, or hyperbola; so as that the equations expressing the natures thereof may be as compound as possible. In order to get general equations, or formulas, by examining the peculiar properties whereof we may know which of these formulas the given equation ought to have regard to; that is, which of the conic sections will be the locus of the proposed equation. This known, compare all the terms of the proposed equation with the terms of the general formula of that conic section, which you have found will be the locus of the given equation; by which means you will find how to draw the section, which is the locus of the equation given.

For example: let AP = x , PM = y , be unknown, and variable straight lines, (fig. 8,) and let m, n, p, r, s , be given right lines: in the line AP take AB = m , and draw BE = n , AD = r and parallel to PM; and through the point A draw AE = e , and through the point D the indefinite right line DG parallel to AE. In DG take DC = s , and with CG, as a diameter, having its ordinates parallel to PM, and the line CH = p , as the parameter, describe a parabola CM: then the portion thereof, included in the angle PAD, will be the locus of the following general formula:

$$yy - \frac{2nxy}{m} + \frac{nnxx}{mm} - 2ry + \frac{2nrx}{m} + rr - \frac{epx}{m} + ps = 0.$$

For if from any point M of that portion there be drawn the right line MP, making any angle APM with MP; the triangles ABE, APF, shall be similar; therefore,

$$AB:AE::AP:AF, \text{ or } DG; \text{ that is, } m:e::x:-\frac{ex}{m}. \text{ And}$$

$$AB:BE::AP:PF; \text{ that is, } m:n::x:-\frac{nx}{m}. \text{ And consequent-}$$

$$\text{ly } GM \text{ or } PM - PF - FG = y - \frac{nx}{m} - r. \text{ And CG or DG}$$

$$-DC = \frac{ex}{m} - s. \text{ But from the nature of the parabola } GM^2 = CG \times CH; \text{ which equation will become that of the general formula, by putting the literal values of those lines.}$$

Again, if through the fixed point A you draw the indefinite right line AQ, (fig. 9.) parallel to PM, and you take AB = m , and draw BE = n , and parallel to AP, and through the determinate points A, E, the line AE = e ; and if in AP you take AD = r ; and draw the indefinite straight line DG parallel to AE, and take DC = s : this being done, if with the diameter CG, whose ordinates are parallel to AP, and parameter the line CH = p , you describe a parabola CM; the portion of this parabola contained in the angle BAP shall be the locus of this second equation, or formula:

$$xx - \frac{2nxy}{m} + \frac{nnyy}{mm} - 2rx + \frac{2nr y}{m} + rr - \frac{c p y}{m} + ps = 0$$

For if the line MQ be drawn from any point M, therein, parallel to AP; then will, AB:AE::AQ or PM:AF or DG; that is,

$$m:e::y:-\frac{ey}{m}; \text{ and } AB:BE::AQ:QF; \text{ that is, } m:n::y:-\frac{ny}{m}.$$

$$\text{And therefore } GM \text{ or } QM - QF - FG = x - \frac{ny}{m} - r; \text{ and } CG \text{ or } DG - DC = \frac{ey}{m} - s$$

$$\text{And so by the common property of the parabola, you will have the foregoing second equation, or formula. So likewise may be found general equations for the other conic sections.}$$

Now if it be required to draw the parabola, which we find to be the locus of this proposed equation $yy - 2ay - bx + cc = 0$; compare every term of the first formula with the terms of the equation, because yy in both is without fractions; and then

$$\text{will } \frac{2n}{m} = 0, \text{ because the rectangle } xy \text{ not being in the proposed equation, the said rectangle may be esteemed as multiplied by } 0; \text{ whence } n = 0, \text{ and } m = e; \text{ because the line AE falling in AB, that is, in AP in the construction of the formula, the points B, E, do coincide. Therefore destroying all the terms affected with } \frac{n}{m} \text{ in the formula, and substituting } m \text{ for } e, \text{ we shall get } yy$$

$$- 2ry - px + rr + ps = 0. \text{ Again, by comparing the correspondent terms } - 2ry \text{ and } - 2ay, \text{ as also } - px \text{ and } - bx, \text{ we have } r = a, \text{ and } p = b; \text{ and comparing the terms wherein are neither of the unknown quantities } x, y, \text{ we get } rr + ps = cc; \text{ and substituting } a \text{ and } b, \text{ for } r \text{ and } p, \text{ then will } s = \frac{cc - aa}{b}, \text{ which is}$$

a negative expression when a is greater than c , as is here supposed. There is no need of comparing the first terms yy and yy , because they are the same. Now the values of n, r, p, s , being thus found, the sought locus may be constructed by means of the construction of the formula, and after the following manner: Because BE = $n = 0$, (fig. 10,) the points B, E, coincide, and the line AE falls in AP; therefore through the fixed point A draw the line AD = $r = a$ parallel to PM, and draw DG parallel to AP, in which take DC = $\frac{aa - cc}{b} = -s$; then with DC, as a diameter, whose ordinates are right lines parallel to PM, and parameter the line CH = $p = b$, describe a parabola; which will give the locus required. For PM being drawn parallel to CH, and meeting DG in G, we have GM = $y \propto a$, and CG, or DG + CG = $x + \frac{a^2 - c^2}{b}$, and therefore by the property of the parabola, GM² ($y^2 - 2ay + a^2$) = CG × CH ($bx + a^2 - c^2$) or $y^2 - 2ay - bx + c^2 = 0$, which is the given equation. In the portion RCO of the parabola the values of x are to be considered as negative, that is, AP = $-x$, and in the part beyond the intersection S, y is negative, that is, PM = $-y$.

From this may be understood the method of constructing the loci of the equations which are conic sections. If, now, an equation, whose locus is a conic section, be given, and the particular section whereof it is the locus be required; all the terms of the given equation being brought over to one side, so that the other be equal to nothing, there will be two cases.

CASE 1. When the rectangle xy is not in the given equation. 1. If either yy or xx be in the same equation, the locus will be a parabola. 2. If both xx and yy are in the equation with the same signs, the locus will be an ellipsis, or a circle. 3. If xx and yy have different signs, the locus will be an hyperbola, or the opposite sections regarding their diameters.

CASE 11. When the rectangle xy is in the given equation. 1. If neither of the squares x^2 or y^2 , or only one of them, be in the same, the locus of it will be an hyperbola between the asymptotes. 2. If yy and xx be therein, having different signs, the locus will be an hyperbola regarding its diameters. 3. If both the squares xx and yy are in the equation, having the same signs, you must free the square yy from fractions; and then the locus will be an hyperbola, when the square of half the fraction multiplying xy , is equal to the fraction multiplying xx ; an ellipsis or circle, when the same is less; and an hyperbola, or the opposite sections, regarding their diameters, when greater.

Since, in the construction of geometrical problems, the loci are of constant use, we shall here notice a few of the principal, which will serve further to illustrate this subject.

1. When the base DB and vertical angle M, (fig. 11.) of a triangle DMB are given, the locus of the vertex M is the circumference of a circle passing through the points D and B. This is evident from Euclid 21. 3.

2. When the ratio of the sides BM, MD, of the triangle DMB, (fig. 12.) and the base DB, are given or constant, the locus is the circumference of a circle AME cutting the base at S in the same ratio, as may be easily demonstrated. See Emerson's Geom. B. 4. Prop. 23.

3. If the sum of the squares of the sides and the base AB of a triangle AMB be given, the locus will also be a circle, this is evident when the vertical angle is a right one, as in fig. 13. When it is not a right angle, bisect AB in O, (fig. 14.) join MO, and draw the perpendicular ME, and from the centre O with the distance OM describe the circle CMD. Then $AM^2 = AO^2 + OM^2 + 2AO \times OE = OB^2 + OM^2 + 2OB \times OE$, and $MB^2 = OB^2 + OM^2 - 2OB \times OE$, (Euc. 12 and 13. 2.) therefore $AM^2 + MB^2 = 2OB^2 + 2OM^2$, and since OB is given, $AM^2 + MB^2$ will be constant, if OM be given, that is, if the vertex M be in the circumference CMD.

4. When the base AB, (fig. 15.) and the difference of the squares of the sides are given, the locus of the vertex is a straight line CM at right angles to AB. For $AC^2 + CM^2 = AM^2$, and $BC^2 + CM^2 = BM^2$, (Euc. 47. 1.) therefore $AC^2 - BC^2 = AM^2 - BM^2$.

5. When the base AB, (fig. 16.) and sum of the sides AM + BM are given, the locus of the vertex M is the ellipse CMD, of which A and B are the foci; and if the difference of the sides, AM - BM, (fig. 17.) be given, the locus is the hyperbola, of which A and B are the foci, and CD the diameter. But if the sum or difference of the sides be given, and the base be drawn from a given point A, (fig. 18, 19.) to meet any given line CD in B, and BM be drawn parallel to AC, and to meet AD in M, the angles ADC and ACD being equal, the loci of the angular points B and M, will be the straight lines CD and AD. For $AC = AD$, and $MB = MD$, (Euc. 5 and 29. 1.) therefore $AM + MB = AD$, (fig. 18.) the given sum, and $AM - MB = AD$, (fig. 19.) the given difference; therefore CD is the locus of the angular point B, and AD of M.

6. If the base AB, (fig. 20, 21.) of a triangle AMB be given, and the rectangles BA $\times$ AP and MA $\times$ AO always equal, the lines MP, BO, forming given equal angles with AB and AM, the locus of the vertex M is the straight line PM, and the locus of the point O is the circle AOB. For since the angle AOB = APM, and OAB common, BA : AO :: AM : AP, hence BA $\times$ AP = AM $\times$ AO, the point M being always in the same straight line PM; and because AB and the angle AOB are given, the locus of O is a circle, (art. 1.)

We shall only add two examples to illustrate the use of the geometrical loci in the construction of geometrical problems.

Example 1. To describe the triangle of which the base and its opposite angle, with the difference of the sides are given.

At A, (fig. 22.) make the angle DAE equal to the given angle, also take AE equal to the given base, and AE, AD, each equal to the given difference of the sides. From the centre A and distance AE describe the circle FGC which is evidently the locus of the angular point C; through E and D draw EDC, which (art. 5.) is also the locus of the point C, hence if from C the intersection of these loci, CB be drawn parallel to AE, and AC be joined, ABC will be the required triangle. For $AC = AE =$

the given base, $ABC = BAE =$ the given angle, and $AB - BC$ (BD) = AD = the given difference of the sides.

Example 2. Given the base of a triangle, and the sum and difference of the squares of the other sides, to construct the triangle.

Let AB, (fig. 23.) be the given base, divide AB in F so that the difference of the squares of AF and FB may be equal to the given difference, and draw FH perpendicular to AB; also bisect AB in G, and take GD so that $2GA^2 + 2GD^2$ may be equal to the given sum, and from the centre G with the distance GD describe the circle DCE, which is the locus of the vertex C, (art. 3.) and FH is also the locus of the vertex C, (art. 4.) therefore from C, the point of intersection draw CA and CB, and ACB will be the required triangle, which is manifest.

LOCUST, in zoology. See GRILLUS.

LOCUTORIUM. The monks and other religious in monasteries, after they had dined in their common hall, had a withdrawing-room, where they met and talked together among themselves, which room, from that sociable use and conversation, they called locutorium, from *loquendo*, speaking; as we call such a place in our houses parlour, from the French *parler*; and they had another room, which they called locutorium forinsecum, where they might talk with laymen.

LODDON, a town of Norfolkshire, 42 miles N. of Ipswich, and 113 N. N. E. of London. Lon. 1. 18. E. Lat. 52. 36. N.

LODE, in mining. See LOAD.

LODESAN, a late territory of the Milanese. The capital is Lodi.

LODEVE, a town of France, in the department of Herault, 21 miles N. of Beziers, and 8 W. of Montpellier. Lon. 3. 30. E. Lat. 42. 47. N.

LODGE, in military affairs, is a work raised with earth, gabions, fascines, wool-packs, or mantelets, to cover the besiegers from the enemies fire, and to prevent their losing a place which they have gained, and are resolved if possible, to keep. For this purpose, when a lodgement is to be made on the glacis, covert-way, or in a breach, there must be great provision made of fascines, sand-bags, &c. in the trenches; and during the action, the pioneers with fascines, sand-bags, &c. should be making the lodgment, in order to form a covering in as advantageous a manner as possible from the opposite bastion, or the place most to be feared.

LODI, a large and strong city of Italy, in the department of Olona, and district (late duchy) of Milan, seated on the Adda, 18 miles S. E. of Milan, and 15 N. W. of Placentia. Lon. 9. 26. E. Lat. 45. 15. N.

LODI VECCHIO, or OLD LODI, an ancient town of Italy, in the department of Olona, district and late duchy of Milan, seated on the Silaro, 3 miles W. S. W. of Lodi.

LODOMERIA, a large territory in the S. of Poland, forcibly seized by the emperor Joseph II. in 1772; and erected into a kingdom, along with another territory, named Gallicia.

LODRONE, a town of Italy, in the bishopric of Trent, 25 miles N. N. E. of Brescia, and 25 S. W. of Trent. Lon. 10. 46. E. Lat. 46. 0. N.

LOEFLINGIA, in botany, a genus of the monogynia order, and triandria class of plants; natural order, Caryophyllaceae. Calyx five-leaved; corolla five-petaled, very small; capsule one-celled, three-valved. There is but one species, viz. *L. hispanica*, a native of Spain.

LOEMEL, a town of France, in the department of Deux Nattes, and late province of Austrian Brabant, 30 miles S. of Bois-le-duc.

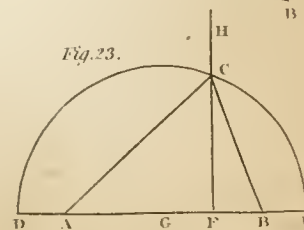
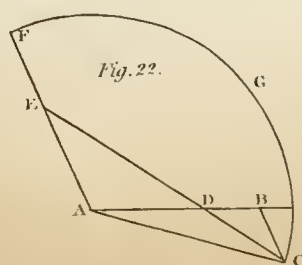
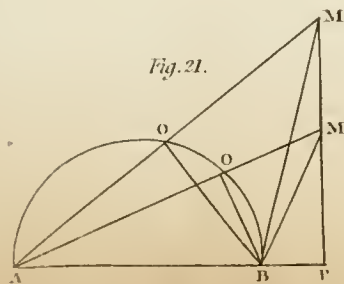
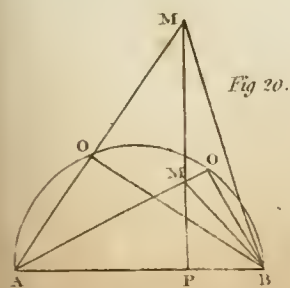
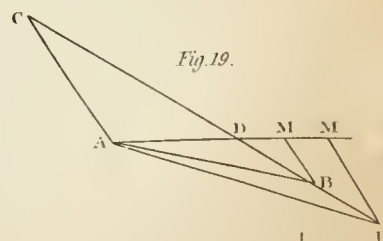
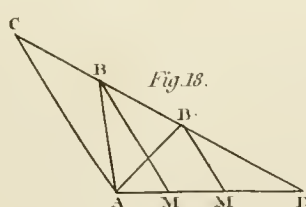
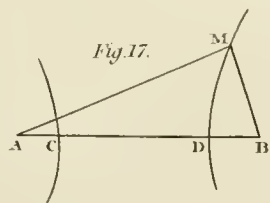
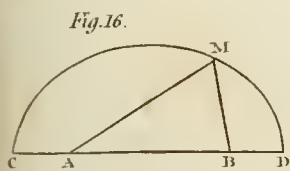
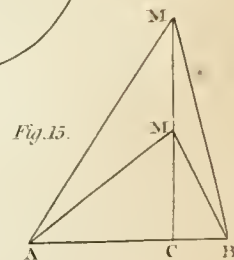
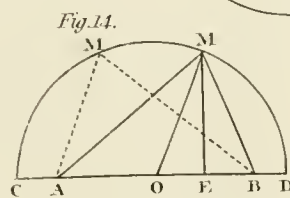
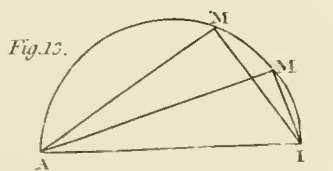
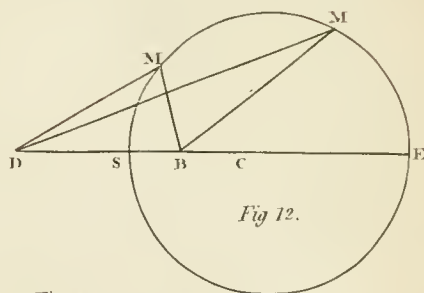
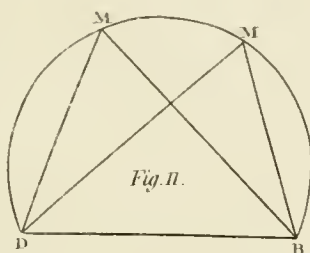
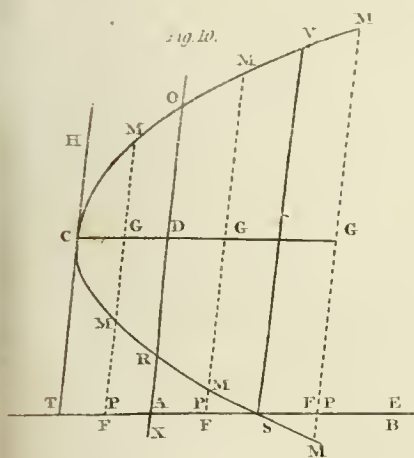
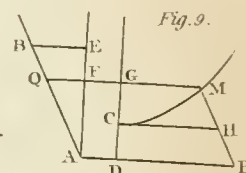
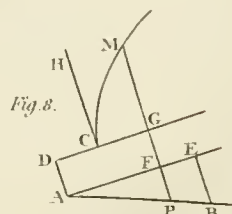
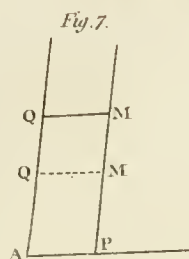
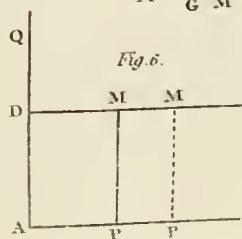
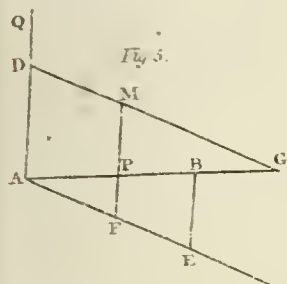
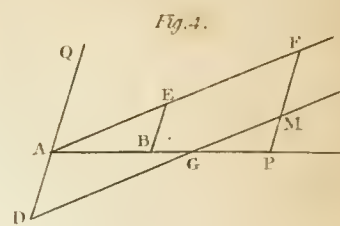
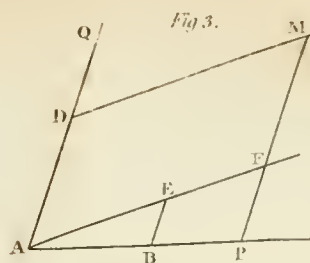
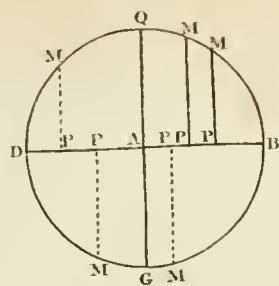
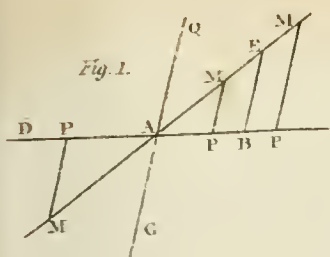
LOESLIA, in botany, a genus of the didynamia order, and angiospermia class of plants. Calyx four-cleft; corolla with all the segments directed one way; stamina opposite to the petal; capsule three-celled. There is but one species, viz. *L. ciliata*, found at La Vera Cruz in South America.

LOG, in the Jewish antiquities, is mentioned (2 Kings vi. 25.) as the fourth part of a cab. But in Leviticus the word log is often met with, and signifies that measure of oil, which lepers were to offer at the temple after they were cured of their disease.

Log, a sea-term, signifying a small piece of timber *a*, Plate CH, fig. 1, of a triangular, sectoral, or quadrantal figure, on board a ship, generally about a quarter of an inch thick, and five or six

↑ inches

GEOMETRICAL LOCI.



inches from the angular point to the circumference. It is balanced by a thin plate of lead, nailed upon the arch, or circular side, so as to swim perpendicularly in the water, with about two-thirds immersed under the surface.

LOG AND LINE, or the **LOG-LINE**, a little cord, or line, about 150 fathoms long, fastened to the log by means of two legs, *a*, *b*, fig. 2, one of which passes through a hole at the corner, and is knotted on the opposite side, while the other leg is attached to the arch by a pin fixed into another hole, so as to draw out occasionally. By these legs the log is hung in equilibrio; and the line thus annexed to it is wound round a reel fixed for that purpose in the gallery of the ship. This line from the distance of about 10, 12, or 15 fathoms off the log, has certain knots or divisions, which ought to be at least 50 feet from each other; though it was the common practice at sea not to have them above 42 feet asunder. The length of each knot ought to be the same part of a sea-mile as half a minute is of an hour; and admitting the measurement of Mr. Norwood, who makes a degree on a great circle of the earth to contain 367,200 English feet, or about 69½ English statute miles, and therefore $\frac{1}{60}$ th part of it, or a nautical mile, will be 6120 feet; $\frac{1}{120}$ th of 6120, or 51 feet, should be the length of each knot. But because it is safer to have the reckoning rather before the ship than after it, therefore 50 feet may be taken as the proper length of each knot. The knots are sometimes made to consist only of 42 feet each, even in the present practice; and this method of dividing the log-line was founded on the supposition that 60 miles, each of 5000 English feet, made a degree; for $\frac{1}{120}$ of 5000 is 41½, or, in round numbers, 42 feet. Mariners, rather than quit the old way, though known to be erroneous, use glasses for half-minute ones, that run but 24 or 25 seconds. They have also used a line of 45 feet to 30 seconds, or a glass of 28 seconds to 42 feet. When this is the case, the distance between the knots should be corrected by the following proportion: as 30 is to 50; so is the number of seconds of the glass to the distance between the knots upon the line. The heat or moisture of the weather has often a considerable effect upon the glass, so as to make it run slower or faster; it should, therefore, be frequently tried by the pendulum in the following manner. On a round nail hang a string that has a musket-ball fixed to one end, carefully measuring between the centre of the ball and the string's loop over the peg 39½ inches, being the length of a second pendulum; then swing it, and count one for every time it passes under the peg, beginning at the second time it passes; and the number of swings made during the time the glass is running out shews the seconds it contains. The line also is liable to relax and shrink, and should therefore be occasionally measured. The use of the log and line is to keep account and make an estimate of the ship's way or distance run; which is done by observing the length of line unwound in half a minute's time, told by a half-minute glass; for so many knots as is run out in that time so many miles the ship sails in an hour. Thus, if there be four knots veered out in half a minute, the ship is computed to run four miles an hour. No mention of this device for measuring the ship's way occurs till 1607, in an East-India voyage published by Purchas; but from that time its name occurs in other voyages among his collections; and henceforward it became famous, being taken notice of both by our own authors and by foreigners; as by Gunter in 1623; Snellius in 1624; Metius in 1631; Oughtred in 1633; Herigone in 1634; Saltonstall in 1636; Norwood in 1637; Pournier in 1643; and almost by all the succeeding writers on navigation of every country.

LOG, HEAVING THE, is throwing it into the water on the lee side, letting it run till it comes without the eddy of the ship's wake; then one, holding a half-minute glass, turns it up just as the first knot, or the mark from which the knots begin to be reckoned, turns off the reel, fig. 3, or passes over the stern. As soon as the glass is out, the reel is stopped, and the knots run off are told, and their parts estimated. It is usual to heave the log once every hour in ships of war and East-Indiamen, and in all other vessels once in two hours; and if at any time of the watch the wind has increased or abated in the intervals, so as to affect the ship's velocity, the officer generally makes a suitable allowance for it at the close of the watch. The log is a very precarious way of computing, and must always be corrected by experience and good sense; there being a great deal of uncertainty in the yawing of the ship going with the wind aft, or upon the quarter,

in the heaving of it, by its coming home, or being drawn after the ship; on account of the friction of the reel and lightness of the log in the course of the current, and in the strength of the wind, which seldom keeps the same tenor for two hours together; which is the interval between the times of using the log in short voyages; though in longer ones they heave it every hour. Yet this is a much more exact way of computing than any other in use; much preferable certainly to that of the Spaniards and Portuguese, who guessed at the ship's way by the running of the froth or water by the ship's side; or to that of the Dutch, who used to heave a chip over-board, and to number the paces they walk on the deck while the chip swims between any two marks, or bulk-heads on the side.

LOG, THE COMPOUND. The above mentioned errors, and particularly the log's being subject to drive with the motion which the water may have at its surface, whereas the experiment requires it to be fixed in the place where it is when the mark commencing the knots goes off the reel, have been considered by writers, and many methods have been proposed to remove, or at least to lessen them. The late M. Bouguer proposed a method, which has been thought deserving of particular attention, in the *Mem. Acad. Sc.* 1747; and afterwards in his *Treatise on Navigation*, published at Paris in 1753, and since reprinted in 1760, by the abbé De La Caille. For this purpose, take for the log a conical piece of wood, which fix to the log-line passed through or along its axis, at about 40, 50, or 60, or more feet, from one end; and to this end fix the diver, which is a body formed of two equal square pieces of tin, or of thin iron-plate, fixed at right angles to one another along their diagonals; and its size so fitted to that of the cone, that the whole may float. A cone of three inches diameter in the base, and of six inches in the slant height, is proposed by M. Bouguer to suit a diver made of plates about 9½ inches square; the intersection of the diagonals is joined to the log-line, and the loop and peg fixed, as in the common log. However, it has been found, that no kind of wood used in British dock-yards, when formed into a cone of the above dimensions, will float a diver made of stout tin-plates, one side of the square being 9½ inches. Such a diver weighing 1½ lb. avoirdupoise, required to float it a cone of five inches diameter and twelve inches on the slant side, so as the point of the cone, which was made of light fir, should just appear above the water. Now supposing one side of such a square tin-diver to be about ten inches, and made of plates only two-thirds of the thickness of the former, such a diver would weigh, with its solder, about 20 ounces, and can be floated by a light fir-cone of about four inches diameter in the base, and ten inches in the slant height or length; and such a compound log might perhaps be found on trial to be affected by about as much again as that proposed by M. Bouguer; and consequently the difference between the numbers given by the common log and compound log, must be augmented by two-thirds of itself for the necessary correction, as below. When the compound log of Bouguer, is hove overboard, the diver will sink too deep to be much affected by the current or motion of water at the surface, and the log will thereby keep more steadily in the place where it first fell; and consequently the knots run off the reel will shew more accurately the ship's rate of sailing. As the common log is affected by the whole motion of the current, so this compound log will feel only a part thereof, viz. such a part nearly as the resistance of the cone is to the resistance of the diver; then the resistances of the above cone and diver are about as 1 to 5; and consequently this log will drive but one-fifth part of what the common log would do; and so the ship's true run will be affected by one-fifth only of the motion of the waters. To obtain the true rate of sailing, it will be proper to heave alternately, hour and hour, the common log and this compound log; then the difference of their knots run off, augmented by its fourth part, is the correction; which, applied to the knots of the common log, will give the ship's true rate of sailing at the middle-time between the hours when these logs were hove. The correction is additive when the compound log's run is the greatest, otherwise it is subtractive. To find the course made good; increase the observed angle between the log-lines by one-fourth part; and this gives the correction to be applied to the apparent course, or the opposite of that shewn by the common log; the correction is to be applied to the right of the apparent course, when the bearing of the common log is to the left of the compound

round log; and vice versa, to the left, when the bearing is to the right of it. Or thus: the lengths run off both logs, together with their bearings, being known; in a card or compass apply the knots run off, taken from a scale of equal parts along their respective bearings, from the centre; join the ends; and in this line produced, on the side next the compound log's length, take one-fourth of the interval; then a line drawn from the end, thus produced, to the centre of the card, will shew the true course and distance made good. When a current, such as a tide, runs to any depth, the velocity of that current may be much better ascertained by the compound log than by the common one, provided the diver does not descend lower than the run of the current; for as those ships which are deepest immersed, drive fastest with the tide; so the diver, by being acted on below, as well as the log on the surface, their joint motion will give the total effect of the current's motion better than could be had from the motion at the surface only. Also, by such a compound log, the depth to which any current runs may be easily tried.

LOGAN, a chief among the Mingo tribe of the North American Indians, whose pathetic address to Lord Dunmore, governor of Virginia, has been much and justly admired. The occasion was as follows; and the authenticity of the facts and of the speech is unquestionable. In spring 1774, a robbery and murder were committed on an inhabitant of the frontiers of Virginia by two Indians of the Shawanee tribe. The neighbouring whites, according to custom, undertook to punish this outrage in a summary way. Colonel Cresap, a man infamous for the many murders he had committed on those much-injured people, collected a party, and proceeded down the Kanaway in quest of vengeance. Unfortunately a canoe of women and children, with one man only, was seen coming from the opposite shore, unarmed, and unsuspecting any hostile attack from the whites. Cresap and his party concealed themselves on the bank of the river; and the moment the canoe reached the shore, singled out their objects, and at one fire killed every person in it. This happened to be the family of Logan, who had long been distinguished as a friend of the whites. This unworthy return provoked his vengeance. He accordingly signaled himself in the war which ensued. In autumn 1774, a decisive battle was fought at the mouth of the Great Kanaway, between the collected forces of the Shawanees, Mingoes, and Delawares, and a detachment of the Virginia militia. The Indians were defeated, and sued for peace. Logan disdained to be seen among the suppliants; but, lest the sincerity of a treaty should be distrusted, from which so distinguished a chief absented himself, he sent by a messenger the following speech, to be delivered to Lord Dunmore: "I appeal to any white man to say if ever he entered Logan's cabin hungry, and he gave him not meat; if ever he came cold and naked, and he clothed him not. During the course of the last long and bloody war, Logan remained idle in his cabin, an advocate for peace. Such was my love for the whites, that my countrymen pointed as they passed, and said, Logan is the friend of white men. I had even thought to have lived with you, but for the injuries of one man. Colonel Cresap, the last spring, in cold blood, and unprovoked, murdered all the relations of Logan, not sparing even my women and children. There runs not a drop of my blood in the veins of any living creature. This called on me for revenge. I have sought it; I have killed many; I have fully glutted my vengeance. For my country, I rejoice at the beams of peace; but do not harbour a thought that mine is the joy of fear. Logan never felt fear. He will not turn his heel to save his life. Who is there to mourn for Logan? Not one."

LOGARITHMIC, [from *λογος*, ratio, and *αριθμος*, number,] belonging to LOGARITHMS.

LOGARITHMIC CURVE. See LOGARITHMS.

LOGARITHMIC LINES. For many mechanical purposes it is convenient to have the logarithms of numbers laid down on scales, as well as the logarithmic sines and tangents; by which means, computations may be carried on by mere mensuration with compasses. Lines of this kind are always put on the common Gunter's scale; see GUNTER'S SCALE. But as these instruments must be extended to a very great length, in order to contain any considerable quantity of numbers, it becomes an object of importance to shorten them. Such an improvement has been made by Mr. William Nicholson, and published in the 77th volume of the Phi-

los. Trans. The principles on which the construction of his instruments depends are as follow: 1. If two geometrical series of numbers, having the same common ratio, be placed in order with the terms opposite to each other, the ratio between any term in one series and its opposite in the other will be constant: Thus,

2 6 18 54 162, &c.

3 9 27 81 243, &c. Thus,

2 3, 6 9, 18 27, 54 81, 162 243, &c.

where it is evident, that each of the terms in the upper series is exactly two-thirds of the corresponding one in the lower. II. The ratio of any two terms in one series will be the same with that between those which have an equal distance in the other. III. In all such geometrical series as have the same ratio, the property above-mentioned takes place, though we compare the terms of any series with those of another: Thus,

{ 2 4 8 16 32 64, &c.

{ 3 6 12 24 48 96, &c.

{ 4 8 16 32 64 128, &c.

{ 5.10 20 40 80 160, &c.; where it is plain

that 2, 4, 3, 6; also 2, 4, 4, 8, and 2, 4, 5, 10, &c. have the same ratio with that of each series. IV. If the differences of the logarithms of the numbers be laid in order upon equidistant parallel right lines, in such a manner, that a right line drawn across the whole shall intersect it at divisions denoting numbers in geometrical progression; then from the condition of the arrangement, and the property of this logarithmic line, it follows, 1st, That every right line so drawn will, by its intersections, indicate a geometrical series of numbers; 2dly, That such series as are indicated by these right lines will have the same common ratio; and, 3dly, That the series thus indicated by two parallel right lines, supposed to move laterally, without changing either their mutual distance or parallelism to themselves, will have each the same ratio; and in all series indicated by such two lines, the ratio between an antecedent and consequent, the former taken upon one line, and the latter upon another, will be also the same. The 1st of these propositions is proved in the following manner: let the lines AB, CD, EF, Plate CII, fig. 5, represent parts of the logarithmic line arranged according to the proportion already mentioned; and let GH be a right line passing through the points *e, c, a*, denoting numbers in geometrical progression; then will any other line IK, drawn across the arrangement, likewise pass through three points *f, d, b*, in geometrical progression. From one of the points of intersection *f* in the last mentioned line IK, draw the line *fg* parallel to GH, and intersecting the arrangement in the points *i, h*; and the ratios of the numbers *e, f, c, i*, will be equal, as well as of *a, h*; because the intervals on the logarithmic line, or differences of the logarithms of those numbers, are equal. Again, the point *f*, the line *id*, and the line *hb*, are in arithmetical progression denoting the differences between the logarithms of the numbers themselves; whence the quotients of the numbers are in geometrical progression. The 2d proposition is proved in a similar manner. For as it was shewn that the line *fg*, parallel to GH passes through points of division denoting numbers in the same continued ratio as those indicated by the line GH; it may also be shewn, that the line LM parallel to any other line IK, will pass through a series of points denoting numbers which have the same continued ratio with those indicated by the line IK, to which it is parallel. The 3d proposition arises from the parallelism of the lines to their former situation; by which means they indicate numbers in a geometrical series, having the same common ratio as before: their distance on the logarithmic line also remains unchanged: whence the differences between the logarithms of the opposite numbers, and of consequence their ratios, will always be constant. V. Supposing now an antecedent and consequent to be given in any geometrical series, it will always be possible to find them, provided the line be of unlimited length. Drawing two parallel lines, then, through each of the numbers, and supposing the lines to move without changing their direction or parallel situation, they will continually describe new antecedents and consequents in the same geometrical series as before. VI. Though the logarithmic line contain no greater range of numbers than from 1 to 10, it will not be found necessary for the purposes of computation to repeat it. The only thing requisite is to have a slider or beam with two fixed points at the distance of the interval betwixt 1 and 10, and a moveable point be made to range betwixt them always

to indicate the antecedent; then, if the consequent fixed point fall without the rule, the other fixed point will always denote the division on which it would have fallen had the rule been prolonged; and this contrivance may easily be adapted to any arrangement of parallel lines whatever. The arrangement of right lines, however, ought always to be disposed in such a manner as to occupy a right-angled parallelogram, or the cross-line already mentioned ought always to be at right angles to the length of the ruler. Fig. 6, is a ruler consisting of ten parallel lines. Fig. 7, a beam-compass for measuring the intervals. B, A, C, are the parts which apply to the surface of the ruler; the middle one, A, being moveable sidewise in a groove in the piece DE, so as always to preserve its parallelism to the external pieces B, C, which are fixed at a distance equal to the length of the ruler, and have their edges placed in such a manner as to form with the parallel lines which they intersect a ratio, which by composition is $\frac{A}{DE}$; which in the present case requires them to be at right angles to the length. The piece DE is applied to the edge FG of the ruler. The edges or borders H, I, K, L, are more conveniently made of transparent horn, or tortoise-shell, than of any opaque matter. In using this ruler, apply the edge of either B or C to the consequent, and slide the piece A to the antecedent; observing the difference between the numbers on the pieces denoting the lines they are found on: then, applying the same edge of A to any other antecedent, the other piece B or C will intersect a consequent in the same ratio upon that line, having the same situation with regard to the antecedent that the line of the former consequent had to its antecedent. But if B be the consequent piece, and fall without the ruler, the piece C will shew the consequent one line lower; or if C, in like manner, fall without the ruler, then B will shew the consequent one line higher. "It might be convenient (says Mr. Nicholson) for the purpose of computation, to make instruments of this kind with 100 or more lines; but in the present instrument, the numbers on the pieces will answer the same purpose; for if a consequent fall upon a line at any given number of intervals without the ruler, it will be found on that line of the arrangement, which occupies the same number of intervals reckoned inwards from the opposite edge of the ruler." Fig. 8, is an instrument on the plan of a Gunter's scale of $28\frac{1}{2}$ inches long, invented by the late Mr. Robertson. There is a moveable piece AB in the slider GH across which is drawn a fine line: the slider having also lines CF EF, drawn across it at distances from each other equal to the length of the ruler AB. In using the instrument, the line CD or EF is to be placed at the consequent, and the line in AB at the antecedent; then, if the piece AB be placed

at any other antecedent, the same line CD or EF will indicate its consequent in the same ratio taken the same way: that is, if the antecedent and consequent lie on the same side of the slider, all other antecedents and consequents in that ratio will be in the same manner; and the contrary if they do not. But if the consequent line fall without the rule, the other fixed line on the slider will shew the consequent, but on the contrary side of the slider to that where it would else have been seen by means of the first consequent line. Fig. 9, is a circular instrument equivalent to the former; consisting of three concentric circles engraved and graduated upon a plate of an inch and an half diameter. Two legs A and B proceed from the centre, having right-lined edges in the direction of radii; and are moveable either singly or together. In using the instrument, place one of the edges at the antecedent and the other at the consequent, and fix them at the angle. Move the two legs then together; and having placed the antecedent leg at any other number, the other will give the consequent one in the like position on the lines. If the line CD happen to lie between the legs, and B be the consequent leg, the number sought will be found one line farther from the centre than it would otherwise have been: and on the contrary, it will be found one line nearer in the like case, if A be the consequent leg. "This instrument (says Mr. Nicholson) differing from that represented fig. 6, only in its circular form, and the advantages resulting from that form, the lines must be taken to succeed each other in the same manner laterally; so that numbers which fall either within or without the arrangement of circles, will be found on such lines of the arrangement as would have occupied the vacant places, if the succession of lines had been indefinitely repeated sidewise. I approve of this construction, as superior to every other which has yet occurred to me, not only in point of convenience, but likewise in the probability of being better executed; because small arcs may be graduated with very great accuracy, by divisions transferred from a larger original. The instrument, fig. 6, may be contained conveniently in a circle of about four inches and an half diameter. The circular instrument is a combination of the Gunter's line and the sector, with the improvements here pointed out. The property of the sector may be useful in magnifying the differences of the logarithms in the upper parts of the line of sines, the middle of the tangents, and the beginning of the versed sines. It is even possible, as mathematicians will easily conceive, to draw spirals, on which graduations of parts, every where equal to each other, will shew the ratios of those lines by moveable radii, similar to those in this instrument."

LOGARITHMS.

LOGARITHMS, [$\lambda\omicron\gamma\omicron\varsigma$, ratio, and $\alpha\beta\iota\gamma\mu\omicron\varsigma$, number,] numbers so contrived and adapted to other numbers, that the sums and differences of the former shall correspond to, and shew, the products and quotients of the latter. Or, more generally, logarithms are the numerical exponents of ratios; or a series of numbers in arithmetical progression, answering to another series of numbers in geometrical progression. Thus,

0, 1, 2, 3, 4, 5, Indices, or logarithms.

1, 2, 4, 8, 16, 32, Geometric progression.

Or,

0, 1, 2, 3, 4, 5, Indices, or logarithms.

1, 3, 9, 27, 81, 243, Geometric progression.

Or,

0, 1, 2, 3, 4, 5 Indices, or logarithms.

1, 10, 100, 1000, 10000, 100000, Geometric progression.

Where it is evident that the same indices serve equally for any geometric series; and consequently there may be an endless variety of systems of logarithms to the same common numbers, by only changing the second term, 2, 3, or 10, &c. of the geometrical series. It is also apparent, from the nature of these series, that if any two indices be added together, their sum will be the

index of that number which is equal to the product of the two terms, in the geometric progression, to which those indices belong. Thus, the indices 2 and 3, being added together, are = 5; and the numbers 4 and 8, or the terms corresponding with those indices, being multiplied together, are = 32, which is the number answering to the index 5. And, in like manner, if any one index be subtracted from another, the difference will be the index of that number, which is equal to the quotient of the two terms to which those indices belong. Thus the index 6, minus the index 4, is = 2; and the terms corresponding to those indices are 64 and 16, whose quotient is = 4; which is the number answering to the index 2. For the same reason, if the logarithm of any number is multiplied by the index of its power, the product will be equal to the logarithm of that power. Thus, the index or logarithm of 4, in the above series, is 2; and if this number is multiplied by 3, the product will be = 6; which is the logarithm of 64, or the third power of 4. And, if the logarithm of any number is divided by the index of its root, the quotient will be equal to the logarithm of that root. Thus, the index or logarithm of 64 is 6; and if this number is divided by 2, the quotient will be = 3; which is the logarithm of 8, or the square root of 64. And here we.

we may observe that these properties are general in all cases, as will be evident, if we set down a geometrical series according to the algebraic method of notation, thus $r^0, r^1, r^2, r^3, r^4, r^5, r^6$, &c. where the ratio of the geometrical series is denoted by r , and the arithmetical series is supplied by the numeral exponents of the terms. Hence it follows, that the properties, here ascribed to any geometrical, and its corresponding arithmetical series, depend on two well known propositions in algebra; namely, that the sum of the exponents of any two powers of an algebraic quantity is equal to the exponent of their product; and that the difference of their exponents is equal to the exponent of their quotient. Hence in all cases when the terms of an arithmetical progression are adapted to those of a geometrical progression, as in the foregoing examples; the terms of the arithmetical series are called the Logarithms of the corresponding terms of the geometrical series. The logarithms most convenient for practice are such as are adapted to a geometric series increasing in a tenfold proportion, as in the last of the above forms, and are those which are to be found, at present, in most of the common tables upon this subject. The distinguishing mark of this system of logarithms is, that the index, or logarithm of 1 is 0; that of 10, 1; that of 100, 2; that of 1000, 3, &c. And in decimals the logarithm of .1 is -1 ; that of .01, -2 ; that of .001, -3 , &c. From whence it follows that the logarithm of any number between 1 and 10 must be 0 and some fractional parts, and that of a number between 10 and 100 will be 1 and some fractional parts; and so on for any other number whatever. And since the integral part of a logarithm is always thus readily found, it is usually called the index, or characteristic; and is commonly omitted in the tables; being left to be supplied by the operator himself, as occasion requires.

HISTORY OF LOGARITHMS.

The properties of a geometrical series, which constitute the foundation of the doctrine of logarithms, appear to have been known as far back as the days of Archimedes; for that celebrated mathematician makes use of them in his work entitled "Arenarius," or "Treatise on the Number of Sands." The same properties are also mentioned in the writings of Stifelius, a German mathematician, who lived about the middle of the 16th century. It does not however appear, that any person perceived all the advantages which might be derived from these properties, till about the beginning of the 17th century; when their utility was rendered evident, by the happy invention of logarithms. This discovery, certainly one of the most valuable that ever was made in mathematics, is due to John Napier, baron of Merchiston, in Scotland, who published it to the world, in 1614, in a work which he called "Mirifica Logarithmorum Canonis Descriptio," and which contained a large table of logarithms, together with their description and uses; but the author reserved his method of constructing them, till the sense of the learned concerning his invention should be known. In the abovementioned work, Napier explains his notion of logarithms, by lines described, or generated, by the motion of points, in this manner. He first conceives a line to be generated by the motion of a point, which passes over equal portions of it, in equal small moments, or portions of time. He then considers another line to be generated by the unequal motion of a point, in such a manner, that, in the aforesaid equal portions, or moments of time, there may be described, or cut off from a given line, parts which shall be continually in the same proportion with the respective remainders of that line, which had before been left; then are the several lengths of the first line the logarithms of the corresponding parts of the latter. Which description of them is similar to that which we have already given, viz. that logarithms are a series of quantities, or numbers, in arithmetical progression, adapted to another series in geometrical progression. Thus while o, p , fig. 4, Plate CII, increases or decreases proportionally, the uniform motion of a point P , by which the logarithm of o, p is generated, is equal to the velocity of p at a ; that is, at the term of time when the logarithms begin to be generated. Hence logarithms, formed after this model, are called Napier's Logarithms, and by some Natural Logarithms. Napier made the first, or whole length of the line, which is diminished in geometrical progression, the radius of a circle; and its logarithm 0, or nothing; representing the beginning of the first, or

arithmetical line. Thus the several proportional remainders of the geometrical line are the natural sines of all arches of a quadrant, decreasing down to 0; while the successive increasing values of the arithmetical line are the corresponding logarithms of those decreasing sines: so that while the natural sines decrease from radius to nothing, their logarithms increase from 0 to infinity. The description and use of Napier's canon being in the Latin language, they were translated into English by Mr. Edward Wright, the ingenious inventor of what is commonly, though erroneously, called Mercator's Sailing. The translation was sent to the author, who revised it, and returned it with his approbation. Mr. Wright, however, dying soon after he received it back, the work, together with the tables, and a preface by Mr. Henry Briggs, was published in 1616, after his death, by his son Samuel Wright, who dedicated it to the East India Company. As Napier's canon contained only the natural sines for every minute of the quadrant, and their corresponding logarithms, it was attended with some degree of inconvenience, when used as a table of the logarithms of common numbers; because when a number was proposed, which was not exactly the same with some number denoting a natural sine, it was then necessary to find its logarithm by means of an arithmetical calculation, performed according to precepts, which the author delivered in his work. This inconvenience, which was in part obviated by certain contrivances of Wright and Briggs, was not the only one; for there was another, which arose from the logarithms being sometimes $+$, or additive, and sometimes $-$, or negative; and which therefore required the knowledge of algebraic addition and subtraction. This last defect was occasioned partly by making the logarithm of radius 0, and those of the sines to increase; and partly by the compendious manner, in which the author had formed the table; making the three columns of sines, cosines, and tangents, to serve also for the other three of cosecants, secants, and cotangents. But this latter inconvenience was well remedied by John Speidell, in his New Logarithms, first published in 1617; which contained all the six columns, and these all of a positive form, by being taken the arithmetical complements of Napier's, that is, they were the remainders left by subtracting each of the latter from 10,000,000. And the former inconvenience was more completely removed by Speidell in a second table, given in the sixth impression of the former work, in the year 1624. This was a table of Napier's Logarithms for the integers 1, 2, 3, 4, 5, &c. to 1000, together with their differences, and arithmetical complements: as also the halves of the said numbers, with their differences, and arithmetical complements; which halves were consequently the logarithms of the square roots of the said numbers. These logarithms are, however, a little varied in their form from Napier's, namely, so as to increase from 1, whose logarithm is 0, instead of decreasing to 1, or radius, whose logarithm Napier made 0 likewise: that is, Speidell's logarithm of any number n is

equal to Napier's logarithm of its reciprocal $\frac{1}{n}$. So that in Speidell's table, the logarithm of 1 being 0, the logarithm of 10 is 2.302584: the logarithm of 100 is twice as much, or 4.605168; and that of 1000, thrice as much, or 6.907753. The logarithms contained in this table are now commonly called hyperbolic logarithms: because they serve to express the areas contained between the curve of the hyperbola and its asymptote. The celebrated inventor of the logarithms died in the year 1618; and in 1619, his son Robert Napier published a new edition of the Logarithmorum Canonis Descriptio, to which was now added the promised Logarithmorum Canonis Constructio, and other miscellaneous pieces written by his father and Mr. Briggs. This work was reprinted in France, in 1620; also, nearly about this time, different mathematicians abroad published tables of logarithms of the same kind as those of Napier; as Benjamin Ursinus, mathematician to the Elector of Brandenburg, also the famous Kepler, who was then mathematician to the emperor Ferdinand II. and others. Next to the discovery of logarithms, the most remarkable circumstance connected with their history, is that improvement which they received in their form from Henry Briggs, who was, at the time of the publication of Napier's logarithms, professor of geometry in Gresham college, in London, and afterwards Savilian professor of geometry at Oxford, where he died in

the year 1630. On the first publication of Napier's logarithms, Briggs immediately applied himself to the study and improvement of them; and presently saw that it would be of advantage to change the scale; so that the logarithm of 1 being 0, as in Napier's form, the logarithm of 10 might be 1, that of 100, 2; of 1000, 3, and so on; whereas the logarithms of the same numbers, according to Napier's construction, were 2·302585, 4·605168, 6·907753, &c. This improvement Briggs communicated both to the public in his lectures, and to Napier himself, who afterwards said, that he had also thought of the same thing; as appears from the preface to Briggs's "Arithmetica Logarithmica." Thus it appears that Briggs was the inventor of the present scale of logarithms. He at first intended to make them to decrease with the natural numbers; but being advised by Napier, he altered his plan, and made the logarithms, or artificial numbers, (as Napier had also called them,) to increase with the natural numbers, which made no alteration in the figures that expressed Briggs's logarithms, but only in their affections, or signs, changing them from negative to positive; for according to Briggs's first intention, the logarithms of ·001, ·01, ·1, 1, 10, 100, 1000, &c. would have been +3, +2, +1, 0, -1, -2, -3, &c. but, in conformity to the suggestion of Napier, they were made -3, -2, -1, 0, +1, +2, +3, &c. which is a change of no essential importance, as the scale of the system is the same in either case. And the reason why Briggs, after his interview with Napier, rejected what he had before done, and began anew, was probably because he had adapted his logarithms to approximate sines of arcs, instead of the round or integer numbers, and not from their being logarithms of another system, as were those of Napier. About the year 1618, Briggs published the first thousand logarithms to eight places of figures; besides the index, under the title of "Logarithmorum Chilius Prima." And, in 1624, he produced his "Arithmetica Logarithmica," a stupendous work for so short a time, containing the logarithms of 30,000 natural numbers, to 14 places of figures, besides the index; namely, from 1 to 20,000, and from 90,000 to 100,000; together with the differences of the logarithms; and in both these works the logarithms were calculated according to the system which had been agreed upon between him and the first inventor: that is, they were the same as the system, which we commonly employ at the present time. Soon after the publication of the "Arithmetica Logarithmica," Adrian Vlacq, or Flack, completed the intermediate 70 chiliads, and republished it at Gouda, in Holland; thus making in the whole, the logarithms of all numbers, from 1 to 100,000; but only to ten places of figures. He also added a table of artificial sines, tangents, and secants, to every minute of the quadrant. Briggs himself also lived to complete a table of logarithmic sines and tangents, for the 100th part of every degree of the quadrant, to 14 places of figures, besides the index; together with a table of natural sines for the same parts, to 15 places, and the tangents and secants for the same to 10 places; with the construction of the whole. These tables were printed at Gouda, under the care of Adrian Vlacq, and nearly finished off before 1631. But the death of the author, which happened in 1630, prevented him from completing the application and uses of them. However, the performing of this office, he recommended, when dying, to his friend Henry Gellibrand, then professor of astronomy in Gresham college; who added a preface, and the application of the logarithms to plane and spherical trigonometry, &c. The work was published in 1633, under the title of "Trigonometria Britannica;" and besides the arcs in degrees, and centesims of degrees, it has another column, containing the minutes and seconds, answering to the several centesims in the first column. In the same year, Vlacq printed at Gouda his "Trigonometria Artificialis; sive Magnus Canon Triangulorum Logarithmicus, ad Decadas Secundorum Scrupulorum Constructus." This work contains the logarithmic sines and tangents to 10 places of figures, with their differences, for every 10 seconds in the quadrant. To them is also added Briggs's table of the first 20,000 logarithms; but carried only to 10 places of figures, besides the index, with their differences. The whole is preceded by a description of the tables, and the application of them to plane and spherical trigonometry, chiefly extracted from Briggs's "Trigonometria Britannica," mentioned above. Gellibrand published also, in 1635, "An Institution Trigonometrical," containing the logarithms of the first 10,000 numbers, with the natural sines, tan-

gents, and secants, and the logarithmic sines and tangents for degrees and minutes, all to 7 places of figures, besides the index; also other tables proper for navigation, with the uses of the whole. Various other authors have written on this subject, and several subsequent improvements have been made, which our limits do not permit to mention. However, it may be proper to mention that the arrangement of the logarithms, in the tables, was first reduced to the most convenient form, by John Newton, in his "Trigonometria Britannica," published at London in 1659. Among the tables of logarithms, which have been published of late years, in this country, there are two works most deservedly in repute, both for accuracy, and convenience of arrangement: these are, Dr. Hutton's "Mathematical Tables, containing Common, Hyperbolic, and Logistic Logarithms, &c." and Taylor's "Tables of Logarithms of all Numbers, from 1 to 101000; and of the Sines, and Tangents, to every Second of the Quadrant." Several very accurate and well arranged collections of tables of logarithms have also been lately printed in France; one, which deserves to be particularly mentioned, is Callet's stereotype edition of "Tables Portatives de Logarithmes." These contain the logarithms of numbers, from 1 to 101000, and the logarithmic sines, and tangents, for every second, in the first 5 degrees, and for every 10 seconds of the remaining degrees of the quadrant; and also for every 10000th part of the arc, according to the new centesimal division of the quadrant: The logarithms are to 7 decimal places.

THE CONSTRUCTION OF LOGARITHMS.

From the general explanation which has been given above of the nature of logarithms, it is not difficult to see, how we may find the logarithms of as many numbers as we please. For the arithmetical series 0, 1, 2, 3, 4, &c. being assumed to denote the logarithms of the geometrical series

$$1, 10, 100, 1000, 10000, \&c.$$

if we find any number of arithmetical proportionals, between every two terms of the former; and an equal number of geometrical proportionals, between the corresponding terms of the latter; these arithmetical proportionals will be the logarithms of the corresponding geometrical proportionals.

The logarithms thus found will not indeed correspond, exactly, to any term in the series of whole numbers 2, 3, 4, 5, &c. but proceeding upon the same principle, the logarithms of these may be also found, as in the following example, where it is proposed to determine the logarithm of the number 9. And as the inserting of two, or more, geometrical proportionals, between any two given numbers, would require the extraction of the cube, or some higher root, we shall carry on the operation, by inserting only one mean, which may be done by the extraction of the square root.

Because the logarithm of 1 is 0, and the logarithm of 10 is 1, we are to find an arithmetical mean between 0 and 1; and a geometrical mean between 1 and 10; and the former will be $\frac{0+1}{2} = .5$

and the latter $\sqrt{1 \times 10} = \sqrt{10} = 3.1622777$. Hence the logarithm of 3.1622777 is .5. Again, let an arithmetical mean be found between .5, the logarithm of 3.1622777, and 1, the logarithm of 10; and a geometrical mean between 3.1622777, and 10; the former will be $\frac{.5+1}{2} = .75$; and the latter $\sqrt{3.1622777 \times 10} = 5.6234132$. Thus the logarithm of 5.6234132 is found to be .75. For a third operation, let an arithmetical mean be found between .75, the logarithm of 5.6234132, and 1, the logarithm of 10; also a geometrical mean between 5.6234132, and 10; the former will be $\frac{.75+1}{2} = .875$; and the latter $\sqrt{5.6234132 \times 10} = 7.4989422$. Therefore the logarithm of 7.4989422 is .875.

Fourth operation. Let an arithmetical mean be found between .875, the logarithm of 7.4989422, and 1, the logarithm of 10; also a geometrical mean between 7.4989422, and 10; the former will be $\frac{.875+1}{2} = .9375$; and the latter $\sqrt{7.4989422 \times 10} = 8.7185968$. Therefore the logarithm of 8.7185968 is .9375.

Fifth operation. Let an arithmetical mean be found between .9375, the logarithm of 8.7185968, and 1, the logarithm of 10; also a geometrical mean between 8.7185968, and 10; the former will be $\frac{.9375+1}{2} = .96875$; and the latter $\sqrt{8.7185968 \times 10} = 9.3325437$. Therefore the logarithm of 9.3325437 is .96875.

Sixth operation. Let an arithmetical mean be found between .96875, the logarithm of 9.3325437, and 1, the logarithm of 10; also a geometrical mean between 9.3325437, and 10; the former will be $\frac{.96875+1}{2} = .984375$; and the latter $\sqrt{9.3325437 \times 10} = 9.6647779$. Therefore the logarithm of 9.6647779 is .984375.

Seventh operation. Let an arithmetical mean be found between .984375, the logarithm of 9.6647779, and 1, the logarithm of 10; also a geometrical mean between 9.6647779, and 10; the former will be $\frac{.984375+1}{2} = .9921875$; and the latter $\sqrt{9.6647779 \times 10} = 9.8325437$. Therefore the logarithm of 9.8325437 is .9921875.

Eighth operation. Let an arithmetical mean be found between .9921875, the logarithm of 9.8325437, and 1, the logarithm of 10; also a geometrical mean between 9.8325437, and 10; the former will be $\frac{.9921875+1}{2} = .99609375$; and the latter $\sqrt{9.8325437 \times 10} = 9.9165150$. Therefore the logarithm of 9.9165150 is .99609375.

Ninth operation. Let an arithmetical mean be found between .99609375, the logarithm of 9.9165150, and 1, the logarithm of 10; also a geometrical mean between 9.9165150, and 10; the former will be $\frac{.99609375+1}{2} = .998046875$; and the latter $\sqrt{9.9165150 \times 10} = 9.9582617$. Therefore the logarithm of 9.9582617 is .998046875.

Tenth operation. Let an arithmetical mean be found between .998046875, the logarithm of 9.9582617, and 1, the logarithm of 10; also a geometrical mean between 9.9582617, and 10; the former will be $\frac{.998046875+1}{2} = .9990234375$; and the latter $\sqrt{9.9582617 \times 10} = 9.9791254$. Therefore the logarithm of 9.9791254 is .9990234375.

will be .9375; and the latter 8.6596431. Thus the logarithm of 8.6596431 is .9375.

Fifth operation. Let an arithmetical mean be found between .9375, the logarithm of 8.6596431, and 1, the logarithm of 10; also a geometrical mean between 8.6596431, and 10; the former will be .96875; and the latter 9.3057204. Thus the logarithm of 9.3057204 is .96875.

Sixth operation. As the geometrical mean last found exceeds 9, let there now be found an arithmetical mean between .9375, the logarithm of 8.6596431, and .96875 the logarithm of 9.3057204; the former will be .933125; and the latter 8.9768713. Thus the logarithm of 8.9768713 is .933125.

Proceeding in this manner, after 25 extractions of the square root, it will be found, that the logarithm of 8.9999998 is .9542425, which may be taken also for the logarithm of 9, as it differs so little from it, that it is sufficiently exact for all practical purposes.

Having found the logarithm of 9, we may thence find the logarithms of all roots and powers of 9, as well as all multiples of those roots and powers by 10, 100, 1000, &c. Thus

$$\log. 3 = \log. \sqrt[9]{9} = \frac{1}{9} \log. 9 = .4771213$$

$$\log. 81 = \log. 9^2 = 2 \times \log. 9 = 1.9084850$$

$$\log. 30 = \log. 3 + \log. 10 = 1.4771213,$$

This method of computing the logarithms of numbers, by the finding of geometrical proportionals is exceedingly tedious: it is however nearly the same as was employed by the first computers of logarithms; but the improvements which have been since made in the various branches of mathematics, and particularly in the doctrine of infinite series, have furnished much easier methods of computing logarithms. These, as well as the nature and properties of logarithms, we now proceed to explain.

Let r denote any positive number whatever, different from unity. Then, by assuming proper exponents, the powers of r may become equal to all positive numbers whatever, whether those numbers be whole or fractional. Thus if $r = 2$, we have $2^0 = 1$, $2^1 = 2$, $2^2 = 4$, $2^3 = 8$, $2^4 = 16$, &c. as to the intermediate numbers 3, 5, 6, 7, &c. they may be expressed, at least nearly, by fractional powers of 2. Thus,

$$2^{1.5850} = 3, 2^{2.3219} = 5, 2^{2.5850} = 6, 2^{2.8073} = 7, \&c.$$

So also the powers of 10 may become, either exactly, or nearly, equal to all positive numbers whatever. Thus,

$10^0 = 1$	$10^{.7781} = 6$
$10^{.3010} = 2$	$10^{.8451} = 7$
$10^{.4771} = 3$	$10^{.9031} = 8$
$10^{.6031} = 4$	$10^{.9545} = 9$
$10^{.6990} = 5$	$10^1 = 10$

In general, if a denote any positive number; it is sufficiently evident, that it is possible to conceive a corresponding number A ,

such, that $r^A = a$; and A , that is the exponent of r , which gives a power equal to a , is called the logarithm of a .

From this manner of defining logarithms, we readily derive all their properties. For a , and b denoting any two numbers; also

A and B their logarithms; we have $r^A = a$, and $r^B = b$, there-

fore $r^A \times r^B = ab$; but $r^A \times r^B = r^{A+B}$; therefore $A+B$ is the logarithm of ab ; that is, the sum of the logarithms of any two

numbers is equal to the logarithm of the product. Again, $\frac{r^A}{r^B}$

$= \frac{a}{b}$; but $\frac{r^A}{r^B} = r^{A-B}$; therefore, $A-B$ is the logarithm of

$\frac{a}{b}$; that is, the difference of the logarithms of two numbers is equal to the logarithm of their quotient.

If we resume the equation $r^A = a$ we have $r^{nA} = a^n$, there-

fore nA is the logarithm of a^n ; and since n may be either a whole number, or a fraction, it follows, that the logarithm of any power of a number is equal to a logarithm of that number, multiplied by the exponent of the power. Also, that the logarithm of any root of a number is equal to the logarithm of the number divided by the exponent of the root.

There may be various systems of logarithms, according to the different values which may be given to the number r , which is called the radical number of the system. In the common system of logarithms, r is 10; but in the system of Napier it is 2.7182818. It is evident from what is here advanced, that the logarithm of the radical number in every system must be unity. In different systems the logarithms of the same number are always to one another in a constant ratio. Suppose that A is the logarithm of the number a , the radical number of the system being r ; and A' the logarithm of the same number, according to another system, the radical number of which is r' . Then $r^A = a$, and $r'^{A'} = a$; there-

fore $r^A = r'^{A'}$, and $r^{\frac{A}{A'}} = r'$: thus it appears, that the fraction $\frac{A}{A'}$ depends only on r , and r' ; and therefore must be the same, whatever be the value of the number a .

Hence it follows, that if the logarithms of numbers according to any one system be given, the logarithms of the same numbers, according to any other proposed system may be readily found.

From what has been advanced, it is evident, that we may exhibit an idea of all possible systems of logarithms, in one general series, which expresses all possible numbers with their logarithms. Thus let r be any given number whatever, and s a constant infinitesimal, or exceedingly small quantity, and the series will be as follows: $r^s, r^{2s}, r^{3s}, r^{4s}, r^{5s}, r^{6s}, r^{7s}, r^{8s}, r^{9s}, r^{10s}, r^{11s}, r^{12s}, r^{13s}, r^{14s}, r^{15s}, r^{16s}, r^{17s}, r^{18s}, r^{19s}, r^{20s}, r^{21s}, r^{22s}, r^{23s}, r^{24s}, r^{25s}, r^{26s}, r^{27s}, r^{28s}, r^{29s}, r^{30s}, r^{31s}, r^{32s}, r^{33s}, r^{34s}, r^{35s}, r^{36s}, r^{37s}, r^{38s}, r^{39s}, r^{40s}, r^{41s}, r^{42s}, r^{43s}, r^{44s}, r^{45s}, r^{46s}, r^{47s}, r^{48s}, r^{49s}, r^{50s}, r^{51s}, r^{52s}, r^{53s}, r^{54s}, r^{55s}, r^{56s}, r^{57s}, r^{58s}, r^{59s}, r^{60s}, r^{61s}, r^{62s}, r^{63s}, r^{64s}, r^{65s}, r^{66s}, r^{67s}, r^{68s}, r^{69s}, r^{70s}, r^{71s}, r^{72s}, r^{73s}, r^{74s}, r^{75s}, r^{76s}, r^{77s}, r^{78s}, r^{79s}, r^{80s}, r^{81s}, r^{82s}, r^{83s}, r^{84s}, r^{85s}, r^{86s}, r^{87s}, r^{88s}, r^{89s}, r^{90s}, r^{91s}, r^{92s}, r^{93s}, r^{94s}, r^{95s}, r^{96s}, r^{97s}, 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r^{898s}, r^{899s}, r^{900s}, r^{901s}, r^{902s}, r^{903s}, r^{904s}, r^{905s}, r^{906s}, r^{907s}, r^{908s}, r^{909s}, r^{910s}, r^{911s}, r^{912s}, r^{913s}, r^{914s}, r^{915s}, r^{916s}, r^{917s}, r^{918s}, r^{919s}, r^{920s}, r^{921s}, r^{922s}, r^{923s}, r^{924s}, r^{925s}, r^{926s}, r^{927s}, r^{928s}, r^{929s}, r^{930s}, r^{931s}, r^{932s}, r^{933s}, r^{934s}, r^{935s}, r^{936s}, r^{937s}, r^{938s}, r^{939s}, r^{940s}, r^{941s}, r^{942s}, r^{943s}, r^{944s}, r^{945s}, r^{946s}, r^{947s}, r^{948s}, r^{949s}, r^{950s}, r^{951s}, r^{952s}, r^{953s}, r^{954s}, r^{955s}, r^{956s}, r^{957s}, r^{958s}, r^{959s}, r^{960s}, r^{961s}, r^{962s}, r^{963s}, r^{964s}, r^{965s}, r^{966s}, r^{967s}, r^{968s}, r^{969s}, r^{970s}, r^{971s}, r^{972s}, r^{973s}, r^{974s}, r^{975s}, r^{976s}, r^{977s}, r^{978s}, r^{979s}, r^{980s}, r^{981s}, r^{982s}, r^{983s}, r^{984s}, r^{985s}, r^{986s}, r^{987s}, r^{988s}, r^{989s}, r^{990s}, r^{991s}, r^{992s}, r^{993s}, r^{994s}, r^{995s}, r^{996s}, r^{997s}, r^{998s}, r^{999s}, r^{1000s}, r^{1001s}, r^{1002s}, r^{1003s}, r^{1004s}, r^{1005s}, r^{1006s}, r^{1007s}, r^{1008s}, r^{1009s}, r^{1010s}, r^{1011s}, r^{1012s}, r^{1013s}, r^{1014s}, r^{1015s}, r^{1016s}, r^{1017s}, r^{1018s}, r^{1019s}, r^{1020s}, r^{1021s}, r^{1022s}, r^{1023s}, r^{1024s}, r^{1025s}, r^{1026s}, r^{1027s}, r^{1028s}, r^{1029s}, r^{1030s}, r^{1031s}, r^{1032s}, r^{1033s}, r^{1034s}, r^{1035s}, r^{1036s}, r^{1037s}, r^{1038s}, r^{1039s}, r^{1040s}, r^{1041s}, r^{1042s}, r^{1043s}, r^{1044s}, r^{1045s}, r^{1046s}, r^{1047s}, r^{1048s}, r^{1049s}, r^{1050s}, r^{1051s}, r^{1052s}, r^{1053s}, r^{1054s}, r^{1055s}, r^{1056s}, r^{1057s}, r^{1058s}, r^{1059s}, r^{1060s}, r^{1061s}, r^{1062s}, r^{1063s}, r^{1064s}, r^{1065s}, r^{1066s}, r^{1067s}, r^{1068s}, r^{1069s}, r^{1070s}, r^{1071s}, r^{1072s}, r^{1073s}, r^{1074s}, r^{1075s}, r^{1076s}, r^{1077s}, r^{1078s}, r^{1079s}, r^{1080s}, r^{1081s}, r^{1082s}, r^{1083s}, r^{1084s}, r^{1085s}, r^{1086s}, r^{1087s}, r^{1088s}, 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r^{1180s}, r^{1181s}, r^{1182s}, r^{1183s}, r^{1184s}, r^{1185s}, r^{1186s}, r^{1187s}, r^{1188s}, r^{1189s}, r^{1190s}, r^{1191s}, r^{1192s}, r^{1193s}, r^{1194s}, r^{1195s}, r^{1196s}, r^{1197s}, r^{1198s}, r^{1199s}, r^{1200s}, r^{1201s}, r^{1202s}, r^{1203s}, r^{1204s}, r^{1205s}, r^{1206s}, r^{1207s}, r^{1208s}, r^{1209s}, r^{1210s}, r^{1211s}, r^{1212s}, r^{1213s}, r^{1214s}, r^{1215s}, r^{1216s}, r^{1217s}, r^{1218s}, r^{1219s}, r^{1220s}, r^{1221s}, r^{1222s}, r^{1223s}, r^{1224s}, r^{1225s}, r^{1226s}, r^{1227s}, r^{1228s}, r^{1229s}, r^{1230s}, r^{1231s}, r^{1232s}, r^{1233s}, r^{1234s}, r^{1235s}, r^{1236s}, r^{1237s}, r^{1238s}, r^{1239s}, r^{1240s}, r^{1241s}, r^{1242s}, r^{1243s}, r^{1244s}, r^{1245s}, r^{1246s}, r^{1247s}, r^{1248s}, r^{1249s}, r^{1250s}, r^{1251s}, r^{1252s}, r^{1253s}, r^{1254s}, r^{1255s}, r^{1256s}, r^{1257s}, r^{1258s}, r^{1259s}, r^{1260s}, r^{1261s}, r^{1262s}, r^{1263s}, r^{1264s}, r^{1265s}, r^{1266s}, r^{1267s}, r^{1268s}, r^{1269s}, r^{1270s}, r^{1271s}, r^{1272s}, r^{1273s}, r^{1274s}, r^{1275s}, r^{1276s}, r^{1277s}, r^{1278s}, r^{1279s}, r^{1280s}, r^{1281s}, r^{1282s}, r^{1283s}, r^{1284s}, r^{1285s}, r^{1286s}, r^{1287s}, r^{1288s}, r^{1289s}, r^{1290s}, r^{1291s}, r^{1292s}, r^{1293s}, r^{1294s}, r^{1295s}, r^{1296s}, r^{1297s}, r^{1298s}, r^{1299s}, r^{1300s}, r^{1301s}, r^{1302s}, r^{1303s}, r^{1304s}, r^{1305s},$

each other, and either of them determines the particular system of logarithms, r is called the radical of the system as above observed, and m is denominated the modulus of the system, if the modulus $m = 1$ the radical $r = 2.7182818$, &c. which is the system of hyperbolic logarithms, if $r = 10$, $m = .4342944$, &c. the modulus of the common logarithms, as shewn below. If in the

proportion above stated, viz. $\frac{\text{flux. } r^y}{r^y} : \text{flux. } y \dots 1 : m$, we put

$r^y = x$, as before, we have $\frac{\dot{x}}{x} : y :: 1 : m$, or $\frac{\dot{x}}{x} = \frac{y}{m}$; that is uni-

versally, the product of the modulus and fluxion of any number divided by that number is equal to the fluxion of the logarithm of the same number; hence we may easily find the logarithm of a given number, or the number of a given number.

I. TO FIND THE LOGARITHM OF A GIVEN NUMBER.

Let $\frac{n+x}{n-x}$ be the number, y its logarithm, and m the modulus, then

by what is shewn above $y = 2m \times \frac{n\dot{x}}{n^2 - x^2} = 2m \times \left(\frac{\dot{x}}{n} + \frac{x^2\dot{x}}{n^3} + \frac{x^4\dot{x}}{n^5} + \frac{x^6\dot{x}}{n^7} + \dots \right)$, &c. and the fluent, or the logarithm of $\frac{n+x}{n-x}$ $= y = 2m \times \left(\frac{x}{n} + \frac{x^3}{3n^3} + \frac{x^5}{5n^5} + \frac{x^7}{7n^7} + \dots \right)$, &c. and this series converges very speedily when x is small or n great. Let $n = 1$, and $x = \frac{1}{2}$, then $\frac{n+x}{n-x} = 2$, hence,

$\frac{x}{1}$	$= .3333333333$
$\frac{x^3}{3}$	$= 1234567901$
$\frac{x^5}{5}$	$= 82304526$
$\frac{x^7}{7}$	$= 6532105$
$\frac{x^9}{9}$	$= 564502$
$\frac{x^{11}}{11}$	$= 51318$
$\frac{x^{13}}{13}$	$= 4824$
$\frac{x^{15}}{15}$	$= 464$
$\frac{x^{17}}{17}$	$= 45$
	$.34657359018$
	2
	$.69314718036$

and this multiplied into m will give the logarithm of 2. If m be 1 then the number already found is the hyperbolic logarithm of 2, which is true to nine places of figures, six terms of the series would have given the logarithm true to six places of figures. In any other system, m is different from 1, and must either be given, or found by means of the given radical; thus in the common loga-

rithms the radical is 10, and by the above $m = \frac{1}{h. l. 10}$, now the

hyperbolic logarithm of 10 found as in the foregoing example is $\frac{1}{2.30258509}$, &c. and therefore $m = \frac{1}{2.30258509} = .4342944819$, &c.

&c. the modulus of the common logarithms; hence, if the number found in the example be multiplied by this number, or modulus, we shall have the common logarithm of 2, that is, .69314718, &c.

Having obtained a few logarithms by this method, others may be found by addition, subtraction, multiplication, and division. Thus the logarithms of 2 and 3 being found, we hence find

$\log. 4 = 2 \log. 2 = .602059991327962$
 $\log. 5 = 10 - \log. 2 = .69897000433601880473$
 $\log. 6 = \log. 2 + \log. 3 = .7781512503836436325$
 $\log. 8 = 3 \log. 2 = .90304998699194338568$
 $\log. 9 = 2 \log. 3 = .954242509439324874$

And thus the table of logarithms might be easily computed.

II. GIVEN A LOGARITHM TO FIND ITS NUMBER.

Let $\frac{n+x}{m\dot{x}}$ be the required number, and y the given logarithm, then $\frac{n+x}{m\dot{x}} = y$, and $n\dot{y} + x\dot{y} - m\dot{x} = 0$. Assume $x = ay + by^2 + cy^3 + \dots$, &c. then $\dot{x} = a\dot{y} + 2by\dot{y} + 3cy^2\dot{y} + \dots$, &c. substitute these values of x and $\dot{x}$ in the equation $n\dot{y} + x\dot{y} - m\dot{x} = 0$, and we have,

$n\dot{y} + ay^2\dot{y} + by^3\dot{y} + cy^4\dot{y} + \dots - may - 2mbyy - 3mcy^2y - 4mdy^3y - \dots = 0$, or,

$n - ma - ay - a^2m - 2mb - 3mc - 4md - \dots = 0$, &c. = 0, where it is evident that the coefficient of every term is = 0, otherwise the equation could not vanish for every possible value of y ,

or it becomes evident by taking $y = 0$. Hence we have $a = \frac{n}{m}$;

$b = \frac{a}{2m} = \frac{n}{2m^2}$; $c = \frac{b}{3m} = \frac{n}{2.3m^3}$; $d = \frac{c}{4m} = \frac{n}{2.3.4m^4}$, &c.

therefore $x = n \times \left(\frac{y}{m} + \frac{y^2}{2m^2} + \frac{y^3}{2.3m^3} + \frac{y^4}{2.3.4m^4} + \dots \right)$, &c.

and $n+x = n \times \left(1 + \frac{y}{m} + \frac{y^2}{2m^2} + \frac{y^3}{2.3m^3} + \frac{y^4}{2.3.4m^4} + \dots \right)$, &c.

which is the number answering to the logarithm y , if $n = 1$, and

$m = 1$, then the series becomes $1 + y + \frac{y^2}{2} + \frac{y^3}{2.3} + \frac{y^4}{2.3.4} + \dots$, &c.

which is the number, whose hyperbolic logarithm is y . For a complete account of the various methods of constructing logarithms we refer the curious reader to Dr. Hutton's Mathematical Tables, where he will meet with ample information on the subject.

OF THE USE AND APPLICATION OF THE COMMON TABLE OF LOGARITHMS.

In the common system of logarithms it is to be observed, that without regarding the decimal part, the integer of the logarithm, whether positive or negative, is called its index, or characteristic; because it indicates the number of places from unity to the highest place in the absolute number, the unit's place not being reckoned; if the index be positive, the places are counted from the unit's place toward the left, if negative, toward the right. Also since 10 is the radical of this system, the logarithms of all the powers of 10 will be integers.

Thus $\log. -3, -2, -1, 0, 1, 2, 3$, &c.

Num. $\frac{1}{1000}, \frac{1}{100}, \frac{1}{10}, 1, 10, 100, 1000$, &c.

Or thus, $10^{-3}, 10^{-2}, 10^{-1}, 10^0, 10^1, 10^2, 10^3$, &c.

Hence it appears that the logarithm of 10, or of any power, or of the reciprocal of any power of 10, has no decimal part, but is always some integer, either positive or negative. Now, since the sum of two logarithms is the logarithm of the product of the number belonging to them, and the difference of the logarithms is the logarithm of the quotient, it follows, that if any number be multiplied or divided by 10, or any of its powers, as 100, 1000, $\frac{1}{100}$, &c.

the logarithm of the product or quotient will be the same in the decimal part, since the addition or subtraction can only affect the index. Thus the logarithm of 5874 being 3.7689339, the logarithm of 10, 100, &c times 5874 will be as follows:

Num.	Logarithms.
5874	3.7689339
58740	4.7689339
587400	5.7689339
5874000	6.7689339

And the logarithm of $\frac{1}{10}$, $\frac{1}{100}$, $\frac{1}{1000}$, &c. part of it will be as follows:

Num.	Logarithms.
5 8 7 4	3.7 6 8 9 3 3 9
5 8 7 4	2.7 6 8 9 3 3 9
5 8 7 4	1.7 6 8 9 3 3 9
5 8 7 4	0.7 6 8 9 3 3 9
5 8 7 4	—1.7 6 8 9 3 3 9
.0 5 8 7 4	—2.7 6 8 9 3 3 9
.0 0 5 8 7 4	—3.7 6 8 9 3 3 9

From this it also appears, that the index, or characteristic, of any logarithm, is always equal to the number of figures from the units' place to the highest or most significant figure, or that which stands last towards the left, and is therefore always one less than the number of figures which the natural number consists of: and this index is constantly to be placed on the left hand of the decimal part of the logarithm. When there are integers in the given number, the index is always affirmative; but when there are no integers, the index is negative, and is to be marked by a line drawn before it, like a negative quantity in algebra. Thus a number having 1, 2, 3, 4, 5, &c. integer places, the index of its log. is 0, 1, 2, 3, 4, &c. And a fraction having a digit in the place of primes, seconds, thirds, fourths, &c. the index of its logarithm will be — 1, — 2, — 3, — 4, &c. It may also be observed, though the indices of fractional quantities are negative, yet the decimal parts of their logarithms are always affirmative; and all operations are to be performed by them in the same manner as by negative and affirmative quantities in algebra. In taking out of a table the logarithm of any number not exceeding 10000, we have the decimal part by inspection: and if to this the proper characteristic be affixed, it will give the complete logarithm required. But if the number, whose logarithm is required, be above 10000, then find the logarithm of the two nearest numbers to it that can be found in the table, and say, as their difference: the difference of their logarithms :: the difference of the nearest number, and that whose logarithm is required: the difference of their logarithms, nearly; and this difference being added to, or subtracted from, the nearest logarithm, according as it is greater or less than the required one, will give the logarithm required, nearly. Thus, let it be required to find the logarithm, of 367182.

The decimal part of 3671 is by the table .5647844; and of 3672 is .5649027;

∴ The { 367100 is 5.5647844 }
log. of { 367200 is 5.5649027 }

Their diff.	100	.0001483 diff.
Nearest No.	{	367200
Given No.	{	367182

18 diff.

Therefore 100:0001183 :: 18 : .0000212.

And 5.5649027 — .0000212 = 5.5648815 = logarithm of 367182, nearly.

If the number consists both of integers and fractions, or is entirely fractional, find the decimal part of the logarithm as if all its figures were integral; and this, being prefixed to the proper characteristic, will give the logarithm required. And if the given number be a proper fraction, subtract the logarithm of the denominator from the logarithm of the numerator, and the remainder will be the logarithm sought; which, being that of a decimal fraction, must always have a negative index. And, if it be a mixed number, reduce it to an improper fraction, and find the difference of the logarithms of the numerator and denominator, in the same

manner as before. In finding the number answering to any given logarithm, the index, if affirmative, will always shew how many integral places the required number consists of; and, if negative, in what place of decimals the first, or significant figure stands, so that, if the logarithm can be found in the table, the number answering to it will always be had by inspection. But, if the logarithm cannot be exactly found in the table, find the next greater, and the next less, and then say, As the difference of these two logarithms: the difference of the numbers answering to them :: the difference of the given logarithm, and the nearest tabular logarithm: a fourth number; which added to, or subtracted from, the natural number answering to the nearest tabular logarithm, according as that logarithm is less or greater than the given one, will give the number required, nearly. Thus, let it be required to find the natural number answering to the logarithm 5.5648815.

The next less and greater logarithms, in the table, are

5.5647844	The numbers {	367100
5.5649027		367200

Their diff.	.0001183	100
-------------	----------	-----

And 5.5649027 — 5.5648815 = .0000212.

Therefore .0001183 : 100 :: .0000212 : 18 nearly.

Whence 367200 — 18 = 367182 = number required.

In the larger tables, the logarithms are found by inspection for any number less than 100000 and by proportional parts to one figure more. The use of the tables is generally given along with them.

TO FIND THE ARITHMETICAL COMPLEMENT OF A LOGARITHM.

Begin at the left hand, and write down what each figure wants of 9, only what the last significant figure wants of 10; so the complement of the logarithm of 456, viz. 2.6589648, is 7.3410352.

TO MULTIPLY BY LOGARITHMS.

Add the logarithms of the factors together, and the sum will be the logarithm of the product: observing that what is carried from the decimal part is to be added to the affirmative indices, and that the difference between the sum of the affirmative, and sum of the negative indices is to be the index of the logarithm of the product, which must be of the same kind with the greater sum.

Let 46:75 be multiplied by 3275.

The log. of	46:75 =	1.6697816
The log. of	3275 =	3.5152113

The product = 153106.2 --- 5.1849929

Multiply 37680, .0002053, and .007693, continually together.

The log. of	37680 =	4.5761109
The log. of	.0002053 =	— 4.3123889
The log. of	.007693 =	— 3.8860957

The product = 059511 --- 2.7745955

TO DIVIDE BY LOGARITHMS.

Take the logarithm of the divisor from the logarithm of the dividend, the remainder is the logarithm of the quotient: observing that the index of the divisor is to be changed from affirmative to negative, or the contrary, and then the difference of the indices is to be taken for the index of the quotient as directed in multiplication, and when one is borrowed at the left hand of the decimal part, it is to be carried and subtracted from the result of the indices, or, which is the same, it is to be added as a negative quantity. Or division may be performed by adding together the logarithm of the dividend, and the complement arithmetical of the logarithm of the divisor, and taking 10 from the sum of the indices, which gives the logarithm of the quotient. This is useful when the dividend or divisor consist of several factors, and as many times as the complement is taken, so many tens must be omitted in the sum of the indices.

Divide

Divided 56 by 4.
 The log. of 56 = 1.7481880
 The log. of 4 = 0.6020600
 The quotient = 14 --- 1.1461280

Divide .24 by 80.
 The log. of .24 = -- 1.3802112
 The log. of 80 = 1.9030900
 The quotient = .003 - 3.4771212

Or thus,
 The log. of .24 = -- 1.3802112
 The comp. of 80 = 8.0969100
 The quotient = .003 --- 3.4771212

Here the sum of the indices is 7, from which 10 being taken the remainder is 3.

Divide the product of 4.718 and .625, by the product of 1265 and 55.

The log. of 4.718 = 0.6737579
 The log. of .625 = -- 1.7958800
 The comp. of .01265 = 11.8979095
 The comp. of 55 = 8.2596373
 The quotient = 4.2382 --- 0.6271847

From this, and multiplication, we easily perceive the method of performing the rule of three, or the rule of five; viz. add the logarithms of the second and third terms together, and from the sum subtract the logarithm of the first, the remainder is the logarithm of the fourth. Or, instead of subtracting the logarithm, add its complement, as directed in division.

INVOLUTION BY LOGARITHMS.

Multiply the logarithm of the number by the index of the power, and it will give the logarithm of the power.

Note. The product of a negative index by a positive number negative, but what is carried is positive; and, on the contrary, when the multiplier is negative.

What is the cube or third power of fifteen.

The log. of 15 = 1.1760913
 The index 3

The power = 3375 --- 3.5282739

Required the 12th power of 1.539

The log. of 1.539 = 0.1872386
 The index 12

The power = 176.6 --- 2.2468632

What is the 4th power of .08.

The log. of .08 = -- 2.9030900
 The index 4

The power = .00004096 --- 5.6123600

EVOLUTION BY LOGARITHMS.

Divide the logarithm of the number by the index of the root, that is, divide by two for the square or second root, by three for the cube root, &c. and the quotient will be the logarithm of the root.

Note. When the index of the logarithm to be divided is negative, and does not exactly contain the divisor, increase it by such a number as will make it exactly divisible, and carry the units borrowed, as so many tens, to the left hand place of the decimal, and then divide as in whole numbers.

Required the square root of 1501

The log. of 1501 = 3.1763807
 Therefore 2) 3.1763807

The root = 38.74 --- 1.5881903

Required the cube root of .166375.

The log. of .166375 = -- 1.2210881
 Therefore 3) -- 1.2210881

The root .53 --- 1.7403627

TO FIND MEAN PROPORTIONALS BETWEEN ANY TWO NUMBERS.

Subtract the logarithm of the least term from the logarithm of the greatest, and divide the remainder by a number more by one than the number of means desired; then add the quotient to the logarithm of the least term (or subtract it from the logarithm of the greatest) continually, and it will give the logarithms of all the mean proportionals required.

Example. Let three mean proportionals be sought, between 106 and 100.

Logarithm of 106 = 2.0253059
 Logarithm of 100 = 2.0000000

Divide by 4) 0.0253059 (0.0063264.75

Logarithm of the least term 100 added 2.0000000

Logarithm of the first mean 101.4673846 2.0063264.75

Logarithm of the second mean 102.9363014 2.0126529.5

Logarithm of the third mean 104.4670483 2.0189794.25

Logarithm of the greatest term 106. 2.0253059.

TO PERFORM THE OPERATION FOR COMPOUND INTEREST BY LOGARITHMS.

Multiply the logarithm of the amount of one pound for the time of one payment by the number of payments, and to the product add the logarithm of the principal; the sum will be the logarithm of the amount.

What will 210*l.* 7*s.* 6*d.* amount to in three years, at five per cent per annum. First 210*l.* 7*s.* 6*d.* = 210.375*l.* and the amount of 1*l.* for one year at the given rate is 1.05. And

The log. of 1.05 = 0.0211893
 Number of payments 3

The log. of 210.375 = 2.3229940

The amount = 243.535*l.* --- 2.3865619

or 243*l.* 10*s.* 8½*d.* nearly.

What is the amount of 50*l.* in five years and a quarter, supposing the interest payable half-yearly, at five per cent. per annum, compound interest. Here the amount of 1*l.* for the time of one payment, is 1.025.

The log. of 1.025 = 0.0107239
 Number of payments 10½

The log. of 50 = 1.126009
 The amount = 64.8*l.* nearly -- 1.8115709

or 64*l.* 16*s.* very nearly.

And thus it appears how the more tedious operations of arithmetic are abridged by means of this useful invention.

OF CERTAIN CURVES RELATED TO LOGARITHMS.

The discovery of logarithms suggested to mathematicians the idea of curve-lines, which might have similar properties to those numbers: hence, the origin of the logarithmic, or, as it has been also called, the logistic curve, the nature and properties of which we now proceed to explain.

Plate CH. fig. 11. Let CD be the logarithmic curve, and AB its base or abscissa, in which let there be taken any number of points P, P', P'', &c. so that the lines AP, AP', AP'', &c. may constitute an arithmetical progression; then, if perpendiculars or ordinates, PM, P'M', P''M'', &c. be drawn, meeting the curve in the points M, M', M'', &c. its nature is such, that the ordinates PM, P'M', P''M'', constitute a geometrical progression. Hence, and from the properties of logarithms, it appears, that the abscissas AP, AP', AP'', &c. may be considered as the logarithms of their corresponding

corresponding ordinates $PM, P'M', P''M'$, &c. respectively. That we may express the relation between any abscissa, and its corresponding ordinate, by means of an equation, let us put the ordinate at the point A, or $AC = 1$; take Ap , a given portion of the abscissa; and put pm , the corresponding ordinate, $= a$; take $pp', p'p'',$ &c. in the abscissa, equal to one another, and to Ap ; and let $AP = x \times Ap$; draw the ordinates $p'm', p''m'',$ &c. also PM . Then, from the nature of continued proportionals $p'm' = a^2$,

$p''m'' = a^3$, &c. to PM , which will be expressed by a^x ; hence, if

we put $PM = y$, we have $a^x = y$ for the equation of the curve. From this equation, as well as by other methods, all the properties of the logarithmic curve may be derived. We shall briefly mention some of the most remarkable:

I. The base AB is an asymptote to the curve.

II. If PM be an ordinate to the curve at M , and MQ a tangent at the same point, the subtangent PQ is a constant quantity, and equal to the modulus of the particular logarithmic system, to which the curve belongs.

III. The curvilinear space, comprehended between any two ordinates AC, PM , is equal to the rectangle contained by PQ the subtangent, and $PM - AC$ the difference of the ordinates.

There is another curve, the properties of which are analogous to those of logarithms; namely, the common hyperbola. Plate CII. fig. 12. Let C be its centre, and CD, CE , its asymptotes, in either of which, let the points $A, A', A'', A''',$ &c. be taken, so that

$CA, CA', CA'', CA''',$ &c. may be continued geometrical proportionals; draw $AB, A'B', A''B'', A'''B''',$ &c. parallel to the other asymptote, meeting the curve in $B, B', B'', B''',$ &c. and join $CB, CB', CB'', CB''',$ &c. Then, it is demonstrated by writers on conics, that the hyperbolic sectors $CBB', CB'B'', CB''B''',$ &c. are equal to each other; and that the quadrilateral spaces $ABB'A', A'B'B''A'', A''B''B'''A''',$ &c. are also equal to one another, and to each of the sectors. Hence the sectors, $CBB', CBB'', CBB''',$ &c. or the quadrilateral figures $ABB'A', ABB''A'', ABB'''A''',$ &c. have equal differences, while their corresponding abscissas $CA, CA', CA'', CA''',$ have equal ratios to one another, viz. the ratio of CA to CA' ; thus the former are analogous to the logarithms of the latter. See CONIC SECTIONS.

Let H be the vertex of the hyperbola, draw HG and HK parallel to the asymptotes, so as to form the rhombus $HGCK$; then putting $CK = 1$, if CP denote any number whatever, and PQ be drawn parallel to the other asymptote, the hyperbolic area $KHPQ$ will serve to express the logarithm of CP , according to a system the modulus of which is denoted by the area of the rhombus $CKHG$. If the asymptotes contain a right angle, the area of the rhombus will be $= 1$, and thus the hyperbolic areas will express Napier's, or the hyperbolic logarithms. But any system of logarithms whatever may be represented by hyperbolic areas; thus if the asymptotes contain an angle of $25^\circ 44' 25'' \cdot 5$, the area of the rhombus will be $\cdot 43429448$, &c. viz. equal to the modulus of the common system of logarithms, and therefore the hyperbolic area equal to the common logarithms.

LOG-BOARD, a table generally divided into five columns, in the first of which is entered the hour of the day; in the second, the course steered; in the third, the number of knots run off the reel each time of heaving the log; in the fourth, from what point the wind blows; and in the fifth, observations on the weather, variation of the compass, &c.

LOG-BOOK, a book ruled in columns like the log-board, into which the account on the log-board is transcribed every day at noon; from whence, after it is corrected, &c. it is entered into the journal. See NAVIGATION.

LOGIC.

LOGIC, [*logica*, Latin, from *λογος*, reason,] the art of thinking and reasoning justly, or the science or history of the human mind; as it traces the progress of our knowledge from our first and most simple conceptions through all their different combinations, and all those numerous deductions that result from variously comparing them one with another. Logic is therefore a system of such principles, observations, and maxims, as are sufficient to furnish the understanding with a greater degree of penetration, force, extent, exactness, and readiness, to discover truth itself, to comprehend it when proposed by others, or to communicate it to others, when the knowledge of it is attained. By these means we become acquainted with the nature and power of the understanding; see what things lie within its reach; where we may attain certainty and demonstration; and when we must be contented with probability. This science is generally divided into four parts, viz. Perception, Judgement, Reasoning, and Method; which comprehend the whole sensations and operations of the human mind.

PART I.

OF PERCEPTION.

Man is surrounded with a variety of objects, which, acting differently upon his senses, convey distinct impressions into the mind, and thereby rouse the attention and notice of the understanding. By reflecting too on what passes within us, we become sensible of the operations of our own minds, and attend to them as a new set of impressions. But in all this there is only bare consciousness.

The mind, without proceeding any farther, takes notice of the impressions that are made upon it, and views things in order, as they present themselves one after another. This attention of the understanding to the objects acting upon it, whereby it becomes sensible of the impressions they make, is called by logicians Perception; and the notices themselves, as they exist in the mind, and are there treasured up to be the materials of thinking and knowledge, are distinguished by the name of Ideas. See METAPHYSICS. Our ideas, though manifold and various, are nevertheless all within our own breasts, invisible to others, nor can of themselves be made to appear. But God, designing us for society, and to have fellowship with those of our kind, has provided us with organs fitted to frame articulate sounds, and given us also a capacity of using those sounds as signs of internal conceptions. Hence spring words and language: for having once pitched upon any sound to stand as the mark of an idea in the mind, custom by degrees establishes such a connection between them, that the appearance of the idea in the understanding always brings to our remembrance the sound or name by which it is expressed; as in like manner the hearing of the sound never fails to excite the idea for which it is made to stand. And thus it is easy to conceive how a man may record his own thoughts, and bring them again into view in any succeeding period of his life. For this connection being once settled, as the same sounds will always serve to excite the same ideas; if he can but register his words in the order and disposition in which the present train of his thoughts present themselves to his imagination, it is evident he will be able to recal his thoughts at pleasure, and that too in the very manner of their first appearance.

appearance. Accordingly we find, that the inventions of writing and printing, by enabling us to fix and perpetuate such perishable things as sounds, have furnished us with the means of giving a kind of permanency to the transactions of the mind, inasmuch that they may be in the same manner subjected to our review as any other objects of nature. But, besides the ability of recording our own thoughts, there is this farther advantage in the use of external signs, that they enable us to communicate our thoughts to others, and also to receive information of what passes in their breasts. For any number of men, having agreed to establish the same sounds as signs of the same ideas, it is apparent that the repetition of these sounds must excite the like perceptions in each, and create a perfect correspondence of thoughts. When, for instance, any train of ideas succeed one another in my mind, if the names by which I am wont to express them have been annexed by those with whom I converse to the very same set of ideas, nothing is more evident, than that, by repeating those names according to the tenor of my present conceptions, I shall raise in their minds the same course of thought that has taken possession of my own. For by barely attending to what passes within themselves upon hearing the sounds which I repeat, they will also become acquainted with the ideas in my understanding, and have them in a manner laid before their view. So that we here clearly perceive how a man may communicate his sentiments, knowledge, and discoveries, to others, if the language in which he converses be extensive enough to mark all the ideas and transactions of his mind. But as this is not always the case, and men are often obliged to invent terms of their own to express new views and conceptions of things; it may be asked, how in these circumstances we can become acquainted with the thoughts of another, when he makes use of words, to which we have never annexed any ideas, and which of course can raise no perceptions in our minds. In answer to this it may be first observed that our simple ideas, cannot find admission into the mind, but by the two original fountains of knowledge, sensation, and reflection. If therefore any of these have as yet no being in the understanding, it is impossible by words or a description to excite them there. A man who had never felt the sensation of heat, could not be brought to comprehend that sensation by any thing we might say to explain it. If we would really produce the idea in him, it must be by applying the proper object to his senses, and bringing him within the influence of a hot body. When this is done, and experience has taught him the perception to which men have annexed the name heat, it then becomes to him the sign of that idea, and he thenceforth understands the meaning of the term. But it is quite otherwise in our complex notions. For these being no more than certain combinations of simple ideas, put together in various forms; if the original ideas out of which the collections are made have already got admission into the understanding, and the names serving to express them are known; it will be easy, by enumerating the several ideas concerned in the composition, and marking the order and manner in which they are united, to raise any complex conception in the mind. Thus the idea answering to the word rainbow may be readily excited in the imagination of another who has never seen the appearance itself, by barely describing the figure, largeness, position, and order, of colours; if we suppose these several simple ideas, with their names, sufficiently known to him. This leads to a second observation upon this subject, namely, That words standing for complex ideas are all definable, but those by which we denote simple ideas are not; for simple ideas being secondary perceptions, which have no other entrance into the mind than by sensation or reflection, can only be got by experience, from the several objects of nature, proper to produce those perceptions in us. Words indeed may serve to remind us of them, if they have already found admission into the understanding, and their connection with the established names is known; but they can never give them their original being and existence there. Hence, when any one asks the meaning of a word denoting a simple idea, we pretend not to explain it to him by a definition, knowing that to be impossible; but, supposing him already acquainted with the idea, and only ignorant of the name by which it is called, we either mention it to him by some other name with which we presume he knows its connection, or appeal to the object where the idea itself is found. Thus, were any one to ask the meaning of the word white, we should tell him it stood for the same idea

as albus in Latin, or blanc in French; or, if we thought him a stranger to these languages, we might appeal to an object producing the idea, by saying it denoted the colour we observe in snow or milk. But this is by no means a definition of the word, exciting a new idea in his understanding; but merely a contrivance to remind him of a known idea, and teach him its connection with the established name. For if the ideas after which he enquires have never yet been raised in his mind; as suppose one who had seen no other colours than black and white, should ask the meaning of the word scarlet; it is easy to perceive, that it would be no more possible to make him comprehend it by words, or a definition, than to introduce the same perception into the imagination of a man born blind. The only method in this case is, to present some object, by looking at which the perception itself may be excited; and thus he will learn both the name and the idea together. But how comes it to pass, that men agree in the names of their simple ideas, seeing they cannot view the perceptions in one another's minds, nor make known these perceptions by words to others? The effect is produced by experience and observation. Thus finding, for instance, that the name of heat is annexed to that sensation which men feel when they approach the fire, I make it also the sign of the sensation excited in me by such an approach, nor have any doubt but it denotes the same perception in my mind as in theirs. For we are naturally led to imagine, that the same objects operate alike upon the organs of the human body, and produce an uniformity of sensations. No man fancies, that the idea raised in him by the taste of sugar, and which he calls sweetness, differs from that excited in another by the like means: or that wormwood, to whose relish he has given the epithet bitter, produces in another the sensation which he denotes by the word sweet. Presuming therefore upon this conformity of perceptions, when they arise from the same objects, we easily agree as to the names of our simple ideas: and if at any time, by a more narrow scrutiny into things, new ideas of this class come in our way, which we choose to express by terms of our own invention; these names are explained, not by a definition, but by referring to the objects whence the ideas themselves may be obtained. Being in this manner furnished with simple ideas, and the names by which they are expressed; the meaning of terms that stand for complex ideas is easily got, because the ideas themselves answering to these terms may be conveyed into the mind by definitions. For our complex notions are only certain combinations of simple ideas. When therefore these are enumerated, and the manner in which they are united into one conception explained, nothing more is wanting to raise that conception in the understanding; and thus the term denoting it comes of course to be understood. And here it is worth while to reflect a little upon the wisdom and goodness of the Deity, in thus furnishing us with the very aptest means of communicating our thoughts. For were it not so ordered, that we could thus convey our complex ideas to one another by definitions, it would in many cases be impossible to make them known at all. There is this additional advantage in the ability we enjoy of communicating our complex notions by definitions; that as these make by far the largest class of our ideas, and most frequently occur in the progress and improvement of knowledge, so they are by these means imparted with the greatest readiness, than which nothing would tend more to the increase and spreading of science: for a definition is soon perused; and if the terms of it are well understood, the idea itself finds an easy admission into the mind. From what has been said, it follows, that in order to communicate to a man a new simple idea, we must refer him to the object, but a complex idea may be conveyed by means of a definition. A definition is the unfolding of some conception of the mind, answering to the word or term made use of as the sign of it. Now as, in exhibiting any idea to another, it is necessary that the description be such as may excite that precise idea in his mind; it is plain that definitions, properly speaking, are not arbitrary, but confined to the representing of certain determinate settled notions, such, namely, as are annexed by the speaker or writer to the words he uses. When logicians tell us that the definition of the name is arbitrary, they mean no more than this; that as different ideas may be connected with any term, according to the good pleasure of him that uses it; in like manner may different descriptions be applied to the term, suitable to the ideas so connected. But this connection being settled, and the term considered

ed as the sign of some fixed idea in the understanding, we are no longer left to arbitrary explications, but must study such a description as corresponds with that precise idea. Now this alone ought to be accounted a definition. What seems to have occasioned no small confusion in this matter, is, that many explanations of words, where no idea is unfolded, but merely the connection between some word and idea asserted, have yet been dignified with the name of definitions. Thus, when we say that, a clock is an instrument by which we measure time: this by some is called a definition; and yet it is plain that we are previously supposed to have an idea of this instrument, and only taught that the word clock serves in common language to denote that idea. By this rule all explications of words in our dictionaries will be definitions, nay, the names of even simple ideas may be thus defined. White, we may say, is the colour we observe in snow or milk; heat the sensation produced by approaching the fire; and so in innumerable other instances. But these, and all others of the like kind, are by no means definitions, exciting new ideas in the understanding, but merely contrivances to remind us of known ideas, and teach their connection with the established names. But now in definitions properly so called, we first consider the term we use, as the sign of some inward conception, either annexed to it by custom, or our own free choice; and then the business of the definition is to unfold and explain that idea. As therefore the whole art lies in giving just and true copies of our ideas; a definition is then said to be perfect, when it serves distinctly to excite the idea described in the mind of another, even supposing him before wholly unacquainted with it. This point settled, let us next inquire what those ideas are which are capable of being thus unfolded? In the first place it is evident, that all our simple ideas are necessarily excluded. We have seen that experience alone is to be consulted here, inasmuch that if either the objects whence they are derived come not in our way, or the avenues appointed by nature for their reception, be wanting, no description is sufficient to convey them into the mind. But where the understanding is already supplied with these original and primitive conceptions, as they may be united together in an infinity of different forms; so may all their several combinations be distinctly laid open, by enumerating the simple ideas concerned in the various collections, and tracing the order and manner in which they are linked one to another. Now these combinations of simple notions constitute what we call our complex notions; whence it is evident, that complex ideas, and those alone, admit of that kind of description which goes by the name of a definition. Definitions, then, are pictures or representations of our ideas; and as these representations are then only possible when the ideas themselves are complex, it is obvious, that definitions cannot have place but where we make use of terms standing for such complex ideas. But our complex ideas, being nothing more than different combinations of simple ideas, we then know and comprehend them perfectly, when we know the several simple ideas of which they consist, and can so put them together in our minds, as may be necessary towards the framing of that peculiar connection, which gives every idea its distinct and proper appearance. Two things are therefore required in every definition: first, That all the original ideas, out of which the complex one is formed, be distinctly enumerated; and, secondly, That the order and manner of combining them into one conception be clearly explained. Where a definition has these requisites, nothing is wanting to its perfection; because every one who reads it and understands the terms, seeing at once what ideas he is to join together, and also in what manner, can at pleasure form in his own mind the complex conception answering to the term defined. Let us, for instance, suppose the word square to stand for that idea by which we represent to ourselves a figure whose sides subtend quadrants of a circumscribed circle. The parts of this idea are the sides bounding the figure. These must be four in number, and all equal among themselves, because they are each to subtend a fourth part of the same circle. But, besides these component parts, we must also take notice of the manner of putting them together, if we would exhibit the precise idea for which the word square here stands. For four equal right lines, any-how joined, will not subtend quadrants of a circumscribed circle. A figure with this property must have its sides standing also at right angles. Taking in therefore this last consideration respecting the manner of combining the parts, the idea is fully described, and the defi-

nition thereby rendered complete. For a figure bounded by four equal sides, joined together at right angles, has the property required; and is moreover the only right-lined figure to which that property belongs. It will now be obvious to every one, in what manner we ought to proceed, in order to arrive at just and adequate definitions. First, we are to take an exact view of the idea to be described, trace it to its original principles, and mark the several simple perceptions that enter into the composition of it. 2dly, We are to consider the particular manner in which these elementary ideas are combined, in order to form that precise conception for which the term we make use of stands. When this is done, and the idea wholly unravelled, we have only to transcribe the appearance it makes to our own minds. Such a description, by distinctly exhibiting the order and number of our primitive conceptions, cannot fail to excite at the same time in the mind of every one that reads it, the complex idea resulting from them; and therefore attains the true and proper end of a definition. The rule laid down in the last section is general, extending to all possible cases; and is indeed that to which alone we can have recourse, where any doubt or difficulty arises. It is not, however, necessary that we should practise it in every case. Many of our ideas are extremely complicated, insomuch that to enumerate all the simple perceptions out of which they are formed, would be a very troublesome and tedious work. For this reason logicians have established certain compendious rules of defining, of which we shall give some account. A little reflection will teach us, that there is a certain gradation in the composition of our ideas. The mind of man is very limited in its views, and cannot take in a great number of objects at once. We must therefore proceed by steps, and make our first advances subservient to those which follow. Thus, in forming our complex notions, we begin at first with but a few simple ideas, such as we can manage with ease, and unite them together into one conception. When we are provided with a sufficient stock of these, and have by habit and use rendered them familiar to our minds, they become the component parts of other ideas still more complicated, and form what we may call a second order of compound notions. This process may be continued to any degree of composition we please, mounting from one stage to another, and enlarging the number of combinations. But in a series of this kind, whoever would acquaint himself perfectly, with the last and highest order of ideas, finds it the most expedient method to proceed gradually through all the intermediate steps. And this gradual progress of the mind to its compound notions, plainly points out the manner of conducting the definitions by which these notions are conveyed into the minds of others. For as the series begins with simple and easy combinations, and advances through a succession of different orders, rising one above another in the degree of composition, it is evident, that, in a train of definitions expressing these ideas, a like gradation is to be observed. Thus the complex ideas of the lowest order can no otherwise be described than by enumerating the simple ideas out of which they are made, and explaining the manner of their union. But then in the second, or any other succeeding order, as they are formed out of those gradual combinations, and constitute the inferior classes, it is not necessary, in describing them, to mention one by one all the simple ideas of which they consist. They may be more distinctly and briefly unfolded, by enumerating the compound ideas of a lower order, from whose union they result, and which are all supposed to be already known in consequence of previous definitions. Here then it is, that the logical method of defining takes place; which, that it may be the better understood, we shall explain somewhat more particularly the several steps and gradations of the mind in compounding its ideas, and thence deduce that peculiar form of a definition which logicians have thought fit to establish. All the ideas we receive, from the several objects of nature that surround us, represent distinct individuals. These individuals, when compared together, are found in certain particulars to resemble each other. Hence, by collecting the resembling particulars into one conception, we form the notion of a species. And here let it be observed, that this last idea is less complicated than that by which we represent any of the particular objects contained under it. For the idea of the species excludes the peculiarities of the several individuals, and retains only such properties as are common to them all. Again, by comparing several species together, and observing their resemblance,

lance, we form the idea of a genus; where, in the same manner as before, the composition is lessened, because we leave out what is peculiar to the several species compared, and retain only the particulars wherein they agree. It is easy to conceive the mind proceeding thus from one step to another, and advancing through the several classes of general notions, until at last it comes to the highest genus of all, denoted by the word *being*, where the bare idea of existence is only concerned. In this procedure we see the mind unravelling a complex idea, and tracing it in the ascending scale, from greater or less degrees of composition, until it terminates in one simple perception. If now we take the series the contrary way, and, beginning with the last or highest genus, carry our view downwards, through all the inferior genera and species, quite to the individuals, we shall thereby arrive at a distinct apprehension of the conduct of the understanding in compounding its ideas. For, in the several classes of our perceptions, the highest at the scale is for the most part made up of but a few simple ideas, such as the mind can take in and survey with ease. This first general notion, when branched out into the different subdivisions contained under it, has in every one of them something peculiar, by which they are distinguished among themselves; inasmuch that, in descending from the genus to the species, we always superadd some new idea, and thereby increase the degree of composition. Thus the idea denoted by the word *figure* is of a very general nature, and composed of but few simple perceptions, as implying no more than space every where bounded. But if we descend farther, and consider the boundaries of this space, as that they may be either lines or surface, we fall into the several species of figure. For where the space is bounded by one or more surfaces, we give it the name of a solid figure; but where the boundaries are lines, it is called a plain figure. In this view of things it is evident, that the species is formed by superadding a new idea to the genus. Here, for instance, the genus is circumscribed space. If now to this we superadd the idea of a circumscription by lines, we frame the notion of that species of figures which are called plain; but if we conceive the circumscription to be by surfaces, we have the species of solid figures. This superadded idea is called the specific difference, not only as it serves to divide the species from the genus, but because, being different in all the several subdivisions, we thereby also distinguish the species one from another. And as it is likewise that conception, which, by being joined to the general idea, completes the notion of the species; hence it is plain, that the genus and specific difference are to be considered as the proper and constituent parts of the species. If we trace the progress of the mind still farther, and observe it advancing through the inferior species, we shall find its manner of proceeding to be always the same. For every lower species is formed by superadding some new idea to the species next above it; inasmuch that in this descending scale of our perceptions, the understanding passes through different orders of complex notions, which become more and more complicated at every step it takes. Let us resume here, for instance, the species of plain figures. They imply no more than space bounded by lines. But if we take in an additional consideration of the nature of these lines, as whether they are right lines or curves, we fall into the subdivisions of plain figure, distinguished by the names of rectilinear, curvilinear, and mixtilinear. And here we must observe, that though plain figures, when considered as one of those branches that come under the notion of figure in general, take the name of a species; yet compared with the classes, of curvilinear, rectilinear, and mixtilinear, into which they themselves may be divided, they really become a genus of which the before mentioned subdivisions constitute the several species. These species, in the same manner as in the case of plain and solid figures, consist of the genus and specific difference as their constituent parts. For in the curvilinear kind, the curvity of the lines bounding the figure makes what is called the specific difference; to which if we join the genus, which here is a plain figure or space circumscribed by lines, we have all that is necessary towards completing the notion of this species. We are only to take notice, that this last subdivision, having two genera above it, viz. plain figure, and figure in general; the genus joined with the specific difference, in order to constitute the species of curvilinears, is that which lies nearest to the said species. It is the notion of plain figure, and not of figure in general, that joined with the idea of curvity, makes up the

complex conception of curve-lined figures. For in this descending scale of our ideas, figure in general, plain figures, curve-lined figures, the two first are considered as general in respect of the third; and the second in order, or that which stands next to the third is called the nearest genus. But now as it is this second idea, which, joined with the notion of curvity, forms the species, of curve-lined figures; it is plain, that the third or last idea in the series is made up of the nearest genus and specific difference. This rule holds invariably, however far the series is continued; because, in a train of ideas thus succeeding one another, all that precede the last; are considered as so many genera in respect of that last; and the last itself is always formed by superadding the specific difference to the genus next it. Here then we have an universal description, applicable to all our ideas of whatever kind, from the highest genus to the lowest species. For, taking them in order downwards from the said general idea, they every where consist of the genus proximum, and differentia specifica, as logicians express them. But when we come to the lowest species of all, comprehending under it only individuals, the superadded idea, by which these individuals are distinguished one from another, no longer takes the name of the specific difference. For here it serves not to denote distinct species, but merely a variety of individuals, each of which, having a particular existence of its own, is therefore numerically different from every other of the same kind. And hence it is, that in this last case, logicians call the superadded idea by the name of the numeral difference; inasmuch that, as the idea of a species is made up of the nearest genus and specific difference, so the idea of an individual consists of the lowest species and numeric difference. Thus the circle is a species of curve-lined figures, and what we call the lowest species, as comprehending under it only individuals. Circles in particular are distinguished from one another by the length and position of their diameters. The length therefore and position of the diameter of a circle form what logicians call the numerical difference; because, these being given, the circle itself may be described, and an individual thereby constituted. This view of the composition of our ideas, representing their constituent parts in every step of the progression, naturally points out the true and genuine form of a definition. For as definitions are no more than descriptions of the ideas for which the terms defined stand; and as ideas are then described, when we enumerate distinctly and in order the parts of which they consist; it is plain, that by making our definitions follow one another according to the natural train of our conceptions, they will be subject to the same rules, and keep pace with the ideas they describe. As therefore the first order of our compound notions, or the ideas that constitute the highest genera in the different scales of perception, are formed by uniting together a certain number of simple notions; so the terms expressing these genera are defined by enumerating the simple notions so combined. And as the species comprehended under any genus, or the complex ideas of the second order, arise from superadding the specific difference to the said general idea; so the definition of the names of the species is absolved, in a detail of the ideas of the specific difference, connected with the term of the genus. For the genus having been before defined, the term by which it is expressed stands for a known idea, and may therefore be introduced into all subsequent definitions, in the same manner as the names of simple perceptions.

PART II.

OF JUDGEMENT.

The mind being furnished with ideas, its next step in the way to knowledge is, the comparing of these ideas together, in order to judge of their agreement or disagreement. In this joint view of our ideas, if the relation be such as to be immediately discoverable by the bare inspection of the mind, the judgements thence obtained are called *intuitive*, from a word that denotes to *look at*; for in this case, a mere attention to the ideas compared suffices to let us see how far they are connected or disjointed. Thus, that the *WHOLE* is greater than any of its *PARTS*, is an intuitive judgement; nothing more being required to convince us of its truth, than an attention to the ideas of whole and part. And this too is the reason why we call the act of the mind forming these judgements *INTUITION*; as it is indeed no more than an immediate perception

ception of the agreement of any two ideas. But here it is to be observed, that our knowledge of this kind respects only our ideas, and the relations between them; and therefore can serve only as a foundation to such reasonings as are employed in investigating those relations. Now it so happens, that many of our judgements are conversant about facts, and the real existence of things, which cannot be traced by the bare contemplation of our ideas. It does not follow, because I have the idea of a circle in my mind, that therefore a figure answering to that idea has a real existence in nature. I can form to myself the notion of a centaur or golden mountain, but never imagine on that account that either of them exists. What then are the grounds of our judgement in relation to facts? Experience and testimony. By experience we are informed of the existence of the several objects which surround us, and operate upon our senses. Testimony is of a wider extent, and reaches not only to objects beyond the present sphere of our observation, but also to facts and transactions, which being now past, and having no longer any existence, could not without this conveyance have fallen under our cognizance. Here we have three foundations of human judgement, from which the whole system of our knowledge may with ease and advantage be derived. First, intuition, which respects our ideas themselves, and their relations; and is the foundation of that species of reasoning which we call demonstration. For whatever is deduced from our intuitive perceptions, by a clear and connected series of proofs, is said to be demonstrated, and produces absolute certainty in the mind. Hence the knowledge obtained in this manner is what we properly term science; because in every step of the procedure it carries its own evidence along with it, and leaves no room for doubt or hesitation. And it is highly worthy of notice, that as the truths of this class express the relation between our ideas, and the same relations must ever and invariably subsist between the same ideas, our deductions in the way of science constitute what we call eternal, necessary, and immutable truths. If it be true that the whole is equal to all its parts, it must be so unchangeably; because the relation of equality being attached to the ideas themselves, must ever intervene where the same ideas are compared. Of this nature are all the truths of natural religion, morality, and mathematics, and in general whatever may be gathered from the bare view and consideration of our ideas. The second ground of human judgement is experience; from which we infer the existence of those objects which surround us, and fall under the immediate notice of our senses. When we see the sun, or cast our eyes towards a building, we not only have perceptions of these objects within ourselves, but ascribe to them a real existence out of the mind. It is also by the information of the senses that we judge of the qualities of the bodies; as when we say that snow is *white*, fire *hot*, steel *hard*. For, as we are wholly unacquainted with the internal structure and constitution of the bodies, that produce these sensations in us, nay, are unable to trace any connection between that structure and the sensations themselves, it is evident, that we build our judgements altogether upon observation, ascribing to bodies such qualities as are answerable to the perceptions they excite in us. Not that we ever suppose the qualities of bodies to be things of the same nature with our perceptions; for there is nothing in fire similar to our sensation of heat, or in a sword similar to pain: but that when different bodies excite in our minds similar perceptions, we necessarily ascribe to these bodies not only an existence independent of us, but likewise similar qualities, of which it is the nature to produce similar perceptions in the human mind. But this is not the only advantage derived from experience; for to that too we are indebted for all our knowledge regarding the co-existence of sensible qualities in objects, and the operations of bodies one upon another. Ivory, for instance, is hard and elastic; this we know by experience, and indeed by that alone. For, being altogether strangers to the true nature both of elasticity and hardness, we cannot by the bare contemplation of our ideas determine how far the one necessarily implies the other, or whether there may not be a repugnance between them. But when we observe them to exist both in the same object, we are then assured from experience that they are not incompatible; and when we also find, that a stone is hard, and not elastic, and that air though elastic is not hard, we also conclude upon the same foundation, that the ideas are not necessarily conjoined, but may exist separately in different objects. In like manner with regard to the

operations of bodies one upon another, it is evident, that our knowledge this way is all derived from observation. From what has been said it is evident, that as intuition is the foundation of what we call scientific knowledge, so is experience of natural. For this last being wholly taken up with objects of sense, or those bodies that constitute the natural world; and their properties, as far as we can discover them, being to be traced only by a long and painful series of observations; it is apparent, that, in order to improve this branch of knowledge, we must betake ourselves to the method of trial and experiment. But though experience is what we may term the immediate foundation of natural knowledge, yet with respect to particular persons its influence is very narrow and confined. The bodies that surround us are numerous, many of them lie at a great distance, and some quite beyond our reach. Life is so short, and so crowded with cares, that but little time is left for any single man to employ himself in unfolding the mysteries of nature. Hence it is necessary to admit many things upon the testimony of others, which thus becomes the foundation of a great part of our knowledge of body. No man doubts of the power of aqua regia, or nitro-muriatic acid, to dissolve gold, though perhaps he never himself made the experiment. In these therefore and such like cases, we judge of the facts and operations of nature upon the mere ground of testimony. However, as we can always have recourse to experience where any doubt or scruple arises, this is justly considered as the true foundation of natural philosophy; being indeed the ultimate support upon which our assent rests, and whereto we appeal when the highest degree of evidence is required. But there are many facts that will not allow of an appeal to the senses; and in this case testimony is the true and only foundation of our judgements. All human actions of whatever kind, when considered as already past, are of the nature here described; because having now no longer any existence, both the facts themselves, and the circumstances attending them, can be known only from the relations of such as had sufficient opportunities of arriving at the truth. Testimony therefore is justly accounted a third ground of human judgement; and as from the other two we have deduced scientific and natural knowledge, so we may from this derive historical; by which we mean, not merely a knowledge of the civil transactions of states and kingdoms, but of all facts whatsoever, where testimony is the ultimate foundation of our belief.

OF PROPOSITIONS.

While the comparing of our ideas is considered merely as an act of the mind, assembling them together, and joining or disjoining them according to the result of its perceptions, we call it judgement; but when our judgements are put into words, they then bear the name of propositions. A proposition, therefore, is a sentence expressing some judgement of the mind, whereby two or more ideas are affirmed to agree or disagree. Now, as our judgements include at least two ideas, one of which is affirmed or denied of the other, so must a proposition have terms answering to these ideas. The idea of which we affirm or deny, and of course the term expressing that idea, is called the subject of the proposition. The idea affirmed or denied, as also the term answering it, is called the predicate. Thus in the proposition, *God is omnipotent*: *God* is the subject, it being of him that we affirm omnipotence; and *omnipotent* is the predicate, because we affirm the idea expressed by that word to belong to God. But as, in propositions, ideas are either joined or disjoined; it is not enough to have terms expressing those ideas, unless we have also some words to denote their agreement or disagreement. That word, in a proposition, which connects two ideas together, is called the copula; and if a negative particle be annexed, we thereby understand that the ideas are disjoined. The substantive verb is commonly made use of for the copula; as in the above-mentioned proposition, *God is omnipotent*; where *is* represents the copula, and signifies the agreement of the ideas of God and omnipotence. But if we mean to separate two ideas; then, besides the substantive verb, we must also use some particle of negation, to express this repugnance. The proposition, *Man is not perfect*, may serve as an example of this kind; where the notion of perfection being removed from the idea of man, the negative particle *not* is inserted after the copula, to signify the disagreement between the subject and predicate. Every proposition necessarily consists of these

these three parts; but then it is not alike needful that they be all severally expressed in words; because the copula is often included in the term of the predicate, as when we say *he sits*; which imports the same as *he is sitting*. In the Latin language, a single word has often the force of a whole sentence. Thus *ambulans* is the same as *ille est ambulans*; *amo*, as *ego sum amans*; and so in innumerable other instances: by which it appears, that we are not so much to regard the number of words in a sentence, as the ideas they represent, and the manner in which they are put together. For wherever two ideas are joined or disjoined in an expression, though of but a single word; it is evident that we have a subject, predicate, and copula, and of consequence a complete proposition. When the mind joins two ideas, we call it an *affirmative* judgement; when it separates them, a *negative*: and as any two ideas compared together must necessarily either agree or not agree, it is evident that all our judgements fall under these two divisions. Hence likewise the propositions expressing these judgements are all either affirmative or negative. An affirmative proposition connects the predicate with the subject, as *a stone is heavy*; a negative proposition separates them, as *God is not the author of evil*. Affirmation therefore is the same as joining two ideas together, and this is done by means of the copula. Negation on the contrary marks a repugnance between the ideas compared; in which case a negative particle must be called in, to shew that the connection included in the copula does not take place. The next considerable division of propositions is into *universal* and *particular*. Our ideas, according to what has been already observed in the First Part, are all singular as they enter the mind, and represent individual objects. But as by abstraction we can render them universal, so as to comprehend a whole class of things, and sometimes several classes at once; hence the terms expressing these ideas must be in like manner universal. If therefore we suppose any general term to become the subject of a proposition, it is evident, that whatever is affirmed of the abstract idea, belonging to that term, may be affirmed of all the individuals to which that idea extends. Thus, when we say, *Men are mortal*; we consider mortality, not as confined to one or any number of particular men, but as what may be affirmed, without restriction, of the whole species. Thus the proposition becomes as general as the idea which makes the subject of it; and indeed derives its universality entirely from that idea, being more or less so according as this may be extended to more or fewer individuals. But it is further to be observed of these general terms, that they sometimes enter a proposition in their full latitude, as in the example given above; and sometimes appear with a mark of limitation. In this last case we are given to understand, that the predicate agrees not to the whole universal idea, but only to a part of it; as in the proposition, *Some men are wise*; For here wisdom is not affirmed of every particular man, but restrained to a few of the human species. From this different appearance of the general idea, that constitutes the subject of any judgement arises the division of propositions into *universal* and *particular*. An universal proposition is that wherein the subject is some general term taken in its full latitude; inso-much that the predicate agrees to all the individuals comprehended under it, if it denote a proper species; and to all the several species, and their individuals, if it mark an idea of a higher order. The words *all*, *every*, *no*, *none*, &c. are the proper signs of this universality; and as they seldom fail to accompany general truths, so they are the most obvious criterion whereby to distinguish them. *All animals have a power of beginning motion*. This is an universal proposition; as we know from the word *all* prefixed to the subject *animals*, which denotes that it must be taken in its full extent. Hence the power of beginning motion may be affirmed of all the several species of animals. A particular proposition has in like manner some general term for its subject; but with a mark of limitation added, to denote, that the predicate agrees only to some of the individuals comprehended under a species, or to one or more of the species belonging to any genus, and not to the whole universal idea. Thus, *Some stones are heavier than iron*; *Some men have an uncommon share of prudence*. In the last of these propositions, the subject *some men* implies only a certain number of individuals, comprehended under a single species. In the former, where the subject is a genus that extends to a great variety of distinct classes, *some stones* may not only imply any number of particular stones, but also several whole species of stones, inas-

much as there may be not a few with the property there described. We see, therefore, that all propositions are either *affirmative* or *negative*; nor is it less evident, that in both cases they may be *universal* or *particular*. Hence arises that celebrated fourfold division of them into *universal affirmative* and *universal negative*, *particular affirmative* and *particular negative*, which comprehends indeed all their varieties. The use of this method of distinguishing them will appear more fully afterwards, when we come to treat of reasoning and syllogism. From the great diversity in the several qualities of things arises a considerable difference as to the manner of our judging about them. For all such properties as are inseparable from objects when considered as belonging to any genus or species, are affirmed absolutely and without reserve of that general idea. Thus we say, *Gold is very weighty*; *A stone is hard*; *Animals have a power of self-motion*. But in the case of mutual or accidental qualities, as they depend upon some other consideration distinct from the general idea; that also must be taken into the account, in order to form an accurate judgement. Should we affirm, for instance, of some stones, that they are very susceptible of a rolling motion; the proposition, while it remains in this general form, cannot with any advantage be introduced into our reasonings. An aptness to receive that mode of motion flows from the figure of the stone; which, as it may vary infinitely, our judgement then only becomes applicable and determinate, when the particular figure, of which volubility is a consequence, is also taken into the account. Let us, then, bring in this other consideration, and the proposition will run as follows: *Stones of a spherical form are easily put into a rolling motion*. Here we see the condition upon which the predicate is affirmed, and therefore know in what particular cases the proposition may be applied. This consideration of propositions respecting the manner in which the predicate is affirmed of the subject gives rise to the division of them into absolute and conditional. Absolute propositions are those wherein we affirm some property inseparable from the idea of the subject, and which, therefore, belongs to it in all possible cases: as, *God is infinitely wise*; *Virtue tends to the ultimate happiness of man*. But where the predicate is not necessarily connected with the idea of the subject, unless upon some consideration distinct from that idea, there the proposition is called conditional. The reason is from the supposition annexed, which is of the nature of a condition, and may be expressed as such, thus: *If a stone be exposed to the rays of the sun, it will contract some degree of heat*; *If a river run in a very declining channel, its rapidity will constantly increase*. This division of propositions is of great importance in philosophy, and requires particular regard. Hitherto we have treated of propositions, where only two ideas are compared together. These are in general called simple; because, having but one subject and one predicate, they are the effect of a simple judgement that admits of no subdivision. But if it so happen that several ideas offer themselves to our thoughts at once, whereby we are led to affirm the same thing of different subjects, or different things of the same subject; the propositions expressing these judgements are called compound; because they may be resolved into as many others, as there are subjects or predicates in the whole complex determination on the mind. Thus, *God is infinitely wise and infinitely powerful*. Here there are two predicates, infinite wisdom and infinite power, both affirmed of the same subject; and accordingly the proposition may be resolved into two others, affirming these predicates severally. In like manner in the proposition, *Neither kings nor people are exempt from death*; the predicate is denied of both subjects, and may, therefore, be separated from them in distinct propositions. Logicians have divided these compound propositions into many different classes; but not with a due regard to their proper definition. Thus conditionals, causals, relatives, &c. are mentioned as so many distinct species of this kind, though, in fact, they are no more than simple propositions. To give an instance of a conditional; *If a stone be exposed to the rays of the sun, it will contract some degree of heat*. Here we have but one subject and one predicate; for the complex expression, *A stone exposed to the rays of the sun*, constitutes the proper subject of this proposition, and is no more than one determined idea. The same thing happens in causals. *Rehoboam was unhappy because he followed evil counsel*. There is here an appearance of two propositions

arising from the complexity of the expression; but when we come to consider the matter more nearly, it is evident that we have but a single subject and predicate. *The pursuit of evil counsel brought misery upon Rehoboam.* It is not enough, therefore, to render a proposition compound, that the subject and predicate are complex notions, requiring sometimes a whole sentence to express them: for in this case the comparison is still confined to two ideas, and constitutes what we call a simple judgement. But where there are several subjects or predicates, or both, as the affirmation or negation may be alike extended to them all, the proposition expressing such a judgement is truly a collection of as many simple ones as there are different ideas compared. Confining ourselves, therefore, to this more strict and just notion of compound propositions, they are all reducible to two kinds, viz. copulatives and disjunctives. A copulative proposition is, where the subjects and predicates are so linked together, that they may be all severally affirmed or denied one of another. Of this nature are the examples of compound propositions given above. The other species of compound propositions are those called disjunctives; in which, comparing several predicates with the same subject; we affirm that one of them necessarily belongs to it, but leave the particular predicate undetermined. If any one, for example, says, *This world either exists of itself, or is the work of some all-wise and powerful cause,* it is evident that one of the two predicates must belong to the world; but as the proposition determines not which, it is, therefore, of the kind we call disjunctive. Such too are the following: *The sun either moves round the earth, or is the centre about which the earth revolves. Friendship finds men equal, or makes them so.* When any proposition is offered to the view of the mind, if the terms in which it is expressed be understood; upon comparing the ideas together, the agreement or disagreement asserted is either immediately perceived, or found to lie beyond the present reach of the understanding. In the first case the proposition is said to be self-evident, and admits not of any proof, because a bare attention to the ideas themselves produces full conviction and certainty; nor is it possible to call in any thing more evident by way of confirmation. But where the connection or repugnance comes not so readily under the inspection of the mind, there we must have recourse to reasoning; and if, by a clear series of proofs, we can make out the truth proposed, inasmuch that self-evidence shall accompany every step of the procedure, we are then able to demonstrate what we assert, and the proposition itself is said to be demonstrable. When we affirm, for instance, that "it is impossible for the same thing to be and not to be;" whoever understands the terms made use of perceives at first glance the truth of what is asserted, nor can he by any efforts bring himself to believe the contrary. The proposition, therefore, is *self-evident*, and such that it is impossible by reasoning to make it plainer; because there is no truth more obvious or better known, from which, as a consequence, it may be deduced. But if we say, *This world had a beginning;* the assertion is indeed equally true, but shines not forth with the same degree of evidence. We find great difficulty in conceiving how the world could be made out of nothing; and are not brought to a free and full consent, until by reasoning we arrive at a clear view of the absurdity involved in the contrary supposition. Hence this proposition is of the kind we call *demonstrable*, inasmuch as its truth is not immediately perceived by the mind, but yet may be made appear by means of others more known and obvious, whence it follows as an unavoidable consequence. From what has been said, it appears, that reasoning is employed only about demonstrable propositions, and that our intuitive and self-evident perceptions are the ultimate foundation on which it rests. Self-evident propositions furnish the first principles of reasoning; and it is certain, that if in our researches we employ only such principles as have this character of self-evidence, and apply them according to the rules to be afterwards explained, we shall be in no danger of error in advancing from one discovery to another. For this we may appeal to the writings of the mathematicians, which, being conducted by the express model here mentioned, are an incontestable proof of the firmness and stability of human knowledge, when built upon so sure a foundation. For not only have the propositions of this science stood the test of ages, but are found attended with that invincible evidence, which forces the assent of all who duly consider the proofs upon which they are established.

PART III.

OF REASONING.

It often happens in comparing ideas together, that their agreement or disagreement cannot be discerned at first view, especially if they are of such a nature as not to admit of an exact application one to another. When, for instance, we compare two figures of a different make, in order to judge of their equality or inequality, it is plain, that by barely considering the figures themselves, we cannot arrive at an exact determination; because, by reason of their disagreeing forms, it is impossible so to put them together, as that their several parts shall mutually coincide. Here then it becomes necessary to look out for some third idea that will admit of such an application as the present case requires; wherein, if we succeed, all difficulties vanish, and the relation we are in quest of may be traced with ease. Thus right-lined figures are all reduced to squares, by means of which we can measure their areas, and determine exactly their agreement or disagreement in point of magnitude. But how can any third idea serve to discover a relation between two others? The answer is, By being compared severally with these others; for such a comparison enables us to see how far the ideas with which this third is compared are connected or disjoined between themselves. In the example mentioned above of two right-lined figures, if we compare each of them with some square whose area is known, and find the one exactly equal to it, and the other less by a square inch, we immediately conclude that the area of the first figure is a square inch greater than that of the second. This manner of determining the relation between any two ideas, by the intervention of some third with which they may be compared, is that which we call *reasoning*; and is indeed the chief instrument by which we push on our discoveries, and enlarge our knowledge. The great art lies in finding out such intermediate ideas, as, when compared with the others in the question, will furnish evident and known truths; because, as will afterwards appear, it is only by means of them that we arrive at the knowledge of what is hidden and remote. Hence it appears, that every act of reasoning necessarily includes three distinct judgements; two wherein the ideas whose relation we want to discover are severally compared with the middle idea, and a third wherein they are themselves connected or disjoined, according to the result of that comparison. Now, as in the second part of logic, our judgements, when put into words, were called *propositions*, so here in the third part the expressions of our reasonings are termed *sylogisms*. Hence it follows, that as every act of reasoning implies three several judgements, so every syllogism must include three distinct propositions. When a reasoning is thus put into words, and appears in form of a syllogism, the intermediate idea made use of to discover the agreement or disagreement we search for, is called the *middle term*; and the two ideas themselves, with which this third is compared, go by the name of the *extremes*. But as these things are best illustrated by examples; let us, for instance, set ourselves to inquire *whether men are accountable for their actions.* As the relation between the ideas of *men* and *accountableness* comes not within the immediate view of the mind, our first care must be to find out some third idea that will enable us the more easily to discover and trace it. A very small measure of reflection is sufficient to inform us, that no creature can be accountable for his actions, unless we suppose him capable of distinguishing the good from the bad; that is, unless we suppose him possessed of reason. Nor is this alone sufficient. For what would it avail him to know good from bad actions, if he had no freedom of choice, nor could avoid the one, and pursue the other? hence it becomes necessary to take in both considerations in the present case. It is at the same time equally apparent, that wherever there is this ability of distinguishing good from bad actions, and of pursuing the one and avoiding the other, there also a creature is accountable. We have then got a third idea, with which *accountableness* is inseparably connected, viz. *reason and liberty*; which are here to be considered as making up one complex conception. Let us now take this middle idea, and compare it with the other term in the question, viz. *man*, and we all know by experience that it may be affirmed of him. Having thus by means of the intermediate idea formed two several judgements, viz. *that man is possessed of reason and liberty*; and *that reason and liberty imply accountableness*; a third obviously and necessarily

rily follows, viz. *that man is accountable for his actions*. Here then we have a complete act of reasoning, in which, according to what has been already observed, there are three distinct judgements; two that may be styled previous, inasmuch as they lead to the other, and arise from comparing the middle idea with the two ideas in the question; the third is a consequence of these previous acts, and flows from combining the extreme ideas between themselves. If now we put this reasoning into words, it exhibits what logicians term a syllogism; and, when proposed in due form, runs thus: "Every creature possessed of reason and liberty is accountable for his actions: man is a creature possessed of reason and liberty: therefore man is accountable for his actions." In this syllogism we may observe, that there are three several propositions expressing the three judgements implied in the act of reasoning; and so disposed, as to represent distinctly what passes within the mind in tracing the more distant relations of its ideas. The two first propositions answer the two previous judgements in reasoning, and are called the *premises*, because they are placed before the other. The third is termed the *conclusion*, as being gained in consequence of what was asserted in the premises. We are also to remember, that the terms expressing the two ideas whose relations we enquire after, as here *man* and *accountableness*, are in general called the *extremes*; and that the intermediate idea, by means of which the relation is traced, viz. *a creature possessed of reason and liberty*, takes the name of the *middle-term*. Hence it follows, that by the premises of a syllogism we are always to understand the two propositions where the middle-term is severally compared with the *extremes*; for these constitute the previous judgements, whence the truth we are in quest of, is by reasoning deduced. The *conclusion* is that other proposition, in which the *extremes* themselves are joined or separated agreeably to what appears upon the above comparison. The conclusion is made up of the extreme terms of the syllogism: and the extreme, which serves as the predicate of the conclusion, goes by the name of the *major term*: the other extreme, which makes the subject in the same proposition, is called the *minor term*. From this distinction of the extremes arises also a distinction between the premises, where these extremes are severally compared with the middle-term. That proposition which compares the greater extreme, or the predicate of the conclusion, with the middle-term, is called the *major proposition*: the other, wherein the same middle-term is compared with the subject of the conclusion or less extreme, is called the *minor proposition*. All this is obvious from the syllogism already given, where the conclusion is, *Man is accountable for his actions*. For here the predicate *accountable for his actions*, being connected with the middle term in the first of the two premises, *every creature possessed of reason and liberty is accountable for his actions*, gives what we call the *major proposition*. In the second of the premises, *man is a creature possessed of reason and liberty*, we find the lesser extreme, or subject of the conclusion, viz. *man*, connected with the same middle-term, whence it is known to be the *minor proposition*. When a syllogism is proposed in due form, the major proposition is always placed first, the minor next, and the conclusion last. These things premised, we may, in the general, define reasoning to be an act or operation of the mind, deducing some unknown proposition from other previous ones that are evident and known. These previous propositions, in a simple act of reasoning are only two in number; and it is always required that they be of themselves apparent to the understanding, inasmuch that we assent to and perceive the truth of them as soon as proposed. In the syllogism given above, the premises are supposed to be self-evident truths; otherwise the conclusion could not be inferred by a single act of reasoning. If, for instance, in the major, "every creature possessed of reason and liberty is accountable for his actions," the connection between the subject and predicate could not be perceived by a bare attention to the ideas themselves; it is evident that this proposition would no less require a proof than the conclusion deduced from it. In this case a new middle-term must be sought for, to trace the connection here supposed; and this, of course, furnishes another syllogism, by which, having established the proposition in question, we are then, and not before, at liberty to use it in any succeeding train of reasoning. And should it so happen, that in this second essay there was still some previous proposition whose truth did not appear at first sight, we must then

have recourse to a third syllogism, to lay open that truth to the mind: because so long as the premises remain uncertain, the conclusion built upon them must be so too. When, by conducting our thoughts in this manner, we at last arrive at some syllogism where the previous propositions are intuitive truths; the mind then rests in full security; as perceiving that the several conclusions it has passed through stand upon the immovable foundations of self-evidence, and when traced to their source terminate in it. We see, therefore, that, to infer a conclusion by a single act of reasoning, the premises must be intuitive propositions. Where they are not, previous syllogisms are required; in which case reasoning becomes a complicated act, taking in a variety of successive steps. This frequently happens in tracing the more remote relation of our ideas; where, many middle-terms being called in, the conclusion cannot be made out but in consequence of a series of syllogisms following one another in train. But although in this concatenation of propositions, those that form the premises of the last syllogism are often considerably removed from self-evidence; yet if we trace the reasoning backwards, we shall find them the conclusions of previous syllogisms, whose premises approach nearer and nearer to intuition in proportion as we advance, and are found at last to terminate in it. And if, after having thus unravelled a demonstration, we take it the contrary way; and observe how the mind, setting out with intuitive perceptions, couples them together to form a conclusion; how by introducing this conclusion into another syllogism, it still advances one step farther; and so proceeds, making every new discovery subservient to its future progress; we shall then perceive clearly, that reasoning, in the highest sense of that faculty, is no more than an orderly combination of those simple acts which we have already so fully explained. All the aims of human reason may, in general, be reduced to these two: 1. To rank things under those universal ideas to which they truly belong; and, 2. To ascribe to them their several attributes and properties, in consequence of that distribution. Therefore the determining of the genera and species of things is a necessary exercise of human reason, the first in order, and previous to the other, which consists in ascribing to them their powers, properties, and relations. But when we have taken this previous step, and brought particular objects under general names; as the properties we ascribe to them are other than those of the general idea, it is plain that, in order to a successful progress in this part of knowledge, we must thoroughly acquaint ourselves with the several relations and attributes of these our general ideas. The relations of our general ideas are of two kinds: either such as immediately discover themselves, upon comparing the ideas one with another; or such as, being more remote and distant, require art and contrivance to bring them into view. The relations of the first kind furnish us with intuitive and self-evident truths: those of the second are traced by reasoning, and due application of intermediate ideas. As, therefore, in tracing the more distant relations of things, we must always have recourse to intervening ideas, and are more or less successful in our researches according to our acquaintance with these ideas, and ability of applying them; it is evident that, to make a good reasoner, two things are principally required. 1st, An extensive knowledge of those intermediate ideas, by means of which things may be compared one with another. 2d, The skill and talent of applying them happily in all particular instances that come under consideration. In order to our successful progress in reasoning, we must have an extensive knowledge of those intermediate ideas by means of which things may be compared one with another. For as it is not every idea that will answer the purpose of our inquiries, but such only as are peculiarly related to the objects about which we reason, so as, by a comparison with them, to furnish evident and known truths; nothing is more apparent than that the greater variety of conceptions we can call into view, the more likely we are to find some among them that will help us to the truths here required. And, indeed, it holds in experience, that in proportion as we enlarge our views of things, and grow acquainted with a multitude of different objects, the reasoning faculty gathers strength: for, by extending our sphere of knowledge, the mind acquires a certain force and penetration, as being accustomed to examine the several appearances of its ideas, and observe what light they cast one upon another. This is the reason why, in order to excel remarkably in any one branch of learning, it is necessary to have, at least, a general acquaintance with the

whole circle of arts and sciences. All the various divisions of human knowledge are very nearly related among themselves, and, in innumerable instances, serve to illustrate and set off each other. And although it is not to be denied that, by an obstinate application to one branch of study, a man may make considerable progress, and acquire some degree of eminence in it; yet his views will be always narrow and contracted, and he will want that masterly discernment which not only enables us to pursue our discoveries with ease, but also, in laying them open to others, to spread a certain brightness around them. But when our reasoning regards a particular science, it is farther necessary that we more nearly acquaint ourselves with whatever relates to that science. A general knowledge is a good preparation, and enables us to proceed with ease and expedition in that branch of learning to which we apply. But then, in the minute and intricate questions of any science, we are by no means qualified to reason with advantage until we have perfectly mastered the science to which they belong. We come now to the second thing required, in order to a successful progress in reasoning; namely, the skill and talent of applying intermediate ideas happily in all particular instances that come under consideration. And here, rules and precepts are of little service. Use and experience are the best instructors. For, whatever logicians may boast of being able to form perfect reasoners by book and rule, we find, by experience, that the study of their precepts does not always add any great degree of strength to the understanding. In short, it is the habit alone of reasoning that makes a reasoner. And, therefore, the true way to acquire this talent is, by being much conversant in those sciences where the art of reasoning is allowed to reign in the greatest perfection. Hence it was, that the ancients, who so well understood the manner of forming the mind, always began with mathematics, as the foundation of their philosophical studies. Here the understanding is, by degrees, habituated to truth, contracts insensibly a certain fondness for it, and learns never to yield its assent to any proposition, but where the evidence is sufficient to produce full conviction. For this reason Plato has called mathematical demonstrations the cathartics, or purgatives of the soul, as being the proper means to cleanse it from error, and restore that natural exercise of its faculties in which just thinking consists. If, therefore, we would form our minds to a habit of reasoning closely and in train, we cannot take any more certain method than the exercising ourselves in mathematical demonstrations, so as to contract a kind of familiarity with them. Not that we look upon it as necessary that all men should be deep mathematicians; but that, having got the way of reasoning to which that study necessarily brings the mind, they may be able to transfer it to other parts of knowledge, as they shall have occasion. But although the study of mathematics be of all others the most useful to form the mind, and give it an early relish of truth, yet ought not other parts of philosophy to be neglected. For there also we meet with many opportunities of exercising the powers of the understanding; and the variety of subjects naturally leads us to observe all those different turns of thinking that are peculiarly adapted to the several ideas we examine, and the truth we search after. A mind thus trained acquires a certain mastery over its own thoughts, insomuch that it can range and model them at pleasure, and call such into view as best suit its present designs. Now, in this the whole art of reasoning consists; from among a great variety of different ideas to single out those that are most proper for the business in hand, and to lay them together in such order, that from plain and easy beginnings, by gentle degrees, and a continued train of evident truths, we may be insensibly led on to such discoveries, as at our first setting out appeared beyond the reach of human understanding. For this purpose, besides the study of mathematics before recommended, we ought to apply ourselves diligently to the reading of such authors as have distinguished themselves for strength of reasoning, and a just and accurate manner of thinking. For it is observable, that a mind exercised and seasoned to truth, seldom rests satisfied in a bare contemplation of the arguments offered by others; but will be frequently assaying its own strength, and pursuing its discoveries upon the plan it is most accustomed to. Thus we insensibly contract a habit of tracing truth from one stage to another, and of investigating those general relations and properties which we afterwards ascribe to particular things, according as we find them comprehended under the abstract ideas to which the properties belong.

Having thus given a general notion of syllogisms, and their parts, we shall now enter more particularly into the subject; examine their various forms, and lay open the rules of argumentation proper to each. And here we may observe, that there are four different positions of the middle-term in the premises; whence arise four different forms of syllogisms, called, by logicians, the four figures. When the middle-term is the subject of the major proposition, and the predicate of the minor, we have what is called the first figure. When it is the predicate of both the premises, the syllogism is said to be the second figure. Again, in the third figure, the middle-term is the subject of the two premises. And when it is the predicate of the major, and subject of the minor, the syllogism is in the fourth figure. But, besides this fourfold distinction of syllogisms, there is a farther subdivision of them, arising from the *quantity* and *quality*, as they are called, of the propositions. By quantity we mean the consideration of propositions, as universal or particular; by quality, as affirmative or negative. Now as, in all the several dispositions of the middle-term, the propositions of which a syllogism consists, may be either universal or particular, affirmative or negative; the due determination of these, and so putting them together as the laws of argumentation require, constitute what logicians call the moods of syllogisms. Of these moods there is a determinate number to every figure, including all the possible ways in which propositions, differing in quantity or quality, can be combined, according to any disposition of the middle-term, in order to arrive at a just conclusion. Mood and figure are, therefore, words applied by logical writers to denote the arrangement of the terms of a syllogism. The propositions of the syllogisms are designated by the letters A, E, I, O, of which A denotes universal affirmative; E, universal negative; I, particular affirmative; and O, particular negative. As only three of these can concur in one syllogism, all the possible combinations of them are sixty-four in each figure, but the greater number of these are excluded by the rules of just reasoning, which are general and special.

General rules of syllogisms. 1. The middle-term must be taken in one of the premises. 2. A term cannot be taken more universally in the conclusion than in the premises. 3. When the major proposition is a particular affirmative, the conclusion cannot be negative. 4. A negative conclusion cannot be drawn from two affirmative premises. 5. From two negative premises, nothing can be concluded. 6. If one of these premises be negative, the conclusion must be negative. 7. From two particular premises, nothing can be concluded. 8. If either of the premises be particular, the conclusion cannot be universal. The above rules apply to all syllogisms, the following are applicable to the particular figures specified.

Special rules of syllogisms. 1. In the first figure, the minor must be affirmative; and the major must be universal. 2. In the second figure, one of the premises must be negative; and the major universal. 3. In the third figure, the minor proposition must be affirmative; and the conclusion particular. 4. In the fourth figure, if the major proposition be affirmative, the minor is universal; if the minor be affirmative, the conclusion is particular; if the major be universal, the conclusion is negative. For the understanding of these rules, it is necessary to observe, that a term is said to be taken *universally*, not only when it is the *subject* of a universal proposition, but also when it is the *predicate* of a negative proposition. On the other hand, a term is said to be taken *particularly*, when it is either the *subject* of a particular, or the *predicate* of an affirmative proposition.

A due consideration of the eight general rules will shew, that 53 of the 64 combinations of three of the letters A, E, I, and O, are excluded from the number of legitimate syllogisms; and one, AEO, is superseded in two of the figures, and excluded by the special rules from the other two: hence, only ten are admitted, and these are not found in each figure, several being excluded by the special rules, so that there are only four in the first figure, four in the second, six in the third, and five in the fourth, in all nineteen. The following tables are intended to illustrate this subject. In the first table, the figures refer to the general rules by which the syllogisms, marked by them, are excluded; in the second table, the figures refer in like manner to the special rules.

TABLE I.

AAA — adm.	EAA — 6	IAA } 8	OAA } 8
AAE — 4.	EAE — ad.	IAE } 8	OAE } 8
AAI — ad.	EAI — 6	IAI — ad.	OAI — 6
AAO — 4	EAO — ad.	IAO — 4.	OAO — ad.
AEA — 6	EEA } 5	IEA — 6	OEA } 5
AEE — ad.	EEE } 5	IEE — 8	OEE } 5
AEI — 6	E EI } 5	IEI — 6	O EI } 5
AEO — —	EEO } 5	IEQ — 3	OEO } 5
AIA — 8	EIA } 8	IIA } 7	OIA } 7
AIE — 4	EIE } 8	II E } 7	OIE } 7
AII — ad.	EII — 6	III } 7	OII } 7
AIO — 4.	EIO — ad.	IIO } 7	OIO } 7
AOA — 6	EOA } 5	IOA } 7	OOA } 7
AOE — 8.	EOE } 5	IOE } 7	O OE } 5
AOI — 6	EOI } 5	IOI } 7	O OI } 5
AOO — ad.	EOO } 5	IOO } 7	O O O } 5

Thus, it appears, that 53 of the possible combinations of these letters in syllogisms, are excluded by the general rules; and AEO is not admitted, because, in the second and fourth figure, it is included in AEE, and from the first and third, it is excluded by the first and third special rules; hence, it is said, to be superseded; and therefore there are only ten admissible moods, which are set down in the first column of the following table.

TABLE II.

	Fig. 1.	Fig. 2.	Fig. 3.	Fig. 4.
AAA	Barbara.	2.	3.	4.
AAI	Sup. in AAA.	2.	Darapti.	Bamarip.
AEE	1.	Camestres.	3.	Cameres.
AII	Darii.	2.	Datisi.	4.
AOO	1.	Baroco.	3.	4.
EAE	Celarent.	Cesare.	3.	4.
EAO	Sup. in EAE.	Sup. in EAE.	Felapton.	Festapo.
IAI	1.	2.	Disamis.	Dimatis.
OAO	1.	2.	Bocardo.	4.
EIO	Ferio.	Festino.	Ferison.	Fresison.

By this table, we see that of the ten admissible moods, several are excluded by the special rules, and some are superseded; but as some occur in different figures, there will be upon the whole nineteen variations of syllogisms; those of the fourth figure, are however hardly worth notice, being only an awkward transposition of the first figure; hence, there remain only fourteen legitimate forms. As it would be difficult to retain these in memory, the technical words in this table, were invented to assist in recollecting the several admissible combinations of the letters AEIO. Each word consists of three syllables, the vowels of which denote the propositions of the syllogism in order; they are all contained in the following lines:

Barbara, Celarent, Darii, Ferio, quoque primæ,
Cesare, Camestres, Festino, Baroco, secundæ.
Tertia Darapti, sibi vindicat atque Felapton,
Adjungens Disamis, Datisi, Bocardo, Ferison.
Non Bamarip, Cameres, Dimatis, Festapo, Fresison.

The last line indicates that it need not be regarded. It may also be observed, that all propositions capable of being proved by syllogisms, are reducible to those of the first figure; hence the rest are comparatively of little use. We shall here add a few examples of syllogisms regularly constructed:

Fig. 1.

BAR- Every wicked man is truly miserable;
BA- All tyrants are wicked men;
RA- Therefore all tyrants are truly miserable.
CE- He that is always in fear is not happy;
LA- Covetous men are always in fear;
RENT- Therefore covetous men are not happy.
DA- Whatsoever furthers our salvation is good for us;
RI- Some afflictions further our salvation;
I- Therefore some afflictions are good for us.
FE- Nothing that must be repented of is truly desirable;
RI- Some pleasures must be repented of;
O- Therefore there are some pleasures which are not truly desirable.

Fig. 2.

CE- No liar is fit to be believed;
SA- Every Christian is fit to be believed;
RE- Therefore no Christian is a liar.
Other examples may be easily formed.

Fig. 3.

DA- All wise men love just government;
RAP- All wise men love temperate liberty;
TI- Therefore all who love temperate liberty, love just government.

We leave the reader to form the other examples, in this and the fourth figure.

The division of syllogisms according to mood and figure-respects those especially which are known by the name of plain simple syllogisms; that is, which are bound to three propositions, all simple, and where the extremes and middle-term are connected, according to the above rules. But as the mind is not tied down to any one precise form of reasoning, but sometimes makes use of more, sometimes of fewer premises, and often takes in compound and conditional propositions, it may not be amiss to take notice of the different forms derived from this source, and explain the rules by which the mind conducts itself in the use of them.

I. HYPOTHETICAL, OR CONDITIONAL SYLLOGISM, is that in which the major is a conditional proposition; the syllogism itself is termed conditional, thus: "If there is a God, he ought to be worshipped;—but there is a God;—therefore he ought to be worshipped." In this example, the major, or first proposition, is conditional, and therefore the syllogism itself is also of this kind. And here we must observe, that all conditional propositions are made of two distinct parts: one expressing the condition upon which the predicate agrees or disagrees with the subject, as in this now before us, *if there is a God*; the other joining or disjoining the said predicate and subject, as here, *he ought to be worshipped*. The first of these parts, or that which implies the condition, is called the antecedent; the second, where we join or disjoin the predicate and subject, has the name of the consequent. There are two ways of arguing in hypothetical syllogisms, which lead to a certain and unavoidable conclusion. For as the major is always a conditional proposition, consisting of an antecedent and a consequent; if the minor admits the antecedent, it is plain that the conclusion must admit the consequent. This is called arguing from the admission of the antecedent to the admission of the consequent, and constitutes that mood or species of hypothetical syllogisms which is distinguished in the schools by the name of the *modus ponens*, inasmuch as by it the whole conditional proposition, both antecedent and consequent, is established. Thus: "if God is infinitely wise, and acts with perfect freedom, he does nothing but what is best;—but God is infinitely wise, and acts with perfect freedom;—therefore he does nothing but what is best." Here we see the antecedent or first part of the conditional proposition is established in the minor, and the consequent or second part in the conclusion; whence the syllogism itself is an example of the *modus ponens*. But if now we on the contrary suppose that the minor rejects the consequent, then it is apparent that the conclusion must also reject the antecedent. In this case we are said to argue from the removal of the consequent to the removal of the antecedent, and the particular mood or species of syllogisms thence arising is called by logicians the *modus tollens*; because in it both antecedent and consequent are rejected or taken away, as appears by the following example:

example: "If God were not a Being of infinite goodness, neither would he consult the happiness of his creatures:—But God does consult the happiness of his creatures:—Therefore he is a Being of infinite goodness." These two species take in the whole class of conditional syllogisms, and include all the possible ways of arguing that lead to a legitimate conclusion; because we cannot here proceed by a contrary process of reasoning, that is, from the removal of the antecedent to the removal of the consequent, or from the establishing of the consequent to the establishing of the antecedent. For although the antecedent always expresses some real condition, which, once admitted, necessarily implies the consequent, yet it does not follow that there is therefore no other condition; and if so, then, after removing the antecedent, the consequent may still hold, because of some other determination that infers it. When we say, *If a stone be exposed some time to the rays of the sun, it will contract a certain degree of heat*; the proposition is certainly true; and, admitting the antecedent, we must also admit the consequent. But as there are other ways by which a stone may gather heat, it will not follow, from the ceasing of the before-mentioned condition, that therefore the consequent cannot take place. We cannot argue: *But the stone has not been exposed to the rays of the sun; therefore neither has it any degree of heat*: inasmuch as there are many other ways by which it may obtain heat.

II. A DISJUNCTIVE SYLLOGISM is where the major is a disjunctive proposition, as in the following example:—"The world is either self-existent, or the work of some finite, or of some infinite Being;—But it is not self-existent, nor the work of a finite being:—Therefore it is the work of an infinite Being." Now, a disjunctive proposition is that, in which, of several predicates, we affirm one necessarily to belong to the subject, to the exclusion of all the rest, but leave that particular one undetermined. Hence it follows, that as soon as we determine the particular predicate, all the rest are of course to be rejected; or if we reject all the predicates but one, that one necessarily takes place. When, therefore, in a disjunctive syllogism, the several predicates are enumerated in the major; if the minor establishes any one of these predicates, the conclusion ought to remove all the rest; or if, in the minor, all the predicates but one are removed, the conclusion must necessarily establish that one.

III. EPICHIREMA, is a syllogism which contains the proof of the major or the minor, or both, before it draws the conclusion. Example:

Unbelievers pay little attention to the evidence of Christianity.

This appears from the contempt in which they hold the subject; from their misconceptions of the nature of the Christian religion; from the futility of their objections; and from their misstatement of facts.

But many philosophers are unbelievers:

Therefore, many philosophers pay little attention to the evidences of Christianity.

IV. ENTHYME, is an imperfect syllogism, in which only one of the premises and the conclusion are expressed, thus:

All sciences are useful:

Therefore, mathematics are useful.

This is the syllogism most in use; the rapidity with which the mind compares its ideas and draws its conclusions, superseding the necessity of formal syllogism, excepting where it may be necessary to analyse an argument, in order to expose its weakness, or to establish its validity.

V. SORITES, is a syllogism which consists of a series of propositions, in which the predicate of the first becomes the subject of the second, and so on, till in the conclusion the subject of the first is joined with the predicate of the last; for example:

All who love wisdom, will earnestly desire it:

All who earnestly desire wisdom, will use the necessary means to attain it:

All who use the means of acquiring wisdom, will encounter many difficulties:

All who encounter difficulties, must exercise patience, perseverance, and self-denial:

Therefore, all who love wisdom must exercise patience, perseverance, and self-denial.

VI. PROSYLLOGISM, unites two or more syllogisms together, so

that the conclusion of the former, shall be the major or the minor of the latter. Example:

Science is an ornament to the mind:

Philosophy is science:

Therefore, philosophy is an ornament to the mind.

But ethics is a branch of philosophy:

Therefore the knowledge of ethics is an ornament to the mind.

VII. DILEMMA, is a hypothetical syllogism of the modus tollens, in which the consequent of the major is a disjunctive proposition, containing every supposition upon which the antecedent may be supported. The minor removes the antecedent, and the conclusion removes the consequent. Example:

If St. Paul's account of his conversion be not true, he was either deceived, or a deceiver:

But he could not be deceived himself; and it is totally incredible that he should have been a deceiver:

Therefore it is absurd to affirm, that St. Paul's account of his conversion, is not true; or in other words, therefore, the apostle's narration is true.

This mode of reasoning is frequently used in mathematical demonstration.

If the consequent of the major consist of three suppositions, the syllogism is called a TRILEMMA. For instance:

If the universe be not perfect, the defect must be owing either to the want of goodness, of wisdom, or of power, in the Creator:

But there is no want of goodness, of wisdom, or of power, in the Creator.

Therefore the universe is perfect.

VIII. INDUCTION, is the distribution of a general idea into its several species and individuals, and ascribing to the whole what is found to be the property of every part. By this process reason advances from particulars to generals, from less general to more general, till by a series of slow progression, and by regular degrees, it arrive at the most general notions, called *forms* or *formal causes*. And by affirming or denying a genus of a species, or an accident of a substance or class of substances, through all the stages of the gradation, we form conclusions, which, if logically drawn, are *axioms*, or general propositions ranged one above another, till they terminate in those that are *universal*. Thus, for instance, the evidence of the external senses is obviously the *primary principle* from which all physical knowledge is derived. But, whereas nature begins with causes, which, after a variety of changes, produce effects, the senses open upon the effects, and from them, through the slow and painful road of experiment and observation, ascend to causes. By experiments and observations skilfully chosen, artfully conducted, and judiciously applied, the philosopher advances from one stage of inquiry to another, in the rational investigation of the general causes of physical truth. From different experiments and observations made on the same individual subject, and from the same experiments and observations made on different subjects of the same kind, by comparing and judging, he discovers some qualities, causes, or phenomena, which, after carefully distinguishing and rejecting all contradictory instances that occur, he finds common to many. Thus, from many collateral comparisons and judgements formed upon particulars, he ascends to generals; and by a repetition of the same industrious process and laborious investigation, he advances from general to more general, till at last he is enabled to form a few of the most general, with their attributes and operations into *axioms* or secondary principles, which are the well-founded laws enacted and enforced by the God of nature. This is that just and philosophic method of reasoning which sound logic prescribes, in this as well as in other parts of learning; by which, through the slow but certain road of experiment and observation, the mind ascends from appearances to qualities, from effects to causes, and from experiments upon many particular subjects forms general propositions concerning the powers and properties of physical body. *Axioms* so investigated and established are applicable to all parts of learning, and are the indispensable, and indeed the wonderful expedients, by which, in every branch of knowledge, reason pushes on its inquiries in the particular pursuit of truth: and the method of reasoning by which they are formed, is that of true and legitimate *induction*; which is therefore by Lord Bacon, the best and soundest of logicians, called "the *key* of interpretation." Instead of taking his axioms arbitrarily out of the great families of

the categories, (see CATEGORY,) and erecting them by his own sophistical invention into the principles upon which his disputation was to be employed, had the analytical genius of Aristotle presented us with the laws of the true *inductive logic*, by which *axioms* are philosophically formed, and had he with his usual sagacity given us an example of it in a single branch of science; he would have brought to the temple of truth an offering more valuable than he has done by the aggregate of all his logical and philosophical productions. In all sciences, except the mathematics, it is only after the *inductive* process has been industriously pursued and successfully performed, that *definition* may be logically and usefully introduced, by beginning with the genus, passing through all the graduate and subordinate stages, and marking the specific difference as it descends, till it arrive at the individual, which is the subject of the question. And by adding an affirmation or negation of the attribute of the genus on the species or individual, or of a general accident on the particular substance so defined, making the definition a proposition, the truth of the question will be logically solved without any farther process. So that instead of being the first, as employed by the logic in common use, definition may be the last act or reason in the search of truth in general. These *axioms* or general propositions, thus inductively established, become another species of *principles*, which may be properly called *secondary*, and which lay the foundation of the syllogistic method of reasoning. When these are formed, but not before, we may safely admit the maxim with which logicians set out in the exercise of their art, as the great hinge on which their reasoning and disputation turn: "From truths that are already known, to derive others which are not known." Or, to state it more comprehensively, so as to apply to probable as well as scientific reasoning—"From truths which are better known, to derive others which are less known." Philosophically speaking, syllogistic reasoning is, under general propositions to reduce others which are less general, or which are particular; for the inferior ones are known to be true, only as we trace their connection with the superior. Logically speaking, it is, To predicate a genus of a species or individual comprehended under it, or an accident of the substance in which it is inherent. Thus *induction* and *sylogism* are the two methods of direct reasoning corresponding to the two kinds of principles, primary and secondary, on which they are founded, and by which they are respectively conducted. In both methods, indeed, reason proceeds by judging and comparing, but the process is different throughout; and though it may have the sanction of Aristotle, an inductive syllogism is a solecism. Till general truths are ascertained by induction, the third or middle-terms by which syllogisms are made are no where safely to be found. So that another position of the Stagyrite, that "syllogism is naturally prior in order to induction," is equally unfounded; for induction does not only naturally but necessarily precede syllogism; and, except in mathematics, is in every respect indispensable to its existence; since, till generals are established, there can be neither definition, proposition, nor axiom, and of course no syllogism. And as induction is the first, so is it the more essential and fundamental instrument of reasoning: for as syllogism cannot produce its own principles, it must have them from induction; and if the general propositions or secondary principles be imperfectly or infirmly established, and much more if they be taken at hazard, upon authority, or by arbitrary assumption like those of Aristotle, all the syllogising in the world is a vain and useless logomachy, only instrumental to the multiplication of false learning, and to the invention and confirmation of error. The truth of syllogisms depends ultimately on the truth of axioms, and the truth of axioms on the soundness of inductions.

IX. ANALOGY, argues from proportional causes to proportional effects, and from similarity of circumstances to similarity of consequences. This method is sometimes nearly equal in force to a complete induction, and sometimes it barely amounts to probability. See ANALOGY. From a due attention to the just rules of logic and the several forms of syllogisms, it will be easy to judge of the validity and force of the arguments offered on any subject, and to detect false syllogisms, which are called paralogisms. However it sometimes happens that much of the appearance of truth is given to a false argument, hence without great caution a person may be misled by it. Such a syllogism is called a sophism. See SOPHISM.

OF TOPICS, ARGUMENTS, AND DEMONSTRATIONS.

The middle-term is often called the argument. Topics, or common places, are general subjects whence arguments are drawn, such as history, philosophy, morals, theology, and the like. Also the argument is denominated according to the science from which the topic is taken, as philosophical argument, mathematical argument, &c. The proof of any proposition is a syllogism, or series of syllogisms, collecting that proposition from known and evident truths. If the syllogism of which the proof consists admit of no premises but definitions, intuitive truths, and propositions already established; the argument so constructed is called a demonstration. Such are all the arguments in mathematics. Demonstrations are of two kinds, a priori and a posteriori. Demonstration a priori, argues from the cause to the effect. Demonstration a posteriori, argues from the effect to the cause. Arguments are either direct or indirect. A direct argument is that which immediately proves the proposition in question. An indirect argument proves the conclusion by proving or disproving some proposition upon which the conclusions depend. For an account of the different arguments, see ARGUMENTUM.

PART IV.

OF METHOD.

Besides the three first operations of the mind already considered, there is yet a fourth, which regards the disposal and arrangement of our thoughts, when we endeavour so to put them together as that their mutual connection and dependence may be clearly seen. This is what logicians call Method, and place always the last in order in explaining the powers of the understanding; because it necessarily supposes a previous exercise of our other faculties, and some progress made in knowledge before we can exert it in any extensive degree. But it often happens, that the understanding is employed, not in the arrangement and composition of known truths, but in the search and discovery of such as are unknown. And here the manner of proceeding is very different. We assemble at once our whole stock of knowledge relating to any subject, and, after a general survey of things, begin with examining them separately and by parts. Hence it comes to pass, that whereas, at our first setting out, we were acquainted only with some of the grand strokes and outlines of truth; by thus pursuing her through her several windings and recesses, we gradually discover those more inward and finer touches whence she derives all her strength, symmetry, and beauty. And here it is that when, by a narrow scrutiny into things, we have unravelled any part of knowledge, and traced it to its first and original principles, insomuch that the whole frame and contexture of it lies open to the view of the mind; here it is, that, taking it the contrary way, and beginning with these principles, we can so adjust and put together the parts as the order and method of science requires. As an example; let us suppose any machine, for instance a watch, presented to us, whose structure and composition we are as yet unacquainted with, but want, if possible, to discover. The manner of proceeding, in this case is, by taking the whole to pieces, and examining the parts separately, one after another. When, by such a scrutiny, we have thoroughly informed ourselves of the frame and contexture of each, we then compare them together, in order to judge of their mutual action and influence. Thus we gradually trace out the inward make and composition of the whole, and come at length to discern how parts of such a form, and so put together, as we found in unravelling and taking them asunder, constitute that particular machine called a watch, and contribute to all the several motions and phenomena observable in it. This discovery being made, we can take things the contrary way, and, beginning with the parts, so dispose and connect them as their several uses and structures require, until at length we arrive at the whole itself, from the unravelling of which those parts resulted. And as it is in tracing and examining the works of art; so is it, in a great measure, in unfolding any part of human knowledge: for the relations and mutual habitudes of things do not always immediately appear upon comparing them one with another. Hence we have recourse to intermediate ideas; and by means of them, are furnished with those previous propositions that lead to the conclusion we are in quest of. And if it so happen that the previous propositions themselves are not sufficiently

ently evident, we endeavour, by new middle-terms, to ascertain their truth; still tracing things backward, in a continual series, until we arrive at some syllogism where the premises are first and self-evident principles. This done, we become perfectly satisfied as to the truth of all the conclusions we have passed through, inasmuch as they are now seen to stand upon the firm and immovable foundation of our intuitive perceptions. And as we arrived at this certainty by tracing things backward to the original principles whence they flow; so may we at any time renew it by a direct contrary process, if, beginning with these principles, we carry the train of our thoughts forward until they lead us, by a connected chain of proofs, to the very last conclusion of the series. Hence it appears, that, in disposing and putting together our thoughts, either for our own use, that the discoveries we have made may at all times lie open to the review of the mind, or where we mean to communicate and unfold the discoveries to others, there are two ways of proceeding equally within our choice; for we may so propose the truth relating to any part of knowledge, as they presented themselves to the mind in the manner of investigation; carrying on the series of proofs, in a reverse order, until they at last terminate in first principles: or, beginning with these principles, we may take the contrary way, and from them deduce, by a direct train of reasoning, all the several propositions we want to establish. The diversity in the manner of arranging our thoughts gives rise to the twofold division of method established among logicians: for method, according to their use of the word, is nothing else but the order and disposition of our thoughts relating to any subject. When truths are so proposed and put together as they were or might have been discovered, this is called the analytic method, or the method of resolution; inasmuch as it traces things backward to their source, and resolves knowledge into its first and original principles. When, on the other hand, they are deduced from these principles, and connected according to their mutual dependence, inasmuch that the truths first in order tend always to the demonstration of those that follow; this constitutes what we call the synthetic method, or method of composition. For here we proceed by gathering together the several scattered parts of knowledge, and combining them into one whole or system, in such a manner that the understanding is enabled distinctly to follow truth through all her different stages and gradations. The first of these two species of method has also obtained the name of the method of invention, because it observes the order in which our thoughts succeed one another in the invention or discovery of truth. The other again, is often denominated the method of doctrine or instruction; inasmuch as, in laying our thoughts before others, we generally choose to proceed in the synthetic manner, deducing them from their first principles. For although there is great pleasure in pursuing truth in the method of investigation, because it places us in the condition of the inventor, and shews the particular train and process of thinking by which he arrived at his discoveries; yet it is not so well accommodated to the purposes of evidence and conviction. For, at our first setting out, we are commonly unable to divine where the analysis will lead us; inasmuch that our researches are for some time little better than a mere groping in the dark. And even after light begins to break in upon us, we are still obliged to make many reviews, and a frequent comparison of the several steps of the investigation among themselves. Nay, when we have unravelled the whole, and reached the very foundation on which our discoveries stand, all our certainty, in regard to their truth, will be found in a great measure to arise from that connection we are now able to discern between them and first principles, taken in the order of composition. But in the synthetic manner of disposing our thoughts, the case is quite different: for as we here begin with the intuitive truths, and advance by regular deductions from them, every step of the procedure brings evidence and conviction along with it; so that, in our progress from one part of knowledge to another, we have always a clear perception of the ground on which our assent rests. In communicating therefore our discoveries to others, this method is apparently to be chosen, as it wonderfully improves and enlightens the understanding, and leads to an immediate perception of truth.

UTILITY OF LOGIC.

The logic which for so many ages kept possession of the schools,

and was deemed the most important of the sciences, has long been condemned as a mere art of wrangling, of very little use in the pursuit of truth. Attempts have been made to restore it to credit, but without success; and of late years little or no attention whatever has been paid to the art of reasoning in the course of what is called a liberal education. However, since reason is capable of improvement, and truth is of the utmost importance; and since logic is instituted for the improvement of reason and discovery of truth, it must be acknowledged, that it is an useful branch of learning. "Laying aside prejudice, whether fashionable or unfashionable, let us consider (says Dr. Reid in his Appendix to Lord Kames's Sketch on the Principle and Progress of Reason;) whether logic is or may be made subservient to any good purpose. Its professed end is, to teach men to think, to judge, and to reason, with precision and accuracy. No man will say that this is a matter of little importance: the only thing therefore that can admit of doubt is, whether it can be taught. To resolve this doubt, it may be observed, that our rational faculty is the gift of God, given to men in very different measures: some have a large portion, some a less; and where there is a remarkable defect of the natural power, it cannot be supplied by any culture. But this natural power, even where it is the strongest, may lie dead for want of the means of improvement. Many a savage may have been born with as good faculties as a Newton, a Bacon, or an Aristotle; but their talents were buried by having never been put to use, whilst those of the philosophers were cultivated to the best advantage. It may likewise be observed, that the chief mean of improving our rational power, is the vigorous exercise of it in various ways, and on different subjects, by which the habit is acquired of exercising it properly. Without such exercise, and good sense over and above, a man who has studied logic all his life may be only a petulant wrangler, without true judgement or skill of reasoning in any science." This must have been Locke's meaning, when, in his *Thoughts on Education*, he says, "If you would have your son to reason well, let him read *Chillingworth*." The state of things is much altered since Locke wrote: logic has been much improved chiefly by his writings; and yet much less stress is laid upon it, and less time consumed in its study. His counsel, therefore, was judicious and seasonable; to wit, That the improvement of our reasoning power is to be expected much more from an intimate acquaintance with the authors who reason best, than from studying voluminous systems of school-logic. But if he had meant, that the study of logic was of no use, nor deserved any attention, he surely would not have taken the pains to make so considerable an addition to it, by his *Essay on the Human Understanding*, and by his *Thoughts on the Conduct of the Understanding*; nor would he have remitted his pupil to *Chillingworth*, the acutest logician as well as the best reasoner of his age." There is no study better fitted to exercise and strengthen the reasoning powers than that of the mathematical sciences; because there is no other branch of science which gives such scope to long and accurate trains of reasoning, or in which there is so little room for authority or prejudice of any kind to give a false bias to the judgement. When a youth of moderate parts begins to study *Euclid*, every thing is new to him: his apprehension is unsteady; his judgement is feeble; and rests partly upon the evidence of the thing, and partly upon the authority of his teacher. But every time he goes over the definitions, the axioms, the elementary propositions, more light breaks in upon him; and as he advances, the road of demonstration becomes smooth and easy: he can walk in it firmly, and take wider steps, till at last he acquires the habit not only of understanding a demonstration, but of discovering and demonstrating mathematical truths. It must indeed be confessed, that a man without the rules of logic may acquire a habit of reasoning justly in mathematics, and perhaps in any other science. Good sense, good examples, and assiduous exercise, may bring a man to reason justly and accurately in his own profession without rules. But whoever thinks, that from this concession he may infer the inutility of logic, betrays by this inference a great want of that art; for he might as well infer, because a man may go from Edinburgh to London by the way of Paris, that therefore any other road is useless. There is perhaps no art which may not be acquired, in a very considerable degree, by example and practice, without reducing it to rules. But practice joined with rules may carry a man forward in his art farther and more quickly than practice

practice without rules. Every ingenious artist knows the utility of having his art reduced to rules, and thereby made a science. By rules he is enlightened in his practice, and works with more assurance. They enable him sometimes to correct his own errors, and often to detect the errors of others; and he finds them of great use to confirm his judgement, to justify what is right, and to condemn what is wrong. Now mathematics are the noblest praxis of logic. Through them we may perceive how the stated forms of syllogism are exemplified in one subject, namely, the predication of quantity; and by marking the force of these forms, as they are there applied, we may be enabled to apply them to ourselves elsewhere. Whoever, therefore, will study mathematics with this view, will become not only by mathematics a more expert logician, and by logic a more rational mathematician, but a wiser philosopher, and an acuter reasoner, in all the possible subjects either of science or deliberation. But when mathematics, instead of being applied to this excellent purpose, are used not to exemplify logic, but to supply its place; no wonder if logic fall into contempt, and if mathematics, instead of furthering science, become in fact an obstacle. For when men, knowing nothing of that reasoning which is *universal*, come to attach themselves for years to a single species, a species wholly involved in lines and numbers, the mind becomes incapacitated for reasoning at large, and especially in the search of *moral truth*. The object of mathematics is demonstration; and whatever in that science is not demonstration, is nothing, or at least below the sublime inquirer's regard. *Probability*, through its almost infinite degrees, from

simple ignorance up to absolute certainty, is the terra incognita of the mathematician. And yet here it is that the great business of the human mind is carried on, in the search and discovery of all the important truths which concern us as reasonable beings. And here too it is, that all its vigour is exerted: for to proportion the assent to the probability accompanying every varying degree of moral evidence, requires the most enlarged and sovereign exercise of reason. In reasonings of this kind, will any man pretend that it is of no use to be well acquainted with the various powers of the mind by which we reason? Is it of no use to resolve the various kinds of reasoning into their simple elements; and to discover, as far as we are able, the rules by which these elements are combined in judging and in reasoning? Is it of no use to mark the various fallacies in reasoning, by which even the most ingenious men have been led into error? It must surely betray great want of understanding, to think these things useless or unimportant. Now these are the things which logicians have attempted; and which they have executed—not indeed so completely as to leave no room for improvement, but in such a manner as to give very considerable aid to our reasoning powers. That the principles they have laid down with regard to definition and division, with regard to the conversion and opposition of propositions, and the general rules of reasoning, are not without use, is sufficiently apparent from the blunders committed daily by those who disclaim any acquaintance with them. Dr. Watts has left us an excellent treatise on logic, to which we refer the reader, who wishes for further information on this branch of science.

LOGISMUS, in rhetoric, an inconclusive kind of argument.

LOGISTÆ, certain officers at Athens, in number ten, whose business consisted in receiving and passing the accounts of magistrates when they went out of office.

LOGISTIC, or **LOGISTICAL**, belonging to computation; logarithmic; sexagesimal.

LOG-LINE. See **Loc**.

LOGOGRAPHER, [from *λογος*, a word, and *γραφω*, I write,] a lawyer's clerk: a writer of books of accounts.

LOGOGRAPHY, a method of printing, in which the types, instead of answering only to single letters, are made to correspond to whole words. This method, though seemingly a retrograde procession in the art of printing, obtained the sanction of his Majesty's patent, and for some time was actually put in execution in the way of trade. In 1783, a treatise was published upon this subject, by Henry Johnson, in which the origin and utility of the art are fully laid down. In this work Mr. Johnson informs us, that in 1778, intending to publish a daily list of blanks and prizes in the lottery numerically arranged, he found it could not be accomplished in time by the ordinary way of printing. On this account he procured types of 2, 3, or more figures as was necessary for his purpose; and thus any entire number might as readily be taken up as if it had been a single type. His next attempt was to form some large mercantile tables of pounds, shillings, pence, and farthings. For these he procured types expressive of any sum of money ready composed and united, "by which (says he) every species of figure-printing could be performed for the 10th part of the cost, printers always charging it double the price of letter-printing." Having thus succeeded to his wish in his two first attempts, he next began to consider if the method could not be applied to words; and in this also the success was equal. "The properties of the logographic art (he says) are, 1. That the compositor shall have less charged upon his memory than in the common way. 2. It is much less liable to error. 3. The type of each word is as easily laid hold of as that of a single letter. 4. The decomposition is much more readily performed, even by the merest novices than they now decompose letters. 5. No extraordinary expence nor greater number of types is required in the logographic than in the common method of printing." But however plausible the logographic art may appear in theory, the practice

seems not to have answered expectation, else it would certainly have come into general use before this time.

LOGOWOGOROD, a town of Poland, in Volhynia, 25 miles N. W. of Kiow. Lon. 31. 7. E. Lat. 50. 46. N.

LOGRONNO, or **LOGRONO**, a town of Spain, in Old Castile, on the Ebro, 52 miles E. of Burgos. Lon. 2. 20. W. Lat. 42. 29. N.

LOGWOOD, in the arts, the wood of a low prickly tree, which is found in great plenty at Campeachy, in the bay of Honduras; it is the "*hamatoxylon campechianum*." See **HAMATOXYLON**. It comes to Europe in large logs, cleared from the bark, and is very hard, compact, heavy, and of a red colour. It is in high request among dyers, especially in dyeing black. To cloth previously boiled in alum and tartar, it gives a beautiful violet colour, which, however, will not stand. Alkalies render the colour darker, acids change it to yellow. From a variety of experiments it is found that the colouring matter of logwood bears in many respects a strong analogy to tannin, but in others it differs from it. Logwood is also found to have a considerable astringent virtue as a medicine, and an extract of it is sometimes given with great success in diarrhoeas.

LOHIA, a town of Arabia, in Yemen, 375 miles S. W. of Mecca. Lon. 42. 49. E. Lat. 15. 42. N.

LOHOCK, or **LOCH**, [Arab.] in pharmacy, is a composition of a middle-consistence between a soft electuary and a syrup, principally used in disorders of the lungs.

LOINS, in anatomy, the two lateral parts of the umbilical region of the abdomen.

LOIR, a river of France, which rises about six miles N. N. W. of Illiers, passes by Bonneval, Chateaudun, Preteval, Vendôme, Chartres, Fleche, &c. and falls into the Sarthe above Angers.

LOIR AND CHER, a department of France, containing the late province of Blaisois. Blois is the capital.

LOIRE, the largest river in France, which rises in Mount Gerbier, one of the Cevennes, about 18 miles N. N. W. of Alençon, in the department of Ardeche: passes by Puy, St. Rambert, Roanne, Marcigny, Nevers, Orleans, Blois, Amboise, Rochefort, Chalonne, Nantes, &c. and falls into the Bay of Biscay, 30 miles W. of Nantes, after running a course of 500 miles.

LOIRE, Lower, a department of France, comprehending part of

of the late province of Bretagne, 55 miles long, and from 30 to 44 broad. Nantes is the capital.

LOIRE, UPPER, a department of France, containing the late province of Velay. Puy is the capital.

LOIRET, a river of France, which runs into the Loire, 3 miles below Orleans.

LOIRET, a department of France, containing the late province of Orlannois. Orleans is the chief city.

LOIRON, a town of France, in the department of Maine, six miles W. of Laval.

LOKE, in mythology, a deity of the northern nations, answering to the Arimanes among the Persians, whom they represent as at enmity both with gods and men, and the author of all the evils which desolate the universe. Loke is described in the Edda as producing the great serpent which encircles the world; which seems to have been intended as an emblem of corruption or sin: he also gives birth to Hela or death, the queen of the internal regions; and to the wolf Fenris, that monster who is to encounter the gods and destroy the world.

LOKMAN, surnamed the WISE, an eminent philosopher among the Easterns. The Arabians say he was the son of Baura, the son or grandson of a sister of Job. He was an Ethiopian, and a slave for some time. It is said that he was born in the time of David, and lived till the age of the prophet Jonas, a period of about 240 years. Some suppose him to have been the same with Æsop the mythologist: and indeed his Parables or Apologues in Arabic, as well as many particulars in his life, resemble the fables and fortune of Æsop. He is said, like Æsop, to have been deformed in his person. Some of his pieces are extant; and he was looked upon as so excellent a person, that Mohammed entitled a chapter of the Koran after his name, in which he introduces God as saying, "We heretofore bestowed wisdom on Lokman." He got his liberty on account of his obedience in eating the whole of a bitter melon, at his master's command. His master, surprised, asked, How it was possible for him to eat such a nauseous fruit? He answered, "I have received so many favours from you, that it is no wonder I should once in my life eat a bitter melon from your hand." M. Galland translated all the fables of Lokman, and Bidpai or Pilpay, a brahmin philosopher, which were published at Paris in 1724.

LOLIUM, DARNEL-GRASS; in botany, a genus of the digynia order, and triandria class of plants; natural order, Gramina. Calyx, fixed, one-leaved, many-flowered. It has five species.

LOLLARD, WALTER, founder of the sect of the Lollards, is said to have been an Englishman. He first broached his doctrines, (which, in many points, have been since adopted by most Protestants,) in Germany, about A. D. 1315. After preaching with great zeal, and gaining many proselytes on the continent, he returned to England, where his disciples were first called Lollards. He and his followers rejected the sacrifice of the mass, extreme unction, and penances for sin; insisting that Christ's sufferings were sufficient. He is likewise said to have set aside baptism as a thing of no effect; and repentance, as not absolutely necessary. But in that age, none who had the courage to oppose the errors of the church of Rome, escaped slander or persecution. Lollard sealed his testimony with his blood, being burnt alive at Cologne in 1322.

LOLLARDS, in ecclesiastical history, a religious sect, which arose in Germany about the beginning of the 14th century; so called from W. Lollard, their founder. See the last article. Some derive the name from *lolum*, a tare, as if the Lollards were tares in God's vineyard. Others derive lollhard, lullhard, lollert, or lullert, from the old German word *tullen*, *tollen*, or *tullen*, "to sing with a low voice;" and say Lollard means a singer, or one who is continually praising God with a song. The Alexians or Cellites were called Lollards, because they were public singers who interred those who died of the plague, and sang a dirge in a mournful tone as they carried them to the grave. The name was afterwards assumed by persons who dishonoured it; for we find, among those Lollards who made extraordinary pretences to piety, and spent their time in meditation and prayer, there were many abominable hypocrites, who entertained the most ridiculous opinions, and concealed the most enormous vices under this specious disguise. And many injurious aspersions were propagated against those who assumed this name by the priests and monks; so that,

by degrees, any person who covered heresies or crimes under the appearance of piety, was called a Lollard. In England, the followers of Wickliffe were called, by way of reproach, Lollards, from some affinity between their tenets. They were solemnly condemned by the archbishop of Canterbury, and the council of Oxford.

LOMBARDS, a nation of Scandinavia, who formerly settled in Italy, and for some time made a considerable figure. The name of Lombards, or Longobards, is derived by Paulus Diaconus their historian, who was himself a Lombard, from the length of their beards. A nation, called Lombards, is mentioned by Tacitus, Strabo, and Ptolemy; but these are different from the Lombards who afterwards settled in Italy, and are reckoned to be the same with the Gepidae, whom the Italian Lombards almost exterminated. The Lombards who settled in Italy are first mentioned by Prosper Aquitanus, bishop of Rhegium, in 379, who tells us, that about this time the Lombards, abandoning the most distant coast of the ocean, and their native country Scandinavia, and seeking for new settlements, as they were overstocked with people at home, first attacked and overcame the Vandals in Germany. They were then headed by two chiefs, Iboreus and Aion; who, dying about A. D. 389, were succeeded by Agilmund.

LOMBARDY, a country of Europe, in the N. of Italy, which comprehends almost the whole of the ancient Gallia Cisalpina, and in the sixth century, formed the kingdom of the Lombards. After the overthrow of that kingdom, it was divided into Upper and Lower Lombardy, and was subdivided among different states and princes; as the house of Austria, the republic of Venice, the king of Sardinia, &c.

1. LOMBARDY, LOWER, the eastern part, comprehended the late duchies of Parma, Modena, Mantua, Bologna, Ferrara, Padua, Vicenza, Verona, Brescia, Como, Crema, and Bergamo.

2. LOMBARDY, UPPER, the western part, comprehended the late duchies of Milan, Montferrat, Piedmont, Nice, and some less principalities.

LOMBES, or LOMBEZ, a town of France, in the department of Gers, and late province of Gascony, twenty-seven miles S. W. of Toulouse. Lon. 1. 0. E. Lat. 43. 29. N.

LOMENTACEE, in botany, the name of the thirty-third order in Linnaeus's Fragments of a natural Method. See BOTANY.

LOMOND HILLS, several verdant hills of Scotland, in the W. part of Fifeshire.

LOMOND, LOCH, a large lake of Scotland, in Lennox-shire, which Mr. Pennant styles "the most beautiful of the Caledonian lakes." The view of it from Tarbat presents an extensive serpentine lake winding amidst lofty hills, on the N. barren, bleak, and rocky, which darken with their shade that contracted part of the water. About 28 islands are dispersed over the lake, well wooded; of these some just peep above the surface, and are tufted with trees; others are so disposed as to form magnificent vistas. Opposite Luss, at a small distance from the shore, is a mountainous isle almost covered with wood, near half a mile long. The largest island is two miles long, and stocked with deer. The lake is 36 miles long; its greatest breadth is eight; its greatest depth, 120 fathoms.

LOMONITE, in mineralogy, a fossil of a snow white colour, with a slight tendency to reddish white. It occurs massive; fracture foliated, the surface of the folia streaked, which gives it a peculiar glimmering aspect easily frangible; not heavy; has a slight degree of coherency; but if it is exposed to the action of the air, the folia spontaneously separate from each other. It is found in the lead-mines of Huelgoet in Lower Brittany.

LOMONOZOF, a celebrated Russian poet, the great reformer of his native tongue, was the son of a fishmonger at Kolmogori. He was born in 1711, and was fortunately taught to read; a rare instance in a person of so low a station in Russia. His genius for poetry was first kindled by the perusal of the Song of Solomon, done into verse by Polotski; which inspired him with such an irresistible passion for the Muses, that he fled from his father, and took refuge in the Kaikonospaski monastery at Moscow; where he indulged his taste for letters, and studied the Greek and Latin languages. In this seminary he made such progress in literature, as to be employed by the Imperial Academy of Sciences. In 1736, that society sent him to the university of Marburg in Hesse

Cassel, where he studied universal Grammar, rhetoric, and philosophy, under the celebrated Christian Wolf. He continued at Marburg four years, during which time he applied himself to chemistry, which he afterwards pursued, with still greater success under the famous Henckel at Freyberg in Saxony. In 1741 he returned into Russia; was chosen in 1742 adjunct to the imperial academy; and in 1743, member of that society and professor of chemistry. In 1760, he was appointed inspector of the seminary, then annexed to the academy, and in 1764, Catharine II. made him a counsellor of state. Lomonozof excelled in various kinds of composition; but his chief merit is derived from his poetical compositions, the finest of which are his odes. They are greatly admired for originality of invention, sublimity of sentiment, and energy of language. Pindar was his great model, and those versed in the Russian tongue, say, he has succeeded in imitating the Theban bard, without incurring the censure of Horace. In this, and other species of composition, he enriched his native language with various kinds of metre, and is hence styled the Father of Russian Poetry. The titles of his principal works, which were printed in three vols. 8vo. shew the versatility of his genius, and his extensive knowledge. Vol. I. besides a Preface on the advantages derived to the Russian tongue from the ecclesiastical writings, contain ten sacred and nineteen panegyric odes. The II. comprises An Essay on Russian Poetry; Translation of a German Ode; Idylls; Tamira and Selim; and Demophoon, 2. Tragedies; Poem on the Utility of Glass; two cantos of an epic poem, entitled, Peter the Great; Heads of Lectures on Natural Philosophy; Translations in verse and prose, from the classics, which he quoted as examples in his Lectures on Rhetoric; Description of the Comet in 1744; &c. Vol. III. consists chiefly of Speeches and Treatises read before the Academy; Panegyric on the Empress Elizabeth; on Peter the Great; on the Advantages of Chemistry; on the Phenomena of the Air occasioned by the Electrical Fire, with a Latin translation; on the Origin of Light as a new Theory of Colours; Methods to determine the Course of a Vessel; on the Origin of Metals by Earthquakes; Latin Dissertation on Solidity and Fluidity; on the Transit of Venus in 1761, with a German translation. He also wrote Annals of the Russian Sovereigns; and the Ancient History of Russia, from its Origin to the Death of Yaroslaf I. in 1054: a work of great merit, as it illustrates the most obscure period in the annals of Russia. He died 4th April 1764, aged 54.

LON, LUNE, a river of England, which rises in Westmoreland, and running past Kirkby Lonsdale, falls into the Irish Sea below Lancaster. Its banks are beautiful and romantic.

LONADO, or LONATO, a territory of Italy, in the department of Mella, and district (late province) of Brescia.

LONADO, or LONARO, the capital of the above territory, 12 miles E. S. E. of Brescia.

LONCHITES, in botany, a genus of the cryptogamia filices class and order; natural order, Filices, or ferns. Capsule disposed in lunulated lines lying under the sinuses of the frond. There are five species, natives of hot climates.

LONCHIURUS, in natural history, a genus of fishes of the order thoracici. Head scaly; ventral fins separate; tail lanceolated. There is but one species, the bearded lonchiurus, a native of Surinam, about twelve inches in length, and of a ferruginous brown colour.

LONDON, a large city of England, the metropolis of Great Britain, and one of the most wealthy and populous places in the world, is situated in Middlesex, on the Thames, 400 miles S. of Edinburgh, 270 S. E. of Dublin; 180 W. of Amsterdam, 210 N. W. of Paris, 500 S. W. of Copenhagen, 600 N. W. of Vienna, 790 S. W. of Stockholm, 800 N. E. of Madrid, 820 N. W. of Rome, 850 N. E. of Lisbon, 1360 N. W. of Constantinople, and 1414 S. W. of Moscow. Lat. 51. 31. N. The city was by the Romans first called Londinium or Londinum. See Tacit. Ptol. Antonin. Ammian. That name was afterwards changed into Augusta; but, in honour of whom, or how long this name prevailed, is not known. After the establishment of the Saxons, it was called Caer Lundain, Lundoun Byrig, Lunden Ceaster, Lundenweye, Lundenne, Lunden-berh, or Lundenburgh. Since the conquest the records call it Londinia, Lundonia, Londine, Londres; and, for several ages past, it has been called London, a modern variation of Londinium. The most probable derivation of these names

appears to be, either from the British words *lhong*, a ship, and *din* a town, i. e. a town or harbour for ships; or from *Llin*, a lake, *g. d.* Llin, din, the town upon the lake, the Surrey side being supposed, upon good grounds, to have been anciently a great expanse of water. Londinium, however, was not the primitive name of this city, which existed before the invasion of the Romans; but Trinov, or the New City; being, at the time of Caesar's arrival in the island, the capital of the Trinobantes or Trinovantes. In its most extensive view, the metropolis, it consists of the City properly so called, the city of Westminster, and the borough of Southwark, with the suburbs in Middlesex and Surrey, within what are called the Bills of Mortality. The irregular form of London makes it difficult to ascertain its extent. However, its length from E. to W. is generally allowed to be above seven miles from Hyde-park corner to Poplar; and its breadth in some places three, in others two, and in others again not much above half a mile. London is divided into 26 wards and 236 precincts, under a lord mayor, aldermen, and common-council. The lord mayor is the supreme magistrate, chosen annually by the citizens, pursuant to a charter of King John. The manner of electing a lord mayor is by the liverymen of the several companies, assembled in Guildhall annually, on Michaelmas-day, (according to an act of common-council in A. D. 1476;) when, the liverymen nominate two aldermen below the chair, who have served the office of sheriff, to be returned to the court of aldermen, who may choose either of the two; but the senior, so returned, is generally declared lord mayor elect. The election being over, the lord mayor elect, accompanied by the recorder and divers aldermen, is soon after presented to the lord chancellor for his approbation; on the 9th Nov. following, is sworn into office at Guildhall; and on the 10th, before the barons of exchequer at Westminster; the procession on which occasion is exceedingly grand and magnificent. The lord mayor sits every morning at the mansion-house, where he keeps his mayoralty, to do the business incident to his office. Once in six weeks, or eight times in the year, he sits as chief judge of Oyer and Terminer, or gaol-delivery of Newgate for London and Middlesex. His jurisdiction extends all over the city and suburbs, except places that are exempted. It extends also from Colneyditch, above Stains-bridge in the W. to Yeudale, or Yenflete, and the mouth of the Medway, and up that river to Upnor-castle, in the E. by which he has the power of punishing or correcting all persons that shall annoy the streams, banks, or fish. For this purpose he holds several courts of conservancy in the counties adjacent to the said river for its conservation, and for the punishment of offenders. The office next in dignity, is that of Alderman. See ALDERMAN. Of these there is one to each ward, in all 26, who are properly the subordinate governors of their respective wards under the lord mayor's jurisdiction. These high officers constitute a second part of the city-legislature when assembled in a corporate capacity, and exercise an executive power in their respective wards. The aldermen, who have passed the chair, or served the office of lord mayor, are justices of the quorum; and all the other aldermen are not only justices of the peace, but by stat. 43 Eliz. entitled, An Act for the Relief of the Poor, "every alderman of London, within his ward, shall and may do and execute, in every respect, so much as is appointed and allowed by the said act to be done or executed by one or two justices of peace of any county within this realm." Every one keeps his wardmote, or court, for choosing ward-officers and settling the affairs of the ward, to redress grievances, and to present all defaults found within the ward. The next branch of the legislative power is the common-council. The many inconveniences that attended the popular assemblies, called folk-motes, determined the commonality of London to choose representatives to act in their name, with the lord mayor and aldermen, in all affairs relating to the city. At first these representatives were chosen out of the companies; but these not being found satisfactory, nor properly the representatives of the whole body of the inhabitants, it was agreed to choose a certain number of discreet men out of each ward; which number has from time to time increased, according to the dimensions of each ward. At present the 26 wards, being subdivided into 236 precincts, each precinct sends a representative to the common-council, who are elected after the same manner as an alderman; and as the lord mayor presides in the wardmote, and is judge of the poll at the election of an alderman, so the alderman of each ward is judge

of the poll at the elections of a common-councilman. The lord mayor, aldermen, and common-council, are a kind of city-parliament, resembling the great council of the nation. For it consists of 2 houses; one for the lord mayor and aldermen, or the upper-house; another for the commoners or representatives of the people, commonly called the common-councilmen. They have power to make and repeal bye-laws; and the citizens are bound to submit to them. They cannot assemble without a summons from the lord mayor, who, however, is obliged to call a common-council, when demanded, by six reputable citizens and members of that court. This corporation is assisted by two sheriffs, a recorder, a common-serjeant, a chamberlain, a town-clerk, a city-remembrancer, a water-bailiff, and many inferior officers. London has fifteen flesh-markets, one for live cattle, and 25 for corn, coals, hay, herbs, &c. Of these the three principal are, at Smithfield for cattle and hay, at Leadenhall for butcher's meat, wool, hides, and Colchester baize, and Billingsgate for fish. The places of religious worship are very numerous. Besides St. Paul's cathedral and the collegiate church at Westminster, there are 102 parish-churches, and 69 chapels, of the established church, with a great number of foreign Protestant churches, chapels for dissenters, synagogues for the Jews, and catholic chapels; in all upwards of 460 places devoted to religious worship. The royal palaces are St. James, an ancient building; the royal town residence called the Queen's Palace, and sometimes Buckingham's House; Charlton House, the residence of the prince of Wales, and the Banqueting House, at White Hall. Besides there are many elegant houses of the princes of the blood, and of the nobility and gentry. The other public buildings in London and its liberties, are far too numerous to be mentioned in this work; many of them are exceedingly magnificent. We shall just enumerate the following: viz. Westminster Hall, Guildhall of the City, the Sessions House, the Tower, the Horse Guards, the Treasury, the Admiralty, Somerset Place, the British Museum, the Royal Exchange, the Bank of England, the Custom House, the Excise Office, the East India House, the South Sea House, the Mansion House, the Monument, London Bridge, Westminster Bridge, and Blackfriars Bridge; all these are worthy of particular notice. We must pass over the inns of court for the study of the law; the colleges, learned societies, and public seminaries, the halls of different trading companies, noble hospitals, &c. The total population of London is estimated at about one million of inhabitants; who, according to a moderate estimate, are calculated to consume provisions weekly to the amount of 228,652*l.* 12*s.* 10*d.* and clothes, fuel, candles, paper, pens, ink, wax, snuff, pipes, tobacco, &c. to the amount of 415,104*l.* 3*s.* 4*d.* which, with the addition of 4,000*l.* per week for corn, hay, and beans to horses, makes in all 647,756*l.* 16*s.* 2*d.* per week, or 33,783,354*l.* 0*s.* 8*d.* per annum. This great and populous city is happily supplied with abundance of fresh water from the Thames and the New River; which is not only of inconceivable service to every family, but by means of fire-plugs every where dispersed, the keys of which are deposited with the parish-officers, the city is in a great measure secured from the spreading of fire; for these plugs are no sooner opened, than vast quantities of water supply the engines. This plenty of water has been attended with another advantage; it has given rise to several companies, who insure houses and goods from fire, the premium is small, and the recovery in case of loss is easy and certain. Each of these offices keeps a set of men in pay, who are ready at all hours to give their assistance in case of fire; and who are extremely bold, dexterous, and diligent. This city may be justly styled the centre of trade; it has an intimate connection with all the counties in the kingdom; and is the grand mart of the nation, to which all parts send their commodities, whence they are again sent back into every town in the nation, and to every part of the world. Hence innumerable carriages by land and water are constantly employed; and hence arises that circulation in the national body which renders every part healthful, vigorous, and prosperous. Merchants are here as rich as noblemen; witness their incredible loans to government; and there is no place in the world where the shops of tradesmen make such a grand and elegant appearance, or are better stocked. The Thames, on the banks of which London is situated, is a river which, though not the largest, is the richest and most commodious for commerce of any in the world. It is continually filled with fleets, sailing to or from distant climates: and its banks, from London-bridge to

Blackwall, form almost one continued magazine of naval stores; containing three large wet docks, 32 dry docks, and 33 yards for building ships for the use of the merchants; besides the places allotted for building boats and lighters, and the king's yards lower down for building men of war. As the city is about 60 miles distant from the sea, it enjoys, by means of this beautiful river, all the benefits of navigation, without the danger of being surprised by foreign fleets, or of being annoyed by the moist vapours of the ocean.

LONDON, NEW, a county and sea-port of Connecticut, on the W. side of the Thames, eighty miles N. E. of New York.

LONDONDERRY, COLERAIN, or DERRY, a county of Ireland, in the province of Ulster. It is bounded on the S. and S. W. by Tyrone; on the E. by Antrim, from which it is parted by the Bann; W. and N. W. by Donegal, and N. by the Dencaledonian ocean. Its greatest length is about 36 miles, its breadth 30, containing about 251,510 acres. The bogs and heaths of this county are manured with sea-shells. It is noted for a very clear river called the Baon, abounding with salmon.

LONDONDERRY, or DERRY, the capital of the above county, and the see of a bishop, stands at the bottom of Lough-Foyle. It has a good port, to which ships of the greatest burden have access, and a considerable trade. Lon. 7. 5. W. Lat. 55. 4. N.

LONG, JAMES LE, a French writer of the 17th century, born at Paris in 1666. He was a priest of the Oratory, and librarian of St. Honoré. He published, 1. *Bibliotheca Sacra*; 2 vols. folio, 1723; 2. *Bibliothèque de la France*; fol. 3. *A Historical Discourse on Polyglott Bibles*. He died at Paris in 1721.

LONG, ROGER, D. D. a native of Norfolkshire, was educated at Cambridge; where he became master, of Pembroke-hall, and Lowndes's professor of astronomy. He was also rector of Cheryhinton in Huntingdonshire, and of Bradwell juxta mare in Essex. Dr. Long is known as the author of a valuable treatise of *Astronomy* in 2 vols. 4to. and as the inventor of a curious astronomical machine. This is a hollow sphere 18 feet in diameter, and capable of containing 30 persons. Withinside the surface, which represents the heavens, are painted the stars and constellations, with the zodiac, meridians, and axis, parallel to the axis of the world, upon which it is easily turned round by means of a winch. Dr. Long published also a *Commencement Sermon* in 1728; and an answer to Dr. Galley's pamphlet on Greek Accents. He died Dec. 16th, 1770, aged 91.

LONGEVITY, [*longævus*, Lat.] Immediately after the creation, when the world was to be peopled by one man and one woman, the ordinary age was 900 and upwards. See *ANTEDILUVIANS*. Immediately after the flood, when there were three persons to stock the world, their age was cut shorter, and none of those patriarchs, but Shem, arrived at 600. In the second century we find none that reached 240; in the third none but Terah that came to 200 years; the world, at least a part of it, by that time being so well peopled, that they had built cities, and were cantoned out into distant nations. By degrees, as the number of people increased, their longevity dwindled, till it came down, to 70 or 80 years; and there it stood and has continued to stand ever since the time of Moses. That the common duration of man's life has been the same in all ages since the above period, is plain both from sacred and profane history. Yet instances of lives greatly exceeding that period, are not only to be found in the history of all ages and countries, but even in our own country and in the present age. Mr. Whitehurst, in his *Inquiry into the Origin and Strata of the Earth*, has given a list (since enlarged by Dr. Fothergill,) of 32 persons, who died between 1635 and 1781, all of whom had lived above a century, most of them considerably longer, and one who was living in 1780, had attained the astonishing age of 175! Lord Bacon assures us from the most incontestable evidence, that A. D. 76, when a general taxation was made over the Roman empire, by Vespasian, there were found living in Italy, between the Appennines and the Po, no fewer than 124 persons aged 100 and upwards. Of these 54 were 100 years old; 57 were 110; two 125; four 130; four 136; and three 140 years old each: besides 19 others in Parma, Placentia, Faventia, Rimini, &c. of whom six were 110 years old, seven 120, one 125, two 130, one 131, one 132, and one 150! From the various instances of longevity given by Mr. Whitehurst and others, we shall only select a few of the most remarkable:

Names.	Ages.	Places of Birth, Abode, or Death
Hippocrates.....	104	Isle of Coos B. C. 358
Democritus.....	102	Abdera..... 361
Galen.....	140	Pergamus..... A. D. 271
Marcus Aponius.....	150	Rimino.....
Titus Fullonius.....	150	Bononia.....
Mark Albana.....	150	Ethiopia.....
Lewis Cornaro.....	100	Venice..... 1566
Thomas Parre.....	152	Shropshire..... 1635
James Bowles.....	152	Killingworth..... 1656
Henry Jenkins.....	169	Yorkshire..... 1670
Robert Montgomery.....	126	Yorkshire..... 1670
James Sands.....	140	Staffordshire.....
Countess of Desmond.....	140	Ireland.....
Countess of Eccleston.....	143	Ireland..... 1691
Margaret Scott.....	125	Dalkeith.....
R. Blackeney, Esq.....	114	Armagh.....
Marq. of Winchester.....	106	Hampshire.....
Kath. M'Kenzie.....	117	Fowlis, Ross-shire.....
Col. T. Winslow.....	146	Ireland..... 1766
John Mount.....	136	Scotland..... 1766
Francis Consist.....	150	Yorkshire..... 1768
Francis Bons.....	121	France..... 1769
C. J. Drakenberg.....	146	Norway..... 1770
Kenneth Munro of In veran.....	100	Kiltearn, Ross-shire..... 1775
Marg. Patton.....	138	Lochwinnoch.....
Mary Yates.....	128	Shropshire..... 1776
A. Goldsmith.....	140	France..... 1776
Countess of Loudoun.....	100	Loudoun..... 1779
M. Laurence.....	140	Orkney.....
Janet Taylor.....	108	Fintary..... 1780
Louisa Truxo, a negress.....	175	Tuconea S. America..... 1780
Jane Reeves.....	103	Essex..... 1781
Evan Williams.....	145	Carmarthenshire..... 1782
John Wilson.....	116	Suffolk..... 1782
J. Brown, Esq.....	107	Fowlis, Ross-shire..... 1782
Alex. Ewart.....	104	Dumfries-shire..... 1789
John Jacobs.....	121	Mount Jura..... 1790
Helen Gray.....	105	Fifeshire..... 1791
Matthew Tait.....	123	Ayrshire..... 1792
Donald M'Leod.....	104	Isle of Sky..... 1792
Tho. Garric.....	108	Fifeshire..... 1792

Mr. J. Easton, in order to supply better materials for others, published, a few years since, a much greater collection of instances of this kind, though probably but a small part of what have actually occurred. His list consists of 1712 persons, who are stated to have died at the following ages:

From 100 to 110 years	1310
110 to 120	277
120 to 130	84
130 to 140	26
140 to 150	7
150 to 160	3
160 to 170	2
170 to 185	3
	1712

Such a number of instances would furnish many useful conclusions; but most accounts of this kind contain little more than the name, age, and place of the death, of the person mentioned, from which of course little information can be gained. Sir J. Sinclair, in an Essay on Longevity, has endeavoured to excite a more general interest on this subject, which has by no means been investigated with the attention it deserves. Although longevity evidently prevails more in certain districts than in others, yet it is by no means confined to any particular nation or climate; for instances of it are to be found in almost every quarter of the globe. Longevity does not depend, so much as has been supposed, on any particular climate, situation, or occupation in life: for it often prevails in places where all these are extremely dissimilar; and it would, moreover, be difficult, in the histories of a number of different persons remarkable for longevity, to find any circum-

stance common to them all, except perhaps, that of being born of healthy parents, and of being inured to daily labour, temperance, and simplicity of diet. Among the inferior ranks of mankind, therefore, we find the most numerous instances of longevity; even frequently, when other external circumstances are extremely unfavourable: as in the case of the poor sexton of Peterborough, who, notwithstanding his unpromising occupation among dead bodies, lived long enough to bury two crowned heads, and to survive two complete generations. The aliment of Henry Jenkins and old Parre, is said to have consisted chiefly of the coarsest fare, as they depended on precarious alms. It is allowed on all hands, that, the luxury and refinements of large cities are destructive to the human species; and this consideration alone, perhaps, more than counterbalances all the boasted privileges of a city-life. Nor is it luxury alone that shortens human life in large cities. The want of pure air is a most powerful cause. Every thing, that is most essentially necessary to life, may be comprised under the six following heads: 1. Air and climate; 2. Meat and drink; 3. Motion and rest; 4. The secretions and excretions; 5. Sleep and watching; 6. Affections of the mind. A proper attention to these particulars so as to observe a due medium in each, and to regulate them according to the dictates of reason, and the order and appointment of the Creator, will be found the best natural method of securing long life; for our frame is so constituted, that its genuine preservative is temperance.

LONGFORD, a county of Ireland, in the N. W. of the province of Leinster. It has a tolerably good soil, but much encumbered with marshes; and is about 25 miles long and 16 broad.

LONGFORD, the capital of the above county, 64 miles N.W. by W. of Dublin. Lon. 8. 0. W. Lat. 53. 42. N.

LONGIMETRY, [*longus*, and *metron*,] the art of measuring lengths, both accessible and inaccessible. See **MENSURATION**, and **TRIGONOMETRY**.

LONGING, a preternatural appetite in pregnant women, and in some sick persons when about to recover. It is called *pica*, from the bird of that name, which is said to be subject to the same disorder. It consists of a desire of unusual things to eat and drink, and in being soon tired of one and wanting another. It is called *Malacia*, from *μαλακία*, weakness. Chlorotic girls, and men who labour under suppressed hemorrhoids, are very subject to this complaint, and are relieved by promoting the respective evacuations. In general, whether this disorder is observed in pregnant women, in persons recovering from an acute fever, or in those who labour under obstructions of the natural evacuations, this craving of the appetite should be indulged.

LONGINUS, **DIONYSIUS**, a celebrated Greek critic of the third century, by some said to have been born in Athens, by others in Syria. His father's name is unknown, but by his mother he was allied to the celebrated Plutarch. His youth was spent in travelling with his parents, which gave him an opportunity to increase his knowledge, and improve his mind. After his travels, he fixed his residence at Athens, and with the greatest assiduity applied to study. Here he published his Treatise on the Sublime; which raised his reputation to such a height, and gave the Athenians such an opinion of his judgement and taste, that they made him sovereign judge of all authors, and every thing was received or rejected by the public, according to his decisions. He seems to have staid at Athens a long time; here he taught the academic philosophy, and among others had the famous Porphyry for his pupil. But it was at length his fortune to be drawn from Athens, and to mix in more active scenes; to train up young princes to virtue and glory; to guide the busy passions of the great to noble objects; to struggle for, and at last to die, in the cause of liberty. Zenobia, queen of the East, prevailed on him to undertake the education of her sons; and he soon gained an uncommon share in her esteem: she spent the vacant hours of her life in his conversation, and modelled her sentiments and conduct by his instructions. That princess was at war with Aurelian; and being defeated by him near Antioch, was compelled to shut herself up in Palmyra, her capital city. The emperor wrote her a letter, in which he ordered her to surrender; to which she returned an answer, drawn up by Longinus, which filled him with resentment. The emperor laid siege to the city; and the Palmyrians were at length obliged to surrender. The queen and Longinus de-

voured

vonred to fly into Persia; but were overtaken and made prisoners, when on the point of crossing the Euphrates. The queen intimidated weakly laid the blame of vindicating the liberty of her country on its true author; and the brave Longinus, to the disgrace of the conqueror, was immediately executed. The writings of Longinus were numerous, some on philosophical, but the greater part on critical subjects. Dr. Pearce has collected the titles of 25 treatises, none of which, excepting that on the Sublime, have escaped the depredations of time and barbarians. On this imperfect piece the great fame of Longinus is raised, who, as Pope expresses it—"is himself the great sublime he draws." The best editions of his works are those of Tollius, printed at Utrecht in 1694, cum notis variorum, and that of Toup, 8vo. 1778, Oxford. It has been well translated into English by Mr. Smith.

LONG ISLAND, an island of New York separated, from the continent by a narrow channel. It extends from the city of New-York 140 miles E. terminating with Montauk point; and is 10

miles broad. It is divided into three counties, King's, Queen's, and Suffolk. The S. side is flat land, of a light sandy soil, well calculated for raising Indian corn. The N. side is hilly, and of a strong soil, adapted to grain, hay, and fruit.

LONGITUDE, [*longitudo*, Lat.] in astronomy, an arc of the ecliptic contained between the first point of Aries, and a great circle passing through the pole of the ecliptic and any given point of the heavens: thus, the longitude of a star is an arc of the ecliptic, intercepted between the beginning of Aries, and the point of the ecliptic cut by the star's circle of longitude. It is usually reckoned in signs and degrees, and is expressed by saying the longitude of the object, as star, planet, &c. is so many degrees, &c. of such a sign. See **ASTRONOMY**.

LONGITUDE, in geography, an arc of the equator contained between the first meridian and the meridian of any place; or, the degrees of the equator from the first meridian to that of the place. See **GEOGRAPHY**.

LONGITUDE.

LONGITUDE, in navigation, an arc of the equator contained between the meridian of the ship and any known meridian, and is therefore the same with longitude in geography. See **NAVIGATION**. To find the longitude of a ship at sea, is a problem to which the attention of navigators and mathematicians has been drawn ever since navigation began to be improved. The importance of this problem soon became so well known, that, in 1598, Philip III. of Spain offered a reward of 1000 crowns for the solution; and his example was soon followed by the States General, who offered 10,000 florins. In 1714 an act was passed in the British parliament, empowering certain commissioners to make out a bill for a sum not exceeding 2000*l.* for defraying the necessary expences of experiments for ascertaining this point; and likewise granting a reward to the person who made any progress in the solution, proportionable to the degrees of accuracy with which the solution was performed: 10,000*l.* was to be granted if the longitude should be determined to one degree of a great circle, or 60 geographical miles; 15,000*l.* if to two-thirds of that distance; and 20,000*l.* if to the half of the distance. In consequence of these offered rewards, innumerable attempts were made to discover this important secret. The first was that of John Mohin professor of mathematics at Paris, who proposed it to Cardinal Richelieu; and though it was judged insufficient on account of the imperfection of the lunar tables, a pension of 2000 livres per annum was procured for him in 1645 by Cardinal Mazarine. Gemma Frisius had indeed, in 1530, projected a method of finding the longitude by means of watches, which at that time were newly invented; but the structure of these machines was then by far too imperfect to admit of any attempt; nor even in 1631, when Metius made an attempt to this purpose, were they advanced in any considerable degree. About 1604, Dr. Hooke and Mr. Huygens made a very great improvement in watchmaking, by the application of the pendulum-spring. Dr. Hooke having quarrelled with the ministry, no experiment was made with any of his machines; but many were made with those of Mr. Huygens. One experiment, particularly, made by Major Holmes, in a voyage from the Coast of Guinea in 1665, answered so well, that Mr. Huygens was encouraged to improve the structure of his watches; but it was found that the variations of heat and cold produced such alterations in the rate of going of the watch, that unless this could be remedied, the watches could be of little use in determining the longitude. The first who succeeded in any considerable degree by means of time-keepers was Mr. John Harrison; who, in 1726, produced a watch which went so exactly, that for ten years together it did not err above one second in a month. In 1736 it was tried in a voyage to Lisbon and back again, on board one of his Majesty's ships; during which it corrected an error of a degree and an half in the computation of the ship's reckoning. In consequence of this he received public encouragement to go on; and by the year 1761 had finished three time-keepers, each of them

more accurate than the former. The last turned out so much to his satisfaction, that he now applied to the commissioners of longitude for leave to make an experiment with his watch in a voyage to the West Indies. Permission being granted, his son Mr. William Harrison set out in his Majesty's ship the *Deptford* for Jamaica in the month of November 1761. This trial was attended with all imaginable success. The longitude of the island, as determined by the time-keeper, differed from that found by astronomical observations only one minute and a quarter of the equator; the longitudes of places seen by the way being also determined with great exactness. On the ship's return to England, it was found to have erred no more during the whole voyage than 1' 54½ in time, little more than 28 miles in distance; which being within the limits prescribed by the act, the inventor claimed the 20,000*l.* offered by government. Objections, however, were started. Doubts were pretended about the real longitude of Jamaica, as well as the manner in which the time had been found both there and at Portsmouth. It was alleged also, that although the time-keeper happened to be right at Jamaica, and after its return to England, this was by no means a proof that it had always been so in the intermediate times; in consequence of which allegations, another trial was appointed in a voyage to Barbadoes. Precautions were now taken to obviate as many of these objections as possible. The commissioners sent out proper persons to make astronomical observations at that island; which, when compared with others in England, would ascertain beyond a doubt its true situation. In 1764 then, Mr. Harrison junior set sail for Barbadoes; and the result of the experiment was, that the difference of longitude betwixt Portsmouth and Barbadoes was shewn by the time-keeper to be 3h. 55' 3"; and by astronomical observations to be 3h. 54' 20"; the error being now only 43" of time, or 10' 45" of longitude. In consequence of this and the former trials, Mr. Harrison received one-half of the reward promised, upon making a discovery of the principles upon which his time-keepers were constructed. He was likewise promised the other half of the reward, as soon as time-keepers should be constructed by other artists, which should answer the purpose as well as those of Mr. Harrison himself. At this time he delivered up all his time-keepers, the last of which was sent to Greenwich to be tried by Mr. Nevil Maskelyne the late astronomer royal. On trial, it was found to go with much less regularity than had been expected; but Mr. Harrison attributed this to his having made some experiments with it which he had not time to finish when he was ordered to deliver up the watch. Soon after this, an agreement was made by the commissioners with Mr. Kendall to construct a watch upon Mr. Harrison's principles; and this upon trial was found to answer the purpose even better than any that Harrison himself had constructed. This watch was sent out with Capt. Cook in 1772; and during all the time of his voyage round the world in 1772, 1773, 1774, and 1775, never erred quite 14½ seconds per day: in consequence

quence of which, the house of commons, in 1774, ordered the sum 10,000*l.* to be paid to Mr. Harrison. Still greater accuracy, however, has since been attained. A watch was lately constructed by Mr. Arnold, which during a trial of 13 months, from Feb. 1779 to Feb. 1780, varied no more than 6.69" during any two days; and the greatest difference between its rates of going on any day and the next to it was 4.11". The greatest error it would have committed therefore in the longitude during any single day would have been very little more than one minute of longitude; and thus might the longitude be determined with as great exactness as the latitude generally can. This watch, however, has not yet been tried at sea. After the discoveries made by Mr. Harrison, the act concerning the longitude was repealed, excepting so much of it as related to the constructing, printing, publishing, &c. of nautical almanacks and other useful tables. It was enacted also, that any person who shall discover a method for finding the longitude by means of a time-keeper, the principles of which have not hitherto been made public, shall be entitled to a reward of 5000*l.* if, after certain trials made by the commissioners, the said method shall enable a ship to keep her longitude during a voyage of six months within 60 geographical miles or a degree of a great circle. If the ship keeps her longitude within 40 geographical miles for that time, the inventor is entitled to a reward of 7500*l.* and to 10,000*l.* if the longitude is kept within half a degree. If the method is by improved astronomical tables, the author is entitled to 5000*l.* when they shew the distance of the moon from the sun and stars within 15 seconds of a degree, answering to about 7 minutes of longitude, after allowing half a degree for errors of observation, and under certain restrictions, and after comparison with astronomical observations for a period of 18½ years, during which the lunar irregularities are supposed to be completed. The same rewards are offered to the person who shall, with the like accuracy, discover any other method of finding the longitude. These methods require celestial observations; and any of the phenomena, such as the different apparent places of stars with regard to the moon, the beginning and ending of eclipses, &c. will answer the purpose: only it is absolutely necessary, that some variation should be perceptible in the phenomenon in the space of two minutes; for even this short space of time will produce an error of 30 miles in longitude. The most proper phenomena, therefore, for determining the longitude in this manner are the eclipses of Jupiter's satellites. Tables of their motions have been constructed, and carefully corrected from time to time, as the mutual attractions of these bodies are found greatly to disturb the regularity of their motions. The eclipses of Jupiter's satellites have commonly been preferred to those of the moon, for finding the longitude; because they are less liable to parallaxes than these are, and besides they afford a very commodious observation whenever the planet is above the horizon. Their motion is very swift, and must be calculated for every hour. Now, to find the longitude by these satellites: with a good telescope observe some of their phenomena, as the conjunction of two of them, or of one of them with Jupiter, &c. and at the same time find the hour and minute, from the altitudes of the stars, or by means of a clock or watch, previously regulated for the place of observation; then, consulting tables of the satellites, observe the time when the same appearance happens in the meridian of the place for which the tables are calculated; and the difference of time, as before, will give the longitude. The eclipses of the first and second of Jupiter's satellites are the most proper for this purpose; and, as they happen almost daily, they afford a ready means of determining the longitude of places at land, having indeed contributed much to the modern improvements in geography; and if it were possible to observe them with proper telescopes, in a ship under sail, they would be of great service in ascertaining its longitude from time to time. To obviate the inconvenience to which these observations are liable from the motions of the ship, Mr. Irwin invented what he called a marine-chair: this was tried by the late Dr. Maskelyne, in his voyage to Barbadoes; it was found quite useless. We shall, therefore, proceed to give some practical directions for finding the longitude at sea by proper celestial observations; exclusive of those from Jupiter's satellites, which, for reasons just mentioned, cannot be practised at sea. In the first place, however, it will be necessary to point out some of those difficulties which stand in the way, of finding the longitude, even by this method. These lie principally in the reduction of

the observations of the heavenly bodies made on the surface of the earth to similar observations supposed to be made at the centre; which is the only place where the celestial bodies appear in their proper situation. It is also very difficult to make proper allowances for the refraction of the atmosphere, by which all objects appear higher than they really are; and another difficulty arises from their parallaxes, which makes them, particularly the moon, appear lower than they would otherwise do, excepting when they are in the very zenith. It is also well known, that the nearer the horizon any celestial body is, the greater its parallax will be; and as the parallax and refraction act in opposite ways to one another, the former depressing, and the latter raising, the object, it is plain, that great difficulties must arise from this circumstance. The sun, for instance, whose parallax is less than the refraction, must always appear higher than he really is; but the moon, whose parallax is greater than her refraction, must always appear lower. To render observations of the celestial bodies more easy, the commissioners of longitude have caused an Ephemeris, or Nautical Almanack, to be published annually, containing every requisite for solving this important problem, which can be put into the form of tables. But, whatever may be done in this way, it will be proper to make the necessary preparations concerning the dip of the horizon, the refraction, semi-diameters, parallax, &c. in order to reduce the apparent to the true altitudes and distances. The principal observation for finding the longitude at sea, is that of the moon from the sun, or from some remarkable star near the zodiac. To do this, the operator must be furnished with a watch which can be depended upon, for keeping time within a minute for six hours; and with a good Hadley's quadrant, or, which is preferable, a sextant; and this last instrument will still be more fit for the purpose, if it be furnished with a screw for moving the index gradually; likewise an additional dark glass, but not so dark as the common kind, for taking off the glare of the moon's light in observing her distance from a star. A small telescope, which may magnify three or four times, is also necessary to render the contact of a star with the moon's limb more discernible. A magnifying-glass of one and a half, or two inches, focus, will assist the operator in reading off his observations with the greater facility.

1. *To Make the Observation.* Having examined and adjusted his instrument as well as possible, the observer is next to proceed in the following manner: when the distance of the moon from the sun is to be observed, turn down one of the screens; look at the moon directly through the transparent part of the horizon-glass; and keeping her in view, gently move the index till the sun's image be brought into the silvered part of that glass. Bring the nearest limbs of both objects into contact, and let the quadrant librate a little on the lunar ray; by which means the sun will appear to rise and fall by the side of the moon; in which motion the nearest limbs must be made to touch one another exactly by moving the index. The observation is then made; and the division coinciding with that on the Vernier scale, will shew the distance of the nearest limbs of the objects. When the distance of the moon from a star is to be observed, when the moon is very bright, turn down the lightest screen, or use a dark glass lighter than the screens, and designed for this particular purpose; look at the star directly through the transparent part of the horizon-glass; and keeping it there, move the index till the moon's image is brought into the silvered part of the same glass. Make the quadrant librate gently on the star's ray, and the moon will appear to rise and fall by the star: move the index between the librations, until the moon's enlightened limb is exactly touched by the star, and then the observation is made. In these operations the plane of the quadrant must always pass through the two objects, the distance of which is to be observed; and for this purpose it must be placed in various positions according to the situation of the objects, which will soon be rendered easy by practice. The observations being made, somebody, at the very instant when the operator calls, must observe by the watch the exact hour, minute, and quarter-minute, if there be no second hand, in order to find the apparent time; and at the same instant, or as quick as possible, two assistants must take the altitudes of those objects, the distance of which is observed; after which, the observations necessary for finding the longitude are completed. The ephemeris shews the moon's distance from the sun, and likewise from proper stars, to every three hours of apparent time for the meridian of Greenwich; and

that the greater number of opportunities of observing this luminary may be given, her distance is generally set down from at least one object on each side of her. Her distance from the sun is set down while it is between 40 and 120 degrees; so that, by means of a sextant, it may be observed for two or three days after her first, and before her last, quarter. When the moon is between forty and ninety degrees from the sun, her distance is set down both from the sun, and from a star on the contrary side; and, lastly, when the distance is above 120 degrees, the distance is set down from two stars, one on each side of her. The distance of the moon from objects on the east side of her is found in the ephemeris, in the eighth and ninth pages of the month; and her distance from objects on the west, is found in the tenth and eleventh pages of the month. When the ephemeris is used, the distance of the moon must only be observed from those stars, the distance of which is set down there; and these afford a ready means of knowing the star from which her distance ought to be observed. The observer has then nothing more to do, than to set his index to the distance roughly computed at the apparent time, estimated nearly for the meridian at Greenwich; after which he is to look to the E. or W. of the moon, according as the distance of the star is found in the eighth or ninth, or in the tenth or eleventh, pages of the month; and having found the moon upon the horizon-glass, the star will easily be found by sweeping with the quadrant to the right or left, provided the air be clear, and the star be in the line of the moon's shortest axis produced. The time at Greenwich is estimated by turning into time the supposed longitude from that place, and adding it to the apparent time at the ship, or subtracting it from it as occasion requires. The distance of the moon from the sun, or a star, is roughly found at this time, by saying, as 150 minutes (the number contained in three hours) is to the difference in minutes between this nearly estimated time, and the next preceding time set down in the ephemeris; so is the difference in minutes between the distances in the ephemeris for the next preceding, and next following, times, to a number of minutes; which, being added to the next preceding distance, or subtracted from it according as it is increasing or decreasing, will give the distance nearly at the time the observation is to be made, and to which the index must be set. An easier method of finding the angular distance is, by bringing the objects nearly into contact in the common way, and then fixing the index tight to a certain degree and minute; waiting until the objects are nearly in contact, giving notice to the assistants to get ready with the altitudes; and when the objects are exactly in contact, to call for the altitudes, and the exact time by the watch. The observer may then prepare for taking another distance, by setting his index three or five minutes backwards, or forwards, as the objects happen to be receding from, or approaching to, each other, thus proceeding to take the distance, altitudes, and time, by the watch, as before. Thus the observer may take as many distances as he thinks proper; but four at the distance of three minutes, or three at the distance of four minutes, will at all times be sufficient. Thus, not only the eye of the observer will be less fatigued, but he will likewise be enabled to manage his instrument with much greater facility in every direction, a vertical one only excepted. If, in taking the distances, the middle one can be taken at any even division on the arch, such as a degree, or a degree and twenty or forty minutes, that distance will be independent of the Nonius division, and consequently free of those errors which frequently arise from the inequality of that division in several parts of the graduated arch. The observation ought always to be made about two hours A. M. or P. M. and the true time may be found by the altitude of the sun taken at the precise time of the distance. If three distances be taken, then find the time by the altitude corresponding with the middle-distance; and thus the observation will be secured from any error arising from the irregularity of the going of the watch. As the time, however, found by the altitude of a star cannot be depended upon, because of the uncertainty of the horizon in the night, the best way of determining the time for a night-observation will be by two altitudes of the sun; one taken on the preceding afternoon, before he is within six degrees of the horizon; and the other on the next morning, when he is more than six degrees high. It must be observed, however, that in order to follow these directions, it is necessary that the atmosphere should be pretty free from clouds; otherwise the observer must take the observations at such times as he can best obtain them.

2. *To Reduce the Observed Distance of the Sun, or a Star, from the Moon, to the True Distance.* 1. Turn the longitude into time, and add it to the time at the ship if the longitude be W. but subtract it if it be E. which will give the supposed time at Greenwich; and this we may call reduced time. 2. Find the nearest noon or midnight both before and after the reduced time in the seventh page of the month in the ephemeris. 3. Take out the moon's semi-diameter, and horizontal parallaxes, corresponding to these noons and midnights, and find their differences. Then say, as twelve hours is to the moon's semi-diameter in twelve hours, so is the reduced time to a number of seconds; which, either added to, or subtracted from, the moon's semi-diameter at the noon or midnight just mentioned, according as it is increasing or decreasing, will give her apparent semi-diameter; to which add the correction from Table VIII. of the ephemeris, and the sum will be her true semi-diameter at the reduced time. And as twelve hours is to the difference of the moon's horizontal parallax in twelve hours, so is the reduced time to a fourth number; which, being added to, or subtracted from, the moon's horizontal parallax at the noon or midnight before the reduced time, according as it is increasing or decreasing, the sum or difference will be the moon's horizontal parallax at the reduced time. 4. If the reduced time be nearly any even part of twelve hours, viz. one-sixth, one-fourth, &c. these parts of the difference may be taken, and either added or subtracted according to the directions already given, without being at the trouble of working by the rule of proportion. 5. To the observed altitude of the sun's lower limb add the difference betwixt his semi-diameter and dip; and that sum will be his apparent altitude. 6. From the sun's refraction take his parallax in altitude, and the remainder will be the correction of the sun's altitude. 7. From the star's observed altitude take the dip of the horizon, and the remainder will be the apparent altitude. 8. The refraction of a star will be the correction of its altitude. 9. Take the difference between the moon's semi-diameter and dip, and add it to the observed altitude if her lower limb was taken, or subtract it if her upper limb was taken; and the sum or difference will be the apparent altitude of her centre. 10. From the proportional logarithm of the moon's horizontal parallax, taken out of the nautical almanack (increasing its index by ten), take the logarithmic cosine of the moon's apparent altitude, the remainder will be the proportional logarithm of her parallax in altitude; from which take her refraction, and the remainder will be the correction of the moon's altitude. 11. To the observed distance of the moon from a star add her semi-diameter if the nearest limb be taken, but subtract it if the farthest limb was taken, and the sum or difference will be the apparent distance. 12. To the observed distance of the sun and moon add both their semi-diameters, and the sum will be the apparent distance of their centres.

3. *The find the true Distance of the Objects, having their apparent Altitudes and Distances.* Several rules for this purpose have been published, the principal object of which seems to have been to abbreviate the computations requisite for determining the true distance of the centre of the sun or a star from the moon's centre. This, however, should have certainly been less attended to than the investigation of the solution, in which considerable errors in the data may produce a small error in the required distance. When either of the luminaries has a small elevation, its altitude will be affected by the variableness of the atmosphere; likewise the altitude, as given by the quadrant, will be affected by the inaccuracy of the instrument, and the uncertainty necessarily attending all observations made at sea. The sum of these errors when they all tend the same way, may be supposed to amount to at least one minute in altitude; which, in many cases, according to the common rules for computing the true distance, will produce an error of about thirty minutes in the longitude. Perhaps the only method of determining the distance, so as not to be affected by the errors of altitude, is that by first finding the angles at the sun and moon, and by the help of them the correction of distance for parallax and refraction. The rule is as follows: Add together the complement of the moon's apparent altitude, the complement of the sun's apparent altitude, and the apparent distance of centres; from half the sum of these subtract the complement of the sun's altitude, and add together the logarithmic co-secant of the complement of the moon's altitude, the logarithmic co-secant of the apparent distance of centres, the logarithmic

sine of the half sun, and the logarithmic sine of the remainder; and half the sum of these four logarithms, after rejecting twenty from the index, is the log. cosine of half the angle at the moon. As radius is to the cosine of the angle at the moon, so is the difference between the moon's parallax and refraction in altitude to a correction of distance; which is to be added to the apparent distance of centres when the angle of the moon is obtuse; but to be subtracted when that angle is acute, in order to have the distance once corrected. In the above formula, if the word sun be changed for moon, and vice versâ, wherever these terms occur, we shall find a second correction of distance to be applied to the distance, once corrected by subtraction when the angle at the sun is obtuse, but by addition when that angle is acute, and the remainder or sum is the true distance nearly. In applying this rule, it will be sufficient to use the complement, altitudes, and apparent distances of centres, true to the nearest minute only, as a small error in the angles at the sun and moon will very little affect the corrections of distances. If D be the computed distance in seconds, d the difference between the moon's parallax and refraction in altitude, S the sine of the angle at the moon, and R the

radius; then $\frac{a^2 - b^2}{2DR}$ will be a third correction of distance, to be

added to the distance twice corrected: but it is plain, from the nature of this correction, that it may be always rejected, except when the distance D is very small, and the angle at the moon nearly equal 90° . This solution is likewise of use in finding the true distance of a star from the moon, by changing the word sun into star, and using the refraction of the star, instead of the difference between the refraction and the parallax in altitude of the sun, in finding the second correction of distance.

Examp. Given the apparent distance of a star from the centre of the moon, $50^{\circ} 8' 41''$; the moon's altitude, $55^{\circ} 35' 50''$; the star's altitude, $19^{\circ} 18' 5''$; and the moon's horizontal parallax, $1^{\circ} 0' 5''$: required the true distance?

Cosec. 0.02512 λ 's co. alt. 70° 42'

D's co. alt. 34 4—Cosec. 0.25169

Cosec. 0.11479 obs. dist. 50 9—Cosec. 0.11479

2154 55

Sine 9.98950 77 27— Sine 9.98950

Rem. 6 45— Sine 9.07018

Sine 9.83688	Rem. 43 23	2)19.42616
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2) 19.96629 — Cosine 9.71303 58° 54'

Cosine 9·98314 15° 54' ~
D's angle 117 48

*'s angle $3t - 48$

Rad. : Cosine $117^{\circ} 48'$:: Δ 's diff. parall. and refrac. $1980''$:
 $923'' = 1^{\text{st}}$ correct. of distance.

Rad. : Cosine $31^{\circ} 48'$: $\frac{1}{2}$'s retrac. $162''$: $138'' = 2d$ correct. of distance.

Here the first correction of distance is additive, since the angle at the moon is obtuse; and the second correction is also additive, since the angle at the star is acute: therefore their sum $923'' + 138'' = 1061'' = 17' 41''$, being added to $50^{\circ} 8' 11''$, the apparent distance of the star from the moon's centre, gives $50^{\circ} 26' 22''$ for the true distance of centres nearly; and $2 \times L(d + S) - L(2LE + L2 + LI)$ is $L 8''$, which, being added to the distance twice corrected, gives $50^{\circ} 26' 30''$ for the true distance.

4. To *Determine the Longitude, after having obtained the True Distance.* Look in the ephemeris among the distances of the objects for the computed distance between the moon and the other object observed on the given day. If it be found there, the time at Greenwich will be at the top of the column; but if it falls between two distances in the ephemeris which stand immediately before and after it, and also the difference between the distance standing before, and the computed distance; then take the proportional logarithms of the first and second differences, and the difference between these two logarithms will be the proportional logarithm of a number of hours, minutes, and seconds; which, being added to the time standing over the first distance, will give the true time at Greenwich. Or it may be found by saying, as the first difference is to three hours, so is the second difference to a proportional part of time; which, being added as above directed, will give the time at Greenwich. The difference between Greenwich time and that at the ship, turned into longitude, will be that at the time the observations were made; and will be E. if the time at the ship is greatest, but W. if it is least. For example, if the time of a celestial phenomenon be observed at 18 m. $9\frac{1}{2}$ s. past three of the morning of June 1, at Port Jackson; and the same phenomenon is calculated in the ephemeris to take place at Greenwich Observatory at 5 h. 13 m. $15\frac{1}{2}$ s. in the evening of May 31, the longitude of the Port is hence known to be $151^{\circ} 13' 30''$ to the east of the Greenwich Observatory. Besides the above there are other methods of finding the longitude of a ship; one of these, much used in short voyages, is by estimation from the direction of the ship's course, and the rate of her sailing. Were it possible to keep an accurate account of the distance the ship has run, and to measure it exactly by the log (see Log), or any other means, then both latitude and longitude would easily be found by settling the ship's account to that time. For the course and distance being known, the difference of latitude and departure is readily found by the Traverse Table; and the difference of longitude being known, the longitude and latitude will also be known. A variety of causes, however, concur to render this computation inaccurate; particularly the ship's continual deflection from the course set by her playing to the right and left round her centre of gravity; the unequal care of those at the helm, and the distance supposed to be sailed being erroneous, on account of stormy seas, unsteady winds, currents, &c. for which it seems impossible to make any allowance. The place of the ship, however, is judged of by finding the latitude every day, if possible, by observations; and if the latitude found by observation agrees with that by the reckoning, it is presumed that the ship's place is determined; but if they disagree, it is concluded that the account of the longitude stands in need of correction, as the latitude by observation is always to be depended upon. For an account of this method, and other particulars relating to the subject, see NAVIGATION.

LONGITUDE OF MOTION, according to some philosophers, is the distance which the centre of any moving body runs through, as it moves on in a right line.

LONGITUDINAL, in general, denotes something placed lengthwise: thus some of the fibres of the vessels in the human body are placed longitudinally, others transversely, or across.

LONGOMONTANUS, CHRISTIAN, a learned astronomer, born in a village of Denmark in 1562. He was the son of a ploughman, and was obliged to suffer, during his studies, many hardships, dividing his time, like the philosopher Cleanthes, be-

twice the cultivation of the earth and the lessons he received from the minister of the place. At last, when he was fifteen, he stole away from his family, and went to Wiburg, where there was a college, in which he spent eleven years, and though he was obliged to earn a livelihood, he studied with such ardour, that among other sciences he learned the mathematics in great perfection. He afterwards went to Copenhagen; where the professors of that university in a short time conceived so high an opinion of him, that they recommended him to the celebrated Tycho Brahe. He lived eight years with that famous astronomer, and was of great

great service to him in his observations and calculations. At length, being extremely desirous of obtaining a professor's chair in Denmark, Tycho Brahe consented, though with some difficulty, to deprive himself of his service; gave him a discharge filled with the highest testimonies of his esteem; and furnished him with money for the expence of his journey. He obtained a professorship of mathematics in the University of Copenhagen in 1605, and discharged the duty of it worthily till his death, in 1647. He wrote many learned works, the chief of which is his *Astronomia Danica*, 1640, folio. He also endeavoured to square the circle, and thought he had made that discovery; but Dr. John Pell, an English mathematician, attacked him, and proved that he was mistaken.

LONGUEVILLE, a town of France, in the department of the Lower Seine, and the late province of Upper Normandy, 17 miles N. of Rouen. Lon. 1. 10. E. Lat. 49. 30. N.

LONGWY, a town of France, in the department of the Moselle, and late duchy of Lorraine, 15 miles S.W. of Luxemburg. Lon. 5. 51. E. Lat. 49. 30. N.

LONICERA, **HONEYSUCKLE**; in botany, a genus of the monogynia order, and pentandria class of plants. Corolla monopetalous, irregular; berry polyspermous, bilocular, inferior. There are nineteen species.

LONS, or **LONS LE SAUNIER**, a city of France, capital of the department of Jura. Lon. 5. 30. E. Lat. 46. 41. N.

LOO, a town of Holland, in the department of the Rhine, and late province of Guelderland, 8 miles W. of Deventer. Lon. 6. 0. E. Lat. 52. 18. N.

LOOE, an island in the British Channel, on the coast of Cornwall, 2 miles S.E. of East Looe.

LOOE, **EAST**, or **EAST LOOE**, an ancient borough of Cornwall, incorporated by charter from queen Elizabeth, seated on the east side of the Loo, 16 miles W. of Plymouth, and 232 W. S. W. of London.

LOOE, **WEST**, or **WEST LOO**, a borough of Cornwall on the west side of the Loo, opposite to East Looe. Lon. 4. 36. W. Lat. 50. 23. N.

LOOF, in the sea-language, is a term used in various senses; thus the loof of a ship is that part of her aloft which lies just before the chest-trees; hence the guns which lie there are called loof-pieces. Keep your loof, signifies, keep the ship near to the wind; to loof into a harbour, is to sail into it close by the wind; loof up, is to keep nearer the wind; to spring the loof, is when a ship that was going large before the wind, is brought close by the wind.

LOOF-TACKLE, is a tackle in a ship which serves to lift goods of small weight in or out of her.

LOOKING-GLASS, a plain glass-mirror, which, being rendered impervious to light, exhibits the images of such objects as are placed before it apparently at the same distance behind. Looking-glasses are made of plate-glass, which is cast and ground in the manner described under the article **GLASS**. When the plates are polished, fine blotting paper is spread on the table, and strewed over with levigated chalk which is covered with a thin leaf of tin-foil. Upon the latter is poured the purest quicksilver, that ought to be distributed uniformly over the leaf, with cotton or other soft substance: over the mercury, clean paper must be placed; and upon this, at length, the glass-plate is pressed down by the right-hand, while the paper is gently removed with the left. The plate is now covered with a thicker paper, or cloth, and a heavy weight laid on it, so that the superfluous quicksilver may be expressed, and the tin adhere closely to the glass: when it is sufficiently dry, the weights are taken off, and the work is complete. Looking-glasses are equally ornamental and useful in domestic life: hence they should not be exposed to accidents or placed against damp walls, or in other moist situations, where the quicksilver loses its tenacity, and the beauty of the glass will, in a short time be impaired. Those idle or conceited persons, who waste every day a certain portion of time, by examining their dress and countenance before a looking-glass, ought to bestow an equal share of attention on their moral scrutiny: thus, we trust, they will easily discover how to make a more proper and economical use of their leisure-hours, which are literally killed before a mirror, that exhibits only the surface of things. For the principles of looking-glasses, see **OPTICS**.

LOOK-OUT, in the sea-language, a watchful attention to some important object or event, which is expected to rise from the ex-

isting situation of a ship, &c. It is principally used in navigation, when there is a probability of danger from the real or supposed proximity of land, rocks, or enemies. There is always a look-out kept on a ship's fore-castle at sea, to watch for any dangerous objects lying near her track, and to which she makes a gradual approach as she advances: the mate of the watch accordingly calls often from the quarter-deck, "Look out afore there!" to the persons appointed for this service.

LOOK-OUT, **CAPE**, a cape of North Carolina. Lon. 76. 48. W. Lat. 34. 22. N.

LOOK-OUT, **CAPE**, a cape of Hudson's bay. Lon. 89. 10. W. Lat. 55. 30. N.

LOOL, in metallurgy, a vessel made to receive the washings of ores of metals.

LOOM, [from *glomus*, a bottom of thread, *Minshew*,] in weaving, a machine whereby many distinct threads are woven into one piece. Looms are of various structures, accommodated to the various kinds of materials to be woven, and the various manners of weaving them; viz. for woollens, silks, linens, cottons, cloths of gold: and other works, as tapestry, ribbands, stockings, &c. which will be found under their proper heads. See **WEAVING**. The weavers loom-engine, otherwise called the Dutch loom-engine, was brought into use from Holland to London, in or about 1676.

LOOM, in the sea-language: when a ship appears big, when seen at a distance, they say she looms.

LOOM-GALE, at sea, a gentle easy gale of wind, in which a ship can carry her top-sails a-trip.

LOOP, in the iron-works, is a part of a sow or block of cast iron broken or melted off from the rest, and prepared for the forge or hammer. The usual method is, to break off the loop of about three quarters of a cwt.

LOOP-HOLES, in a ship, are holes made in the coamings of the hatches of a ship, and in their bulk-heads, to fire muskets through, in a close fight.

LOOPING, in metallurgy, a word used by the miners of some counties of England, to express the running together of the matter of an ore into a mass, in the roasting or first burning, intended only to calcine it so far as to make it fit for powdering. This accident, which gives the miners some trouble, is generally owing to the continuing the fire too long in this process.

LOOSESTRIFE, [*lysimachia*, Lat.] an herb. See **LYSIMACHIA**.

LOOTS, a late county of Germany, in the bishopric of Liege, now included in the department of Ourte.

LOOTS, the capital of the above county, sixteen miles W. of Maestricht. Lon. 5. 19. E. Lat. 50. 52. N.

LOPEZ, or **INDIA-ROOT**, in the materia medica. The plant to which this article belongs is unknown. Neither the woody nor cortical part of the root has any perceptible sensible quality. A slight bitterness is perceptible; and it is recommended, like sirimarauba, in diarrhoeas even of the colliquative kind, in half-drachm doses four times a day. Little of this root has been brought to Europe: but some of those who have had an opportunity of employing it, speak in very high terms of the effects obtained from it.

LOPIUS, **FISHING-FROG**, **TOAD-FISH**, or **SEA-DEVIL**; a genus of fishes of the order cartilaginei. Head depressed; teeth numerous and sharp; mouth armed with teeth; pectoral fins brachiated. There are eight species.

L. EUROPEUS, or the **EUROPEAN ANGLER**, is a native of the European seas, and measures sometimes seven feet in length, but is generally about three, in shape similar to a tadpole.

L. HISTRIO, or the **HARLEQUIN ANGLER**, is a native of the Indian and American seas, and is a very curious and remarkable fish. See **PLATE LV**.

LORANTHUS, in botany, a genus of the hexandria monogynia class and order; natural order, *Aggregatæ*. Germ inferior; calyx none; corolla six-cleft, revolute; stamina at the tips of the petals; berry one-seeded. It has eighteen species, natives of warm climates.

LORARI, among the Romans, officers whose business it was, with whips and scourges, to compel the gladiators to engage.

LORD, a title of honour given to those who are noble either by birth or creation; amounting to much the same as peer of the realm. The title is by courtesy also given to all the sons of dukes and

and marquises, and to the eldest sons of earls. The Saxon word, *illaford*, is abbreviated from *illaford*, to *laford*, and *lord*. The etymology of the word (says J. Coates) is well worth observing; for it was composed of *illaf*, a loaf of bread, and *ford*, to give or afford; so that *illaford*, implied a giver of bread; because in those ages, such great men kept extraordinary houses, and fed all the poor; for which reason they were called givers of bread, a thing now much out of date, great men being fond of retaining the title, but few regarding the practice for which it was first given." See **LADY**.

LORDS, HOUSE OF, one of the three estates of parliament, is composed of the Lords Spiritual and Temporal. The following are among the peculiar privileges of the house of Lords: 1. One very ancient privilege is declared by the charter of the forest, confirmed in parliament, 9 Hen. III.; viz. that every lord spiritual or temporal summoned to parliament, and passing through the king's forests, may, both in going and returning, kill one or two of the king's deer without warrant; in view of the forester if he be present, or on blowing a horn if he be absent; that he may not seem to take the king's venison by stealth. 2. They have a right to be attended, and constantly are, by the judges of the court of king's bench and common pleas, and such of the barons of the exchequer as are of the degree of the coif, or have been made sergeants at law; also by the king's learned counsel, being sergeants, and by the masters of the court of chancery; for their advice in point of law, and for the greater dignity of their proceedings. The secretaries of state, with the attorney and solicitor-general, also used to attend the house of peers, and have to this day (together with the judges, &c.) their regular writs of summons issued out at the beginning of every parliament, ad tractandum et concilium impendendum, though not ad consentiendum: but, whenever of late years, they have been members of the house of commons, their attendance in the house of lords hath fallen into disuse. 3. Every peer, by licence obtained from the king, may make another lord of parliament his proxy, to vote for him in his absence: a privilege, which a member of the other house can by no means have, as he himself is but a proxy for a multitude of other people. 4. Each peer has a right, by leave of the house, when a vote passes contrary to his sentiments, to enter his dissent on the journal of the house, with the reasons for such dissent; which is usually styled his protest. 5. All bills, that may in their consequences any way affect the rights of the peerage, are by the custom of parliament to have their first rise in the house of peers, and to suffer no changes or amendments in the house of commons. 6. There is also one statute peculiarly relative to the house of lords; 6 Ann. c. 13, which regulates the election of the 16 representative peers of North Britain, in consequence of the 22d and 23d articles of the union: and for that purpose prescribes the oaths, &c. to be taken by the electors; directs the mode of balloting; prohibits the peers electing from being attended in an unusual manner; and expressly provides, that no other matter shall be treated of in that assembly, save only the election, on pain of incurring a praemunire; and a similar act was passed in 1800, regulating the elections of the Irish Peers. See **NOBILITY**, and **PEERS**.

1. **LORDS, SPIRITUAL**, consist of two archbishops and 24 bishops; and, at the dissolution of monasteries by Henry VIII. consisted likewise of 26 mitred abbots and two priors: a very considerable body, and in those times equal in number to the temporal nobility. All these hold, or are supposed to hold, certain ancient baronies under the king: for William I. thought proper to change the spiritual tenure of frankalmoin or free alms, under which the bishops held their lands during the Saxon government, into the feudal or Norman tenure by barony; which subjected their estates to all civil charges and assessments, from which they were before exempt; and in right of succession to those baronies, which were unalienable from their respective dignities, the bishops and abbots were allowed their seats in the house of lords. But though these lords spiritual are in the eye of the law a distinct estate from the lords temporal, and are so distinguished in most of our acts of parliament; yet in practice they are usually blended together under the name of the lords; they intermix in their votes, and the majority of such intermixture joins both estates. And from this want of a separate assembly, and separate negative of the prelates, some writers have argued very cogently, that the

lords spiritual and temporal are now in reality only one estate, which is unquestionably true in every effectual sense, though the ancient distinction between them still nominally continues. For if a bill should pass their house, there is no doubt of its validity, though every lord spiritual should vote against it; of which Selden and Sir Edward Coke give many instances: as, on the other hand, doubtless it would be equally good, if the lords temporal present were inferior to the bishops in number, and every one of those temporal lords gave his vote to reject the bill; though this Sir Edward Coke seems to doubt of it.

II. **LORDS, TEMPORAL**, consist of all the peers of the realm, (the bishops not being in strictness held to be such, but merely lords of parliament), by whatever title of nobility distinguished; dukes, marquises, earls, viscounts, or barons. Some of these sit by descent, as do all ancient peers; some by creation, as do all new made ones; others, since the union with Scotland, and lately with Ireland, by election, which is the case of the 16 Scots peers, and 30 Irish peers who represent the body of the Scots and Irish nobility. Their number is indefinite, and may be increased at will by the power of the crown: and once, in the reign of Queen Anne, there was an instance of creating no less than 12 together; in contemplation of which, in the reign of King George I. a bill passed the house of lords, and was countenanced by the then ministry, for limiting the number of the peerage. This was thought by some to promise a great acquisition to the constitution, by restraining the prerogative from gaining the ascendant in that august assembly, by pouring in at pleasure an unlimited number of new created lords. But the bill was ill relished, and miscarried in the house of commons, whose leading members were then desirous to keep the avenues to the other house as open and easy as possible. See **KING**, **NOBILITY**, **PARLIAMENT**, **PEER**; also **COMMONS**, and **COMMONALTY**.

LORD'S DAY. All persons not having a reasonable excuse, shall resort to their parish-church or chapel (or some congregation of religious worship allowed by the toleration act) on every Sunday, on pain of punishment by the censures of the church, and of forfeiting one shilling to the poor for every offence. To be levied by the churchwardens by distress, by warrant of one justice. The hundred shall not be answerable for any robbery committed on the Lord's day. No person upon the Lord's day shall serve or execute any writ, process, warrant, order, judgement, or decree (except in cases of treason, felony, or breach of the peace), but the service thereof shall be void. Public houses are shut during the usual hours of divine service.

LORDOSIS, [of λωδωσις, bent inwards,] in the medical writings, a name given to a distempered state of the spine, in which it is bent inwards, or toward the anterior parts. It is used in opposition to gibbous, or hump-backed.

LOREDO, a town of Italy, in the Polesin or Rovigo, on the Adige; 29 miles E. of Rovigo. Lon. 12. 50. E. Lat. 45. 5. N.

LORETTO, a town of Italy, in the Marche of Ancona. Lon. 13. 40. E. Lat. 43. 27. N.

LORGUES, a populous town of France, in the department of Var, and late province of Provence. Lon. 6. 27. E. Lat. 43. 30. N.

LORICA, in Roman antiquity, was a cuirass, brigantine, or coat of mail, in use among the soldiers. It was generally made of leather, and is supposed to be derived from *lorum*, a thong.

LORICATION or **COATING**, in chemistry, is the covering of a glass or earthen vessel with a coat or crust of a matter able to resist the fire.

LORNE, a division of Scotland, in Argyleshire, which extends about 30 miles in length from N. to S. and about nine at its utmost breadth.

LORRAIN, a late sovereign state of Europe, and province of France; now divided into four departments, viz. the Meuse, Meurthe, Moselle, and Vosges. It was bounded on the N. by Luxemburg and Treves; on the E. by Alsace and Deux Ponts; on the S. by Franche Comté, and on the W. by Champagne and Bar. It is about 100 miles long, and 75 broad; and abounds in corn, wine, hemp, flax, rapeseed, game, fish, and all the necessities of life. It has fine meadows and large forests, with mines of iron, silver, and copper; also salt-pits. The principal rivers are the Meuse, Moselle, Sâlle, Meurthe, and Sarre. It was divided into three parts; viz. 1. The duchy of Lorraine properly so called,

anciently a sovereign state. 2. The duchy of Barr, which formerly belonged to the dukes of Lorraine, but afterwards came under the government of France; and 3. The bishoprics of Metz, Toul, and Verdun, which have belonged to France ever since 1552.

LOSSIE-MOUTH, a sea-port of Elgin, at the mouth of the Lossie.

LOSVA, a river of Russia, in Tobolsk.

LOT, [לֹט, *i. e.* joined together,] the son of Haran, nephew of Abraham, and progenitor of the Moabites and Ammonites. His separation from Abraham, his captivity by Chedorlaomer, his restoration by the bravery of his uncle, his extraordinary hospitality, his deliverance from the destruction of Sodom, his wife's metamorphosis, with his fatal intoxication, and involuntary incest, are recorded in Gen. xiii. xiv, and xix. His righteous character is particularly taken notice of by the apostle Peter: 2 Ep. ii. 7, 8. Some trace the immediate worship of Baal-peor, the god of the Moabites and Ammonites, from the involuntary incest of their ancestor.

LOT, in geography, a department of France, 70 miles long, and about 35 broad; it comprehends the late province of Quercy. The capital is Cahors.

LOT, a river of France, which joins the Garonne near Aiguillon.

LOT AND GARONNE, a department of France, 45 miles long, and 36 broad. It contains part of the late province of Guienne. Agen is the capital.

LOTE, or **LOTE-TREE**. See **CELTIS**.

LOTHARINGIA, the ancient name of Lorraine, so called from the emperor Lothaire I.

LOTHIAN, a name common to three counties in Scotland, viz. Haddington, Edinburgh, and Linlithgow, shires; otherwise called East, Mid, and West Lothians.

I. LOTHIAN, EAST, or HADDINGTON-SHIRE, is bounded on the N. by the Frith of Forth; on the E. by the German sea; on the S. E. by Berwickshire; and on the W. by the county of Edinburgh. It extends about 25 miles from E. to W. and where broadest, nearly 15 from N. to S. The coast, advancing northward into the Frith, forms an irregular curve. This is one of the most fruitful counties in Scotland, producing great quantities of wheat and all sorts of grain; and being well-watered, and plentifully supplied with fish, fowl, fuel, and all the necessities of life.

II. LOTHIAN, MID, or EDINBURGH-SHIRE, is about 35 miles long, but varies in its breadth in different places from 5 to 16 miles. It is bounded on the E. by East Lothian; on the S. by the county of Peebles; on the W. by that of Linlithgow; and on the N. by part of West Lothian and the Frith of Forth. It is well watered with rivers, and shaded with woods. It produces plenty of coal, limestone, a soft black marble, and some copper-ore. The soil, naturally fertile, is finely cultivated, and yields as plentiful harvests of excellent wheat as are found in any part of Great Britain. The whole county is interspersed with grand houses and plantations, belonging to noblemen and gentlemen of fortune. The farmers are masters of agriculture; and wealthy in consequence of their skill, some of them paying 500*l.* of yearly rent.

III. LOTHIAN, WEST, or LINLITHGOW-SHIRE, is bounded on the N. by the Frith of Forth; by the Almond, which divides it from Mid-Lothian on the E. On the S. W. it joins the county of Lanerk; and on the W. it is separated from Stirlingshire by the Avon. Its form, though irregular, approaches to a parallelogram. It measures from N. E. to S. W. nearly 20 miles. Its breadth, except on the shore of the Frith, does not exceed 12. The county is pleasant and fertile, abounding with corn, pasturage, coal, lime-stone, and lead-ore; and, in the reign of James VI. it had a rich silver-mine.

LOTION, [*lotio*, Lat.] such a washing as beautifies the skin, by cleansing it of those deformities which a disordered blood throws upon it. Medicines of this kind, however are for the most part insignificant, and sometimes very dangerous; the only proper method of treating these disorders is, by administering such medicines as tend to correct that morbid state of the constitution whence they arise.

LOTION, in pharmacy, denotes a preparation of medicines, by washing them in some liquid, either made very light, so as to take

away only the dregs; or sharp, so as to penetrate them, in order to clear them of some salt, or corrosive spirit, as is done to antimony, precipitates, magisteries, &c. or intended to take away some foulness or ill quality, or to communicate some good one.

LOTOPHAGI, in ancient geography, a people of the Regio Syrtica, so called from their living on the lotus; inhabiting between the two Syrtes, from the Cinyphus to the Triton. The lotus was said to be a food so luscious, as to make strangers forget their native country. A sweet wine was expressed from it which did not keep above ten days.

LOTTERY, a kind of public game at hazard, which, in this country, is managed by commissioners appointed by parliament. It consists of a certain number of tickets, that are drawn out of two different wheels, one of which contains a limited proportion of blanks and prizes; and the other the corresponding tickets. Lotteries were originally instituted with a view to raise money for the service of the state; but this method appears to have been contrived by persons, who possessed no practical knowledge of mankind; as it encourages a spirit of gambling, that cannot be too severely censured. One of the most cogent arguments to discourage this practice, appears to be the disproportion between the distant gain, and the probable loss of the numerous adventurers: nay, it is an indisputable fact, that if a club of infatuated persons (indeed, there are too many of this description) were to purchase the tickets of the whole lottery, they would necessarily lose about 100 per cent. of their money; and in a similar situation is the single share-holder, who, besides, incurs the risk of losing the whole. It is to be regretted, that the consequences of this evil are not confined to the more opulent classes of society; but extend even to those industrious members, whose utmost exertions are frequently inadequate to furnish their families with bread. Yet such is their infatuation, that nearly the whole of their weekly earnings is squandered on insurances: and it is a melancholy proof of the folly of mankind, that of the bread usually consumed, one-third only is eaten during the eventful period of drawing the lottery. Hence we think it our duty to state abuses of such magnitude; as they prey on the vitals of the community; and we trust that the wisdom of the legislature will shortly be induced to reform, or, if possible, to abolish the whole department of the lottery, and to adopt a less hazardous, and more dignified plan of finance. And indeed such are the effects of lotteries, that they have generally been considered as nuisances to the public, and several laws and regulations have been made respecting them. But all these having proved insufficient, a Committee of the House of Commons was appointed in 1808, to enquire how far the evils attending lotteries have been remedied by the laws passed respecting them; who in their report were of opinion, That (in case it shall be thought expedient to continue state-lotteries) the number thereof in each year should be limited to two lotteries, of not more than 30,000 tickets each; that the number of days allowed for drawing, instead of ten, should be brought back to eight for each lottery, the number fixed in 1802: that the number of tickets to be drawn each day should be uncertain, and left to the discretion of the commissioners of stamp-duties, and kept secret till the close of the drawing each day, care being taken, as the lottery proceeds, not to leave too great a number undrawn on the latter days of drawing, but that one moiety or upwards be drawn on the four first days thereof; that every lottery-office keeper should, in addition to his own licence, take out a limited number of licences for his agents; and that the limitation of hours during which lottery-offices may be open for the transaction of business, viz. from eight o'clock in the morning till eight o'clock in the evening, enacted 22 Geo. III. c. 47, and renewed in the lottery, acts of 1802, and the three following years, but omitted in those of 1806 and 1807, ought in future to be re-enacted without the exception therein made to Saturday evenings.

LOTUS, **BIRD'S-FOOT TREFOIL**; in botany, a genus of the decandria order, and diadelphia class of plants; natural order, Papilionaceæ. Legumen cylindrical, erect; alæ closing upwards longitudinally; calyx tubulated. There are 23 species, chiefly herbaceous plants.

LOTUS, the Lote-tree. See **CELTIS**.

LOVAGE, [*levisticum*, Lat.] a plant. See **LIGUSTICUM**.

LOUDON, a rich and fertile county of Virginia, bounded on the

the E. by the Potomack, S. E. by Fairfax, S. by Fauquier, and N. W. by Berkley counties; 50 miles long and 20 broad.

LOUDUN, a town of France, in the department of Vienne, 27 miles N. W. of Poitiers, and 155 S. W. of Paris. Lon. 0. 17. E. Lat. 47. 2. N.

LOVE, in a large sense of the word, denotes all those affections of the pleasing kind, which are excited by certain objects and incidents.

Love, in the Christian religion is a gracious habit, principle, or disposition, wrought in our souls by the Spirit of God, whereby we esteem, desire, and delight in God, as our chief good, and sum of all perfection and excellency, and the fountain of all blessings, and take pleasure to obey his laws; and whereby we are inclined and enabled to esteem, desire, and delight, in spiritual fellowship with such as bear his image, and to do good to all men, even our enemies, 1 John iv. 19, 21. This love, or charity, is of great importance; without it, no gifts can be truly valuable; where it is not, there can be no true faith. Love renders us patient under trouble, slow to anger, ready to forgive injuries, and makes us straiten ourselves to help our neighbour, makes us mourn for his faults and afflictions, and kindly bear with his infirmities, and is the bond of perfection; and in fine, if pure and fervent, tends to render our life a very heaven upon earth. Gal. vi. 5. 1 Cor. x. 3.

LOVE-APPLE. See **SOLANUM**.

LOVENTINUM, or **LUENTINUM**, in ancient geography, a town of the Demeta in Britain, near the mouth of the Tuerobis, or Tivy; supposed to have been afterwards swallowed up by an earthquake, and to have stood where the lake called Lin Savatan in Brecknockshire, now stands.

LOUGH-ALLEN, a lake of Ireland, in the county of Leitrim, above 30 miles in circumference, and surrounded by high mountains.

LOUGHBOROUGH, a town of England, in Leicestershire, 18 miles N. of Leicester, and 109 N. W. by W. of London. Lon. 1. 10. W. Lat. 52. 48. N.

LOUGH-DERG, a lake of Ireland, in Donnegal, anciently called Derg-abban, i. e. the river of the woody morass, from a river which issues out of this lake. It is famous for an island that contains St. Patrick's purgatory, which is a narrow little cell, hewn out of the solid rock, in which a man can scarcely stand upright.

LOUGH-EARNE, a great lake of Ireland, in the county of Fermanagh, near 20 miles in length, and in some places 14 in breadth, diversified with upwards of 300 islands, most of them well wooded, inhabited, and covered with cattle. It abounds with great variety of fish, such as huge pikes, large breams, roaches, eels, trouts, and salmon, &c.

LOUGH-FOYLE, a large lake or gulf of Londonderry.

LOUGH-LEAN. See **KILLARNEY**.

LOUGH-NEAGH, an extensive lake of Ireland, in the counties of Armagh, Down, Derry, and Antrim. It is the largest in Europe, those of Ladoga and Onega in Russia, and that of Geneva in Switzerland, excepted; being 20 miles long and 16 broad. The area is computed to be 100,000 acres. It is remarkable for a healing virtue; and for petrifying wood, which is not only found in the water but in the adjacent soil at a considerable depth. On its shores several beautiful gems have been discovered. Its ancient name was Loch-eacha or Loch-Neach, from *loch* and *Neach*, wonderful, divine, or eminent. Its petrifying powers are not instantaneous, as several of the ancients have supposed, but require a long series of ages to bring them to perfection, and appear to be occasioned by a fine mud or sand, which insinuates itself into the pores of the wood, and which in process of time becomes hard like stone.

LOUICHEA, in botany, a genus of the monadelphia tetrandria class and order. Receptacle common, peduncle-shaped, trichotomous, producing the flowers; pericarpium proper, four-parted; segments concave, subulate, acuminate, irregular, growing together; corolla none; filaments four, connate, inserted into the receptacle; germ superior; style bifid; seed single, arilled, within the calyx. The only species is *L. cervina*.

LOUIS, the French name for Lewis. See **LEWIS**.

LOUIS D'OR, [Fr.] a gold coin of France, valued at about twenty shillings.

LOUIS D'OR, or **LEWIDORE**, was first struck in 1640, under

Lewis XIII. and had long a considerable currency, before the revolution.

LOUIS, KNIGHTS OF ST. a late military order in France, instituted by Lewis XIV. in 1693. Their colours were of a flame-colour, and passed from left to right; the king was their grand master.

LOUIS, ST. an island on the W. coast of Africa, at the mouth of the Senegal, with a fort. Lon. 15. 35. E. Lat. 16. 0. N.

LOUIS, ST. a lake of Canada. Lon. 73. 20. W. Lat. 45. 25. N.

LOUIS, ST. a Spanish town on the W. side of the Mississippi 13 miles below the mouth of the Missouri.

LOUISA, a county of Virginia, 35 miles long, and 20 broad.

LOUISBOURG, **LOUISBURG**, or **LOUISBURGH**, the capital of Cape Breton. It has an excellent harbour, near 12 miles in circumference. Lon. 59. 54. W. Lat. 45. 54. N.

LOUISIANA, a country of North America, bounded on the S. by the gulph of Mexico, on the E. by the Mississippi, on the W. by New Mexico, and on the N. by an unknown country. It extends from 29° to 40° Lat. N. and from about the 80° to 96° or 97° Lon. W. of London. The climate varies according to the latitudes. The southern parts are not so hot as those parts of Africa which lie under the same parallel, and the northern parts are colder than the countries of Europe at the same distance from the pole: the causes of which are supposed to be the thick forests which over-run the country, and the great number of rivers; the former preventing the sun from heating the earth, and the latter supplying it with moist vapours; besides the cold winds which come from the north over vast tracts of land.

LOUISVILLE, a town of Georgia, 45 miles S. W. of Augusta.

LOUISVILLE, a town of Kentucky, capital of Jefferson county, 70 miles W. of Lexington. Lon. 86. 6. W. Lat. 38. 4. N.

LOUITZ, a town of Poland, in the palatinate of Rava, 45 miles E. of Gnesna. Lon. 19. 0. E. Lat. 52. 26. N.

LOURDE, a town of France, in the department of the Upper Pyrenees, and late province of Bigorre, 10½ miles S. of Tarbe. Lon. 0. 5. W. Lat. 43. 8. N.

LOUSE, in zoology. See **PEDICULUS**.

LOUSEWORT. See **PEDICULARIS**.

LOUTH, a town of Lincolnshire, one of the handsomest and gayest in the country, 28 miles N. E. of Lincoln, and 148 N. of London. Lon. 0. 10. E. Lat. 53. 25. N.

LOUTH, a county of the E. part of Ireland, extending in the form of a half-moon, on the side of the ocean, being much longer than it is broad. Its chief towns are Dundalk and Carlingford. It is very fertile, and abounds with many remains of antiquities.

Louth, a town in the above county, 19 miles N. by W. of Drogheda.

LOUVAIN, a city of France, in the department of Dyle, and late province of Austrian Brabant, 13 miles N. E. of Brussels, and 21 S. W. of Antwerp. Lon. 4. 40. E. Lat. 50. 53. N.

LOUVIERS, a town of France, in the department of Eure, 12 miles N. of Evreux, and 55 N. W. of Paris. Lon. 1. 15. E. Lat. 49. 0. N.

LOUVO, a populous town of Asia, in the kingdom of Siam, 50 miles N. of Siam. Lon. 100. 50. E. Lat. 15. 8. N.

LOWBELL, [*laeye*, Dutch; *leg*, Sax. or *logs*, Islandic, a flame, and *bell*,] a kind of fowling in the night, in which the birds are awakened by a bell, and lured by a flame into a net. *Low* denotes a flame in Scotland; and *to low*, to flame.

LOWERING, among distillers, a term used to express the debasing of the strength of any spirituous liquor, by mixing water with it. The standard and marketable price of these liquors is fixed in regard to a certain strength in them called proof.

LOWES, or **LOWES WATER**, a lake of Cumberland, a mile long and a quarter of a mile broad, situated among beautiful hanging woods and groves. It runs from N. to S. into Cromack Water.

LOWESTOFFE, a town of Suffolk, 10 miles S. of Yarmouth.

LOWTH, DR. WILLIAM, a learned divine, born at London in 1661, was the son of an apothecary, and took his degree of D. D. at Oxford. His learning recommended him to Dr. Mew, bishop

bishop of Winchester, who made him his chaplain, gave him two livings in Hampshire, and conferred on him a prebend in the cathedral of Winchester. Few were more deeply versed in critical learning; there being scarcely any ancient author, Greek or Latin, profane or ecclesiastical, but what he had read with accuracy, constantly accompanying his reading with critical and philological remarks. Of his collections in this way he was upon all occasions very communicative: hence his notes on Clemens Alexandrinus, inserted in Potter's edition; his remarks on Josephus, communicated to Hudson for his edition; and those numerous annotations on the Ecclesiastical Historians, inserted in Reading's edition of them at Cambridge. He also assisted the author of *Bibliotheca Biblica*, and Dr. Chandler, late bishop of Durham, in his "Defence of Christianity." His piety, diligence, hospitality, and beneficence, rendered his life highly exemplary, and enforced his public exhortations. He married Margaret, daughter of Robert Pitt, Esq. of Blandford, by whom he had two sons and three daughters. He died in 1732. He published, 1. A Vindication of the Divine Authority and Inspiration of the Old and New Testaments. 2. Directions for the profitable Reading of the Holy Scripture. 3. Commentaries on the Prophets; and other works.

LOWTH, ROBERT, D. D. and F. R. S. son of the preceding, and bishop successively of St. David's, Oxford, and London, was born on the 29th November 1710. He studied at Winchester college, where his exercises were distinguished by uncommon elegance; and in 1730, he went to New College, Oxford, where he continued his studies, and took the degree of M. A. June 8, 1737. In 1741, he was elected by the university professor of Hebrew poetry, re-elected in 1743, and, whilst he held that office, he read his admirable lectures *De Sacra Poesi Hebræorum*. In 1744, bishop Hoadley appointed him rector of Ovington in Hants; in 1750, archdeacon of Winchester, and rector of East Weehay in 1753. In 1754 the university created him D. D. by diploma; an honour never granted but to distinguished merit. Having, in 1749, travelled with Lord George and Lord Frederic Cavendish, in 1755, the late duke being lord-lieutenant of Ireland, Dr. Lowth went to that kingdom as his grace's first chaplain. Soon after this, he was offered the bishopric of Limerick; but preferring a less dignified station in his own country, he exchanged it with Dr. Leslie, prebendary of Durham and rector of Sedgfield, for these preferments. In November 1765, he was chosen F. R. S. In June 1766, he was, on the death of Dr. Squire, raised to the see of St. David's; which, in October, he resigned for that of Oxford. In April 1777, he was translated to the see of London, on the death of bishop Terrick; and in 1783 he declined the offer of the primacy of all England. Having been long afflicted with the stone, which he bore with the most exemplary fortitude, he died at Fulham, November 3, 1787. He had married in 1752, Mary, daughter of Laurence Jackson of Christ-church, Hants, Esq. by whom he had two sons and five daughters; of whom two and his lady survived him. His literary character may be estimated from the value and the importance of his works. Besides his "Prelections on the Hebrew Poetry," which have been read with applause abroad and at home, and the Latinity of which is equal to that of Buchanan in classical purity, he published, in 1758, "The Life of William of Wykeham, Bishop of Winchester," with a dedication to bishop Hoadley; which involved him in a dispute concerning a decision which that bishop had made respecting the wardenship of Winchester college. This controversy was on both sides carried on with such abilities, that, though relating to a private concern, it may still be read with pleasure and improvement. The life of Wykeham is drawn from the most authentic sources; and affords much information concerning the manners and transactions of the period in which Wykeham lived, as well as respecting the two literary societies of which he was the founder, and in which Dr. Lowth was educated. In 1762 was first published his "Short Introduction to English Grammar," which has since gone through many editions. It was originally designed only for domestic use; but its judicious remarks being too valuable to be confined to a few, the book was given to the world; and the excellence of its method, which teaches what is right by shewing what is wrong, has insured public approbation and very general use. In 1765, Dr. Lowth was engaged with bishop Warburton in a controversy, which made so much noise at the time, that it even

attracted the notice of royalty. In 1778, he published his last great work, "A Translation of Isaiah," which proved adequate to the highest expectations of the public. Several occasional discourses were also published, worthy of their author. Among these, one on the kingdom of God, on the extension and progressive improvement of Christ's religion, and on the means of promoting these by the advancement of religious knowledge, by freedom of inquiry, by toleration, and mutual charity, has been much admired as exhibiting a most comprehensive view of the successive states of the Christian church. Of his poetical pieces, none display greater merit than "Verses on the Genealogy of Christ, and the Choice of Hercules," both written very early in his life. He wrote a spirited "Imitation of an Ode of Horace," applied to the alarming situation of Britain, in 1745; and some "Verses on the Death of Frederic Prince of Wales," with a few smaller poems. Learning and taste, however, did not constitute bishop Lowth's highest excellence. Eulogium can scarcely ascend too high, in speaking of him either as a private man or as a Christian pastor. His amiable manners rendered him an ornament to his station, whilst they endeared him to all with whom he conversed; and his zeal for the interest of religion made him promote to places of trust and dignity such clergymen as he knew were best qualified to fill them. To the world he was a benefit by his splendid abilities; and whilst virtue and learning are esteemed, the memory of Lowth will be respected.

LOXA, a province, or jurisdiction, of Peru, in Quito, famous for fine Peruvian bark and cochineal.

LOXA, a town in the above province.

LOXAN, a town of China, in Ho-nan province.

LOXIA, the GROSSBEAK, in zoology, a genus of birds of the order passerines: the distinguishing characters are these: Bill strong, convex above and below, very thick at the base; nostrils small, round; tongue as if cut off at the end; toes four, or three, two toes before and one behind. There are 93 species, besides many varieties. The following are among the most remarkable:

L. BENGALENSIS, the BENGAL GROSSBEAK, is little bigger than a house-sparrow; the bill is of a flesh-colour; the irides are whitish; the top of the head is of a golden yellow; the upper parts of the body are brown, with paler edges; the sides of the head and under parts rufous white; across the breast is a brown band, uniting to, and of the same colour with, the upper parts of the body; the legs are of a pale yellow, the claws grey.

L. CHLORIS, the GREEN-FINCH, is a well-known bird: the general colour is a yellowish green, palest on the rump and breast, and inclining to white on the belly. These birds soon become tame; even old ones being familiar almost as soon as caught; they live five or six years. Like the chaffinch, they grow blind if exposed to the sun. This species is also pretty common every where on the continent, but not very frequent in Russia; and is not at all found in Siberia, though it has been met with at Kamtschatka.

L. ORIX, the GRENADIER GROSSBEAK, is about the size of a house-sparrow. The forehead, sides of the head and chin, the breast and belly are black; the wings are brown, with pale edges; and the rest of the body is of a beautiful red colour: the legs are pale. These birds inhabit St. Helena, and the Cape of Good Hope; frequenting watery places that abound with reeds, among which they are supposed to make their nest. See Plate LVIII.

L. PENSILIS, the PENSILE GROSSBEAK, the TODDY BIRD of Fryer, is about the size of the house-sparrow: the bill is black, the irides are yellow; the head, throat, and fore-part of the neck, the same; from the nostrils springs a dull green stripe, which passes through the eye and beyond it, where it is broader; the hind part of the head and neck, the back, rump, and wing-coverts, are of the same colour: the quills are black, edged with green; the belly is deep grey, and the vent of a rufous red; the tail and legs are black. This species is found at Madagascar; and fabricates a nest of a curious construction, composed of straw and reeds interwoven in shape of a bag, the opening beneath. It is fastened above to a twig of some tree; mostly to those growing on the borders of streams. On one side of this, within, is the true nest. The bird does not form a new nest every year, but fastens a new one to the end of the last; and often as far as five in number, one hanging

hanging from another. These build in society like rooks; 5 or 600 being often seen on one tree. They have three young at a hatch. Kämpfer mentions a bird similar to this, if not the same, which makes the nest, near Siam, on a tree with narrow leaves and spreading branches, the size of an apple-tree: the nest in the shape of a purse, with a long neck: made of dry grass and other materials, and suspended at the ends of the branches; the opening always to the N. W. He counted fifty on one tree only; and describes the bird itself as being like a Canary-bird, of a dark yellow, and chirping like a sparrow. Fryer also talks of the ingenuity of the Toddy Bird, making her nest "like a steeple, with winding meanders," and tying it by a slender thread to the bough of a tree. "Hundreds of these pendulous nests may be seen on these trees." Account of India and Persia, p. 76. See Plate LVIII.

L. PYRRHULA, the **BULLFINCH**, is well known; the head, wings, and tail, are black; the breast and belly red; the upper tail-coverts and vent white; and the breast ash-colour. The female differs in having the under parts of a reddish brown. This species is common in most parts of the Continent; and throughout Russia and Siberia, where it is caught for the table. They are pretty common in England, and build in bushes, five or six feet from the ground.

L. VIOLACEA, the **PURPLE GROSSBEAK**, is about the size of a sparrow: the bill is black: the plumage violet black; except the irides, a streak over the eye, the chin and the vent, which are red: the legs are dusky grey. This species inhabits the Bahama Islands, Jamaica, and the warmer parts of America.

LOXODROMIC, [$\lambda\omicron\varsigma\omicron\delta\rho\omicron\mu\omicron\varsigma$] the art of oblique sailing by the rhomb, which always makes an equal angle with every meridian; that is, when you sail neither directly under the equator, nor under one and the same meridian, but across them: hence the table of rhombs, or the transverse tables of miles, with the table of longitudes and latitudes, by which the sailor may practically find his course, distance, latitude, or longitude, is called loxodromic.

LOYOLA, IGNATIUS, the founder of the order of the Jesuits, was born at the castle of Loyola, in Giopuscoa, in 1491; and became first page to Ferdinand V. king of Spain, and then an officer in his army. In this last capacity, he signalized himself by his valour; and had his right leg broken by a cannon-ball, at the siege of Pampeluna, in 1521. While he was under cure of his wounds, a Life of the Saints was put into his hands, which determined him to forsake the military for the ecclesiastical profession. His first devout exercise was to dedicate himself to the blessed virgin as her knight. He then practised the most severe mortifications for above a year; after which he went on pilgrimage to the Holy Land; and on his return to Europe, he continued his theological studies in the universities of Spain, though he was then thirty-three years of age. In 1526, upon commencing preacher, he was imprisoned at Alcala, and Salamanca, and impeached before the inquisition. After this he went to Paris, and laid the foundation of his new order; the institutes of which he presented to Pope Paul III. who made many objections to them, but at last confirmed the institution in 1549. He died at Rome, July 31, 1556, aged 66; and left his disciples two famous books; 1. Spiritual Exercises; 2. Constitutions or Rules of the Order. But though these avowed institutes contain many privileges obnoxious to the welfare of society, the most diabolical are contained in the private rules entitled "Monita Secreta," which were not discovered till the close of the seventeenth century; and most writers attribute these, and even the Constitutions, to Laynez, the second general of the order. See **JESUITS**.

LOZENGE, or **LOZANGE**, **RHOMBUS**, in geometry, a quadrilateral figure, consisting of four equal and parallel sides, two of whose opposite angles are acute, and the other two obtuse; the distance between the two obtuse ones being always equal to the length of one side: when the sides are unequal, this figure is called a rhomboides.

LOZENGE, in heraldry, a rhombus, or figure of equal sides, but unequal angles.

LOZENGE, in pharmacy, the same with what is otherwise called troche.

LOZENGES, among jewellers, are common to brilliant and rose-diamonds. In brilliants, they are formed by the meeting of the

skill and star facets on the bezil; in the latter, by the meeting of the facets in the horizontal ribs of the crown.

LOZERE, a department of France, 55 miles long and 35 broad, comprehending the late province of Gevaudan, Mende is the capital.

LUBEC, or **LUBECK**, a city and port of Germany, in the late circle of Lower Saxony, and late duchy of Holstein, 40 miles N. E. of Hamburg. Lon. 10. 44. E. Lat. 53. 52. N.

LUNEEK, or **LUNOI**, an island of the East Indian Ocean, near that of Madura. Lon. 112. 22. E. Lat. 5. 50. S.

LUBEN, a city in the marquisate of Lower Lusatia. Lon. 14. 25. E. Lat. 52. 0. N.

LUBLIN, a considerable town of Poland, capital of the palatinate of the same name. Lon. 22. 31. E. Lat. 51. 26. N.

LUBOW, a town of Poland, 50 miles S. E. of Cracow.

LUC, a town of France, in the department of Isere, and late province of Dauphiny, 32 miles S. of Grenoble. Lon. 5. 48. E. Lat. 44. 40. N.

LUCA, in ancient geography, a town of Etruria, on the Ausser, now called Lucca, capital of the republic of that name.

LUCAN, **MARCUS ANNEIUS**, a Latin poet, was born at Cordova in Spain, about A. D. 39. His father was Anneus Mela, brother of Seneca. He was for some time a favourite of Nero, but being discarded by him he joined in a conspiracy with Piso, for which he was sentenced to death, and was suffocated in a bath A. D. 65. His Pharsalia is an epic poem of merit, though harsh and irregular. The best edition is that of Strawberry-hill, 1760, 4to. —Watkins.

LUCANIA, a country of Italy, and a part of Magna Grecia.

LUCANUS, the **STAG-BEETLE**, in zoology, a genus of insects of the order coleoptera. The antennæ end in a club or knob, which is compressed or flattened on one side, and divided into short laminae resembling the teeth of a comb; jaws advanced before the head, dentated. There are twenty species.

L. CERVUS is the largest as well as the most singular. It has two large moveable maxillæ, resembling the horns of a stag, which project from its head, and have acquired it the appellation of Stag-beetle. Those maxillæ, broad and flat, equal to one-third of its length, have in the middle, towards their inner part, a small branch, and at their extremity are forked. They have also several small teeth throughout their length. The head that bears these maxillæ is very irregular, very broad and short. The thorax is something narrower than the head and body, and margined round. The elytra are very plain, without either streaks or lines. The whole animal is of a deep brown colour. It is commonly found upon the oak, but is scarce in the neighbourhood of London, and though the largest of coleopterous insects to be met with in this part of the world, it is much smaller than those of the same species that are found in woody countries. It is strong and vigorous, and its horns, with which it pinches severely, are carefully to be avoided. The jaws are sometimes as red as coral, which gives this insect a very beautiful appearance; the female is distinguished by the shortness of the jaws, which are not half so long as those of the male. The females deposit their eggs in trunks of decayed trees, such as the oak and the ash. The larvæ lodge under the bark and in the hollow of old trees, which they eat into and reduce into fine powder, and there transform themselves into chrysalids. They are common in Kent and Sussex, and are sometimes met with in other parts of England. See Plate LXXVI.

LUCAR, **ST. DE BARAMEDA**, a town of Spain, in Andalusia, 13 miles N. of Cadiz. Lon. 6. 5. W. Lat. 36. 40. N.

LUCAR, **ST. DE GUADIANA**, a town on the confines of Algarve, on the Guadiana, 64 miles W. of Seville. Lon. 5. 59. W. Lat. 37. 32. N.

LUCARIA, [from *lucus*, Lat. a grove,] a feast celebrated at Rome on the 15th of July, in memory of the flight of the Romans into a great wood, where they found an asylum from the Gauls.

LUCAS JACOBS, or **LUCAS VAN LEYDEN**, an eminent artist, called also Hugense, was born at Leyden in 1494. He received his first instructions in painting from his father Hugues Jacobs; but completed his studies under Cornelius Engelbrecht. He gained much money by his profession; but being of a generous turn of mind, spent it freely, and lived in a superior style. A

few years before his death, he made a tour in Zealand and Brabant; and during his journey, a painter of Flushing, envious of his great abilities, gave him poison at an entertainment; which, though slow, was fatal in its effect, and put an end to his life, after six years languishing under its cruel influence. Others, denying the story of the poison, attribute his death to his incessant industry. The superiority of his genius manifested itself very early, for his works, at the age of nine, were so excellent as to excite the admiration of all contemporary artists; and when he was about fifteen, he painted a St. Hubert, which gained him great applause. His tone of colouring (Mr. Pilkington observes) is good; his attitudes are well chosen; his figures have a considerable expression in their faces, and his pictures are very highly finished. He endeavoured to proportion the strength of his colouring to the different degrees of distance in which his objects were placed: for in that early time, the true principles of perspective were but little known. In the town-hall at Leyden, his most capital picture, the Last Judgement, is preserved with great care; the magistrates having refused very large sums for it. Lucas's prints are pretty numerous, but seldom met with complete. The following are among the principal: 1. Mohammed sleeping, with a Priest murdered by his side, and another figure stealing his sword; a middling-sized upright plate, 1508. 2. An Ecce Homo, a large plate lengthwise, 1510. 3. The Crucifixion on Mount Calvary, ditto. 4. The Wise Men's Offering, ditto, 1513. 5. Return of the Prodigal Son, middle-sized, lengthwise, 1518. 6. The Dance of Magdalen, large, lengthwise, 1519. 7. His own Portrait, small, upright, 1525. 8. David playing before Saul, a middling-sized, upright, very fine print. 9. A print called Ulespiegle, which is the scarcest of all his works. It was in the collection of the king of France; and said by Marolles to be unique; but Mariette had also an impression of it. It represents a travelling bag-piper with his family, consisting of his wife, seven children, a little dog, &c. in a singular groupe. It is nearly seven inches and a half high by four and three quarters broad; and has been twice copied.

LUCCA, a late republic of Italy, on the coast of the Mediterranean, between the late Ligurian republic on the W. Modena on the N. and Tuscany on the E. It is only about 30 miles in circumference, but is exceeding fertile and populous.

LUCCA, the capital of the above republic, is situated in a plain, terminating in most delightful eminences, adorned with villas, summer-houses, corn-fields, and plantations of every kind. Lon. 44. 27. E. Lat. 43. 52. N.

LUCERES, in Roman antiquity, the third in order of the three tribes into which Romulus divided the people, including foreigners; so called from *lucus*, or grove, where Romulus opened an asylum.

LUCERIA, in ancient geography, a town of Italy, in Apulia; now Nocera de Pagani, in Naples. Lon. 15. 0. E. Lat. 40. 40. N.

LUCERIA and **LUCERIUS**, in mythology, names given to Juno and Jupiter, as the deities which give light to the world.

LUCERNA, a town and valley of Piedmont, 15 miles S. W. of Turin. Lon. 7. 38. E. Lat. 44. 52. N.

LUCERNALIA, in zoology, a genus of the class vermes, and order mollusca. Body wrinkled, branched, gelatinous; mouth beneath. Three species are enumerated.

LUCERNE, one of the thirteen cantons of the Helvetic republic. It holds the third place among the thirteen; and is the head of the Catholic cantons. It is less than the canton of Zurich, and much less than the canton of Berne, and is estimated to be about sixteen leagues long, and eight broad. The population is reckoned at 100,000. The mountainous parts abound in wood and pasture, furnishing cattle, hides, cheese, and butter, for exportation. All the N. part is fertile in grain, fruit, and hay; supplying sufficient for the consumption of the inhabitants. Their manufactures consist in silk and cotton thread.

LUCERNE, the capital of the above canton, 30 miles S. W. of Zurich, and 35 E. of Berne. Lon. 8. 6. E. Lat. 47. 5. N.

LUCERNE, a lake in the above canton, exhibiting greater variety and more picturesque scenery than any other of the Helvetic lakes. It is seven leagues long in a right line, and three broad, but the shape is very irregular.

LUCERNE, in botany, a plant frequently cultivated in the man-

ner of clover. Its leaves, like the latter, grow three at a joint, its stalks are erect, and after mowing, immediately spring up again from the stubble. It is made into hay, in the same manner as saintfoin, but should be mowed before it flowers. It makes the sweetest and most fattening food in the world for cattle. See **MEDICAGO**.

LUCIA, or **ST. ALOUSIE**, or **ST. LUCIA**, one of the Caribbee Islands, about 22 miles long, and 11 broad, the middle of it lying in Lon. 60. 46. W. Lat. 13. 24. N. The soil is tolerably good, even at the sea-side; and is much better the farther one advances into the country. The whole of it is capable of cultivation except some high and craggy mountains which bear evident marks of old volcanoes.

LUCIA, Sr. a high and mountainous island of Africa, one of the Cape de Verd Islands, about nine leagues long. It abounds with goats, sea and land fowl, tortoises, &c. Lon. 24. 3. W. Lat. 16° or 17° 18' N.

LUCIA, Sr. a town of South America, in the province of Buenos Ayres, on the E. bank of the Plata; 140 miles N. of Santa Fe.

LUCIAN, or **LUCIANUS**, a celebrated Greek author in the first century, born at Samosata, in the reign of Trajan. He studied law and practised some time as an advocate; but afterwards commenced rhetorician. He lived to the time of Marcus Aurelius, who made him register of Alexandria in Egypt; and, according to Suidas, he was at last worried by dogs, in his 90th year, A. D. 180. Lucian was one of the finest wits in all antiquity. His dialogues, and other works, are written in pure Greek. In these he has joined the useful to the agreeable, instruction to satire, and erudition to elegance: they abound in that delicate and fine raillery which characterises the Attic taste. Lucian has been censured as an impious scoffer at religion, but surely religion consists neither in the theology of the Pagan poets; nor in the extravagant opinions of philosophers, which he justly ridicules; but he nowhere writes against an over-ruling Providence, though he sometimes pollutes his wit with obscenity.

LUCIANISTS, or **LUCANISTS**, a religious sect, so called from Lucianus, or Lucanus, a heretic of the second century, a disciple of Marcion, whose errors he followed, adding some new ones to them. He denied the immortality of the soul; asserting it to be material.

LUCID INTERVALS, intervals of reason that occur between the fits of lunatics or maniacs, wherein the phrenzy leaves them for a short time.

LUCIFER, in astronomy, is the bright planet Venus, which either goes before the sun in the morning, and is our morning star; or in the evening follows the sun, and then is called Hesperus or the evening star.

LUCIFER, in the mythology, the son of Jupiter and Aurora.

LUCIFERA, in mythology, a surname given to Diana, under which title she was invoked by the Greeks in childbed. She was represented as covered with a large veil, interspersed with stars, bearing a crescent on her head, and holding in her hand a lighted flambeau.

LUCIFERIAN, a religious sect, so called from Lucifer, their founder. St. Augustine intimates, that they believed the soul, which they considered as of a material nature, to be transmitted to the children from their fathers.

LUCINA, a goddess among the Romans, who presided over women in labour. Some take her to be Diana, others Juno, others make her a distinct goddess, daughter of Jupiter and Juno. The Greeks called her Ilithyia.

LUCKNOW, an ancient and extensive city of Hindostan, capital of Oude, but meanly built. Lon. 81. 25. E. Lat. 26. 35. N.

LUCKO, a town of Poland, capital of Volhynia, 75 miles N. E. of Lemburg. Lon. 25. 30. E. Lat. 51. 13. N.

LUCON, or **LUZON**, a town of France, in the department of Vendee, and late province of Poitou, 15 miles W. of Fontenay, and 50 S. of Nantes.

LUCON, or **LUCONIA**, the chief of the Philippines, more generally called Manila. See **MANILLA**.

LUCRETIA, a celebrated Roman lady, the wife of Tarquinius Collatinus, and the cause of the revolution in Rome from a monarchy to a republic. Being ravished by Sextus, the eldest son

son of Tarquin II. she stabbed herself, B. C. 509. The bloody poignard, with her dead body exposed to the senate, was the signal of Roman liberty; the expulsion of the Tarquins, and abolition of the regal dignity, was instantly resolved on, and carried into execution. See **ROME**.

LUCRETIUS CARUS, Titus, a celebrated Latin poet, descended of an ancient and noble Roman family. He studied at Athens, where he became one of Epicurus's sect, and acquired great reputation by his learning and eloquence; but in the flower of his age fell into a frenzy, occasioned by a philter given him by his wife, who was distractedly fond of him. Lucretius, during the intervals of his madness, put Epicurus's doctrines into verse, and composed his six books "De Rerum Naturâ," which are still extant. It is said that he killed himself in a fit of madness, B. C. 54, when fifty-one years old. The most correct edition of Lucretius, is that of Simon de Coline. The Cardinal de Polignac has refuted Lucretius's atheistical arguments in his excellent Latin poem entitled "Anti-Lucretius." His poem "De Rerum Naturâ" has been translated into English by Mr. Creech.

LUCRINUS LACUS, a lake of Campania, between Baïæ and Puteoli, famous for oysters; now a perfect bay since the earthquake in 1538.

LUCULLUS, Lucius Lucinius, a Roman general, celebrated for his eloquence, his victories, and his riches. In his youth he made a figure at the bar; and being afterwards made quæstor in Asia, and prætor in Africa, governed those provinces with great moderation and justice. Scarce was he known as a military man, when he twice beat the fleet of Hamilcar, and gained two great victories over him. His happy genius was greatly improved by study; for he employed his leisure in reading the best authors on military affairs. Being made consul with Aurelius Cotta, during the third war with Mithridates, King of Pontus, he was sent against this prince: and this expedition was attended with a series of victories, which did him less honour than an act of generosity towards his colleague; who, willing to take advantage of his absence to signalize himself by some great exploit, hastened to fight Mithridates; but was defeated and shut up in Calcedonia; where he must have perished, if Lucullus, sacrificing his resentment to his patriotism, had not flown to his assistance, and disengaged him. All Pontus then submitted to Lucullus; who, being continued in his government of Asia, entered the territories of Tigranes, the most powerful king in Asia. That prince marched with a formidable army against Lucullus: who defeated him with a handful of men, and killed great numbers of his forces; took Tigranocertes, the capital of his kingdom; and was ready to put an end to the war, when the intrigues of a tribune got him deposed, and Pompey nominated in his room. Lucullus having brought home prodigious riches, now gave himself up to excessive luxury; and his table was served with a profusion till that time unknown. He brought from the east a great number of books, which he formed into a library, and gave admittance to all men of learning, who frequented it in great numbers. Toward the end of his life, he fell into a kind of madness; and Lucullus, his brother, was appointed his guardian. He is said to have been the first who brought cherries into Europe, having brought the grafts from Pontus.

LUCUS, a wood, or grove, sacred to a deity, so called à lucendo, because a great number of lights were usually burning in honour of the god; a practice common with idolaters, as we learn from scripture: hence Homer's ἀγλυν ἀδρος.

LUD, a British king mentioned in old chronicles, and said to have reigned about A. M. 3878.

LUDI, in Roman antiquity, shows, and public games, made for the entertainment of the people.

LUDLOW, a town of Shropshire, at the conflux of the Tame and the Corve, 138 miles N. W. of London.

LUDWIGIA, in botany, a genus of the monogynia order, and tetrandria class of plants; natural order, Calycanthemæ. Calyx four-parted, superior; corolla four-petaled; capsule inferior, four-cornered, four-celled; receptacle distinct from the axis of the fruit, bearing the seeds on each side. There are four species, natives of the East and West Indies.

LUES, in medicine, is, in general, used for a disease of any kind; but in a more particular sense, is restrained to contagious and pestilential diseases: thus the lues Gallica, or venerca, signifies the venereal disease. See **MEDICINE**.

LUFF, in sea-language. See **LOOF**.

LUGANO, or **LUCANO**, one of the four late Italian bailiwicks, formerly belonging to Switzerland, but united to the late Cisalpine Republic in Oct. 1797, and included in the department of Verbano.

LUGANO, a trading town of Italy, sixteen miles N. W. of Como, and sixteen S. E. of Bellinzona.

LUGANO, a lake of Italy, in the centre of the above bailiwick, twenty-five miles long, and from two to four broad.

LUGDUNUM, in ancient geography, the capital of the Segusiana in Gallia Celtica. It is now called Lyons.

LUGDUNUM BATAVORUM, in ancient geography, a town of the Batavi in Gallia Belgica; now called Leyden.

LUGUS LACUS, in ancient geography, a lake of Japydia, in Illyricum, S. of the Save, near the head of the Arsia: now commonly called the Zurichnitz Lake, from a small adjoining town.

LUGGERSHALL, an ancient borough of Wiltshire, twelve miles N. of Salisbury, and seventy-five N. by W. of London.

LUGO, a town of Italy, in the department of the Lower Po, and late duchy of Ferrara; fifteen miles S. of Ferrara, and twenty-one E. N. E. of Bologna.

LUGO, a city of Spain, in Galicia, on the Minho, anciently the metropolis of Spain; sixty miles S. W. of Oviedo. Lon. S. 52. W. Lat. 42. 46. N.

LUG-SAIL, a square sail, hoisted occasionally on the mast of a boat or small vessel, upon a yard which hangs nearly at right angles with the mast.

LUKE, St. the evangelist, and the disciple of the apostles, was originally of Antioch in Syria, and by profession a physician. He particularly attached himself to St. Paul, and was his faithful companion in his travels and labours. He went with him to Troas in Macedonia, about A. D. 51. He wrote his Gospel in Achaia, about 53; and, in 63, the Acts of the Apostles, which contains a history of thirty years. Of all the inspired writers of the New Testament, his works are written in the most elegant Greek. It is believed that St. Luke died at Rome, or in Achaia.

LUKE, ST. EVANGELIST'S DAY, a festival in the Christian church, observed on the eighteenth of October.

LULA, a town of Swedish Lapland, forty-two miles S. W. of Tornea. Lon. 21. 0. E. Lat. 64. 30. N.

LULA LAPMARK, a province of Swedish Lapland; bounded by that of Tornea on the N.

LUMBAGO, [*lumbi*, Lat. the loins,] a pain very troublesome about the loins, and small of the back, such as precedes agues, fits, and fevers. See **MEDICINE**.

LUMBALES, or **LUMBARES**, the arteries and veins which spread over the loins.

LUMBAR NERVES, or **LUMBAR REGION**. See **ANATOMY**.

LUMBRICALES, four muscles of the fingers, and as many of the toes. See **ANATOMY**.

LUMBRICUS, the **WORM**, in zoology, a genus of insects belonging to the order of vermes intestina. The body is cylindrical, annulated, with an elevated belt near the middle, and a vent-hole on its side. There are sixteen species.

L. MARINUS, the **MARINE-WORM**, or **LUG**, is of a pale red colour, and the body is composed of a number of annular joints; the skin is scabrous, and all the rings or joints are covered with little prominences, which render it extremely rough to the touch. See **PLATE LXXXVI**. It is an inhabitant of the mud about the sea-shores, and serves for food to many kinds of fish: surprising large ones are to be met with about the Bognor rocks in Sussex. The fishermen bait their hooks and nets with them.

L. TERRESTRIS, the **EARTH**, or **DEW-WORM**, Mr. Barbut observes, differs extremely in colour and external appearance in the different periods of its growth, which has occasioned people, little acquainted with the variations of this kind of animals, to make four or five different species of them: the general colour is a dusky-red. They live under ground, never quitting the earth but after heavy rains, or at the approach of storms, and in the season of their amours. The method to force them out is, either to water the ground with infusions of bitter plants, or to trample on it. The bare motion on the surface of the soil drive them up, in fear of being surprised by their formidable enemy the mole. The winding progression of the worm is facilitated by the inequalities of its body, armed with small, stiff, sharp-pointed, bristles: when it

it means to insinuate itself into the earth, there oozes from its body a clammy liquor, by means of which it slides down. It never damages the roots of vegetables. Its food is a small portion of earth, which it has the faculty of digesting.

LUMELUN, a late district in the duchy of Milan, lying along the Po. Mortaria and Valencia are the two principal places.

LUMELLO, a small town in the above district, twenty-six miles S. W. of Milan.

LUMP-FISH. See **CYCLOPTERUS**.

LUNA, in astronomy, the moon. See **ASTRONOMY**.

LUNA, in chemistry, signifies silver. See **SILVER**.

LUNACY. See **LUNATIC**, and **MEDICINE**.

LUNACY, in law. If a man in his sound memory commits a capital offence, and before arraignment for it he becomes mad, he ought not to be arraigned for it: because he is not able to plead to it with that advice and caution that he ought. And if, after he has pleaded, the prisoner become mad, he shall not be tried; for how can he make his defence? If, after he be tried and found guilty, he lose his senses before judgement, judgement shall not be pronounced; and if, after judgement, he becomes of nonsane memory, execution shall be stayed: for, peradventure, says the humanity of the English law, had the prisoner been of sound memory, he might have alleged something in stay of judgement or execution. If there be any doubt whether the party be compos or not, this shall be tried by a jury. And if he be so found, a total idiocy, or absolute insanity, excuses from the guilt, and of course from the punishment, of any criminal action committed under such deprivation of the senses: but if a lunatic has lucid intervals of understanding, he shall answer for what he does in those intervals, as if he had no deficiency. Yet, in the case of absolute madmen, as they are not answerable for their actions, they should not be permitted the liberty of acting unless under proper control; and, in particular, they ought not to be suffered to go loose, to the terror of the king's subjects. It was the doctrine of our ancient law, that persons deprived of their reason might be confined till they recovered their senses, without waiting for the forms of a commission, or other special authority from the crown: and now by the vagrant acts, a method is chalked out for imprisoning, chaining, and sending them to their proper homes. The matrimonial contract likewise cannot take place in a state of idiocy. Idiots, and persons of nonsane memory, as well as infants and persons under duress, are not totally disabled either to convey or purchase, but sub modo only. For their conveyances and purchases are voidable, but not actually void. The king, indeed, on behalf of an idiot, may avoid his grants or other acts. But it hath been said, that a non compos himself, though he be afterwards brought to a right mind, shall not be permitted to allege his own insanity in order to avoid such grant: for that no man shall be allowed to plead his own disability.

LUNE MONS, in ancient geography, a promontory of Lusitania, now called the Rock of Lisbon. Lon. 10. W. Lat. 38. 50. N.

LUNAR, something belonging to the moon; thus we say lunar month, lunar year, lunar dial, lunar eclipse, &c.

LUNAR CAUSTIC, is the old name for nitrate of silver, a very powerful caustic, much used in medicine. It is also called "Lapis Infernalis," by surgeons.

LUNARIA, **MOON-WORT**, or **HONESTY**: in botany, a genus of the tetradynamia siliculosa class and order; natural order, Siliquosae, or Cruciformes. Silicle entire, elliptic, compressed, flat, pedicelled; valves equal, and parallel to the partition, flat; calyx with bagged leaflets. It has three species.

LUNAS, a town of Sweden, in Nericia.

LUNATED, [from *luna*,] formed like a half moon.

LUNATIC, [*lunaticus*, Lat.] one that hath lucid intervals; sometimes enjoying his senses, and sometimes not; and that supposed to depend on the influence of the moon.

LUNATIC, in law. Under the general term of non compos mentis (which Sir Edward Coke says is the most legal name) are comprised not only lunatics, but persons under frenzies, or who lose their intellects by disease; those that grow deaf, dumb, and blind, not being born so; or such, in short, as are judged by the court of chancery incapable of conducting their own affairs. To these also, as well as idiots, the king is guardian, but to a very

different purpose. For the law always imagines that these accidental misfortunes may be removed; and, therefore, only constitutes the crown a trustee for the unfortunate persons, to protect their property, and to account to them for all profits received, if they recover, or after their decease to their representatives. And, therefore, it is declared by stat. 17 Edw. III. c. 10, that the king shall provide for the custody and sustentation of lunatics, and preserve their lands, and the profits of them, for their use, when they come to their right mind; and the king shall take nothing to his own use: and if the parties die in such estate, the residue shall be distributed for their souls by the advice of their ordinary, and of course (by the subsequent amendments of the law of administrations) shall now go to their executors or administrators. On the first attack of lunacy, or other occasional insanity, when there may be hopes of a speedy restitution of reason, it is usual to confine the unhappy objects in private custody, under the direction of their nearest friends and relations: and the legislature, to prevent all abuses incident to such private custody, hath interposed its authority, by 14 Geo. III. c. 49, for regulating private mad-houses. But when the disorder is grown permanent, and the circumstances of the party will bear such additional expence, it is thought proper to apply to the royal authority to warrant a lasting confinement. The method of proving a person non compos, is very similar to that of proving him an idiot. The lord-chancellor, to whom, by special authority from the king, the custody of idiots and lunatics, is intrusted, upon petition or information, grants a commission in the nature of the writ de idiotis inquirendo, to inquire into the party's state of mind; and if he be found non compos, he usually commits the care of his person, with a suitable allowance for his maintenance, to some friend, who is then called his committee. However, to prevent sinister practices, the next heir is seldom permitted to be of this committee of the person; because it is his interest that the party should die. But, it hath been said, there lies not the same objection against his next of kin, provided he be not his heir; for it is his interest to preserve the lunatic's life, in order to increase the personal estate by savings, which he, or his family, may hereafter be entitled to enjoy. The heir is generally made the manager or committee of the estate, it being clearly his interest by good management to keep it in condition: accountable, however, to the court of chancery, and to the non compos himself, if he recover; or otherwise, to his administrators. See **LUNACY**.

LUNATION, the period between one new moon and another; called also synodical month. See **CHRONOLOGY**, and **ASTRONOMY**.

LUNDY, an island of England, fifty miles off the N. W. coast of Devonshire, five miles long and two broad, but so encompassed with inaccessible rocks, that it has but one entrance, so narrow that two men can scarcely go abreast. It is reckoned in the hundred of Branton. It had anciently a fort and a chapel. The soil on the S. is pretty good, but barren on the N. where it has a high pyramidal rock called the Constable. Horses, kine, hogs, goats, sheep, and rabbits, abound in it; but the chief commodity is fowls, and their eggs are very thick on the ground at the season of breeding. No venomous creature will live in this island.

LUNE, in mathematics, is a geometrical figure, in form of a crescent, terminated by the arcs of two circles that intersect each other within. Though the quadrature of the whole circle has never been effected, yet many of its parts have been squared. The first of these partial quadratures was that of the lunula, given by Hippocrates, of Scio, or Chios; who, from being a ship-wrecked merchant, commenced geometricalian. But although the quadrature of the lune be generally ascribed to Hippocrates, yet Proclus expressly says, it was found out by Oenopidas of the same place. The lune of Hippocrates is this: let ABC, Plate CII. fig. 13, be a semi-circle, having its centre E; and ADC a quadrant, having its centre F; then the figure ABCDA, contained between the arcs of the semi-circle and quadrant, is his lune; and it is equal to the right-angled triangle ACF, as is thus easily proved. Since $AF^2 = 2AE^2$, that is, the square of the radius of the quadrant equal to double the square of the radius of the semi-circle; therefore, the quadrant-area, ADCFA, is = the semi-circle of ABCEA; from each of these take away the common space ADCEA, and there remains the triangle ACF = the lune ABCDA. Another more general property of this lune is, that if FG be any line drawn from

from the point F, and AH perpendicular to it; then is the intercepted part of the lune AGIA = the triangle AGH, cut off by the chord-line AG; or, in general, that the small segment, AKGA, is equal to the tri-linear AIIIA. For, the angle AFG being at the centre of the one circle, and at the circumference of the other, the arcs cut off AG, AI are similar to the wholes ABC, ADC, therefore the small segment AKGA is to the semi-segment AIII, as the whole semi-circle ABCA to the semi-segment or quadrant ADCF, that is, in a ratio of equality. Again, if ABC, fig. 14, be a triangle, right-angled at C, and if semi-circles be described on the three sides as diameters; then the triangle T (ABC) is equal to the sum of the two lunes L1, L2. For the greatest semi-circle is equal to the sum of both the other two; from the greatest semi-circle take away the segments S1, and S2, and there remains the triangle T; also from the two less semi-circles take away the same two segments S1, and S2, and there remains the two lunes L1, and L2; therefore the triangle T = L1 + L2, the two lunes. If ADFA, fig. 15, be a lune, of which the centre G of one circle be in the circumference of the other, and if GHD be drawn through the centres, and any point B taken in ADE, and BA be joined, also BF meeting the other circumference in I, and the other lines drawn as in the figure; then BA, BI, BC, and DE, are equal; also EF, EI, EC, and DB, are equal. Join AG, GB, and GF, which produce to K. Then, because BAGF is a quadrilateral in a circle, the angle BFK = BAG, but because GF = GI, the angle BFK = CIF = BIG = BAG, and GAI = GIA; hence BAI = BIA, and BA = BI; also because the triangles BIC, and GIE, are similar, and IG = GF, BI = BC; and because GOI and GBD are right angles, AE is parallel to BD, and therefore AB = DE, hence the four AB, BI, BC, and DE, are equal. In like manner it may be shewn that EF, EI, EC, and DB, are equal.

Cor. From this it appears that BDEI is a parallelogram, having its angles constant.

LUNEL, a town of France, in the department of Gard, sixteen miles E. of Montpellier.

LUNENBURG, or **LUNEBERG ZELL**, a late principality of Germany, bounded on the S. by the diocese of Hildesheim, and the duchy of Brunswick; N. by the duchy of Lauenburg and the Elbe; on the E. by the duchy of Mecklenburg; and W. by the duchies of Bremen and Verden. The soil, except along the Elbe, Aller, and Jetz, is either sand, heath, or moor. In the fertile parts are produced wheat, rye, barley, oats, pease, buck-wheat, flax, hemp, hops, pulse, oak, beech, firs, pines, birch, and alder; together with black cattle and horses. The heaths abound with bees and honey, and a small species of sheep, whose wool is long and coarse. Lunenburg is well furnished with salt-springs and lime-stone, and the forest of Gorde with venison. The Elbe, Hmenzu, and Aller, being navigable, are very advantageous to the country, independent of their fish. There are near 200 Lutheran churches in the country, under two general, and fifteen subordinate, superintendants, several grammar-schools, two Calvinist churches at Zell, and an academy of exercises at Lunenburg. The manufactures are chiefly linen-cloth, cottons, ribbons, stockings, hats, starch, bleached-wax, refined-sugar, gold and silver-ware, all kinds of wooden-ware, barges, boats, and ships. The exports of these to Hamburg, Lubec, and Altena, are considerable.

LUNENBURG, the capital of the above principality, thirty miles S. E. from Hamburg. Lon. 10. 40. E. Lat. 53. 28. N.

LUNENBURG, a county of Virginia, thirty miles long and twenty broad.

LUNENBURG, a town in the above county, fifty-five miles S.W. of Richmond.

LUNENBURG, a county of Nova Scotia, on Mahone Bay. Its chief towns are Lunenburg, Chester, and New Dublin.

LUNETTE, in fortification, differs from a ravelin only in its situation. See **FORTIFICATION**.

LUNETTE, in the manege, is a half horse-shoe, or such a shoe as wants the sponge, *i. e.* that part of the branch which runs towards the quarters of the foot.

LUNETTE, is also the name of two small pieces of felt, made round and hollow, to clap upon the eyes of a vicious horse that is apt to bite, and strike with his fore-feet, or that will not suffer his rider to mount him.

LUNEVILLE, a town of France, in the department of the Meurthe, and late duchy of Lorraine, 13 miles S.E. of Nancy, and 62 W. of Strasburg. Lat. 48. 35. N. Lon. 6. 35. E.

LUNGS, [*lungen*, Sax. *long*, Dutch,] in anatomy, denote the two viscera or lobes in the cavity of the breast, by which we breathe. They are connected with the neck, and situated on the right and left side of the heart. Being furnished with innumerable cells, which are formed by the descent of the wind-pipe into the lungs, those bronchial tubes communicate with each other; and the whole appears not unlike a honey-comb. The most important use of the lungs is that of respiration, by which the circulation of the blood is supposed to be effected; and by the consequent alternate pressure of the different parts of the lower belly, the digestion of food is promoted. Besides, not only the expulsion of the feces and urine greatly depends on the constant action of the lungs, but likewise the sense of smelling is enjoyed by inhaling the air; and it is chiefly by the organic structure of these vessels, that mankind are enabled to speak. Lastly, they perform the office of excretion, and expel those useless matters which, if retained in the system, would be productive of fatal consequences. See **ANATOMY**.

LUNG-WORT, in botany. See **PULMONARIA**.

LUNISOLAR YEAR, in chronology, the space of 532 common years, found by multiplying the cycle of the sun by that of the moon. See **CHRONOLOGY**.

LUPERCAL, in Roman antiquity, a place under mount Palatine, where the lupercalia were performed.

LUPERCALIA, feasts instituted in ancient Rome, in honour of Pan. They were celebrated on the 15th of the kalends of March, or the 15th of February, or third day after the ides. They are supposed to have been established by Evander.

LUPERCI, the priests of the god Pan. See **LUPERCALIA**. They were the most ancient order of priests in Rome; they were divided into two colleges, called Fabii, and Quinctilii. To these Cæsar added a third, called Julii.

LUPINE, or **LUPINUS**, in botany, a genus of the decandria order, and diadelphia class of plants; natural order Papilionaceæ. Calyx bilabiate; anthers five oblong, and five roundish; legumen coriaceous. There are ten species, chiefly hardy herbaceous flowery annuals. They are all easily raised from seed, and succeed in any open borders, where they make a fine variety. The seeds of the white lupine have a leguminous taste, accompanied with a disagreeable bitter one, are said to be anthelmintic, both internally taken, and applied externally. Caspar Hoffman cautions against their external use, and tells us that they have sometimes occasioned death.

LUPUS, the **WOLF**. See **CANIS**.

LUPUS, in astronomy, a southern constellation. See **ASTRONOMY**.

LUPUS MARINUS. See **ANARRHICHAS**.

LURCHER, a kind of hunting-dog, much like a mongrel greyhound, with pricked ears, a shaggy coat, and generally of a yellowish white colour.

LURE, in falconry, a device of leather, in the shape of two wings, stuck with feathers, and baited with a piece of flesh, to call back a hawk when at a considerable distance.

LURE, a town of France, in the department of Upper Saone, and late province of Franche Comté 30 miles N. E. of Besançon.

LURGAN, a town of Ireland, in Armagh, 67 miles from Dublin. Lon. 6. 31. W. Lat. 54. 35. N.

LURIDE, the twenty-eighth order in Linnaeus's Fragments of a natural method. See **BOTANY**.

LUSATIA, [*Sclavonic*, *i. e.* a marshy, or woody country,] a marquisate of Germany, in Upper Saxony, bounded on the east by Silesia, west by Misnia, south by Bohemia, and north by Brandenburg. It is divided into Upper and Lower Lusatia. The heathy and mountainous tracts are generally barren; but the lower lands are tolerably fertile, producing wheat, rye, oats, &c.

LUSITANIA, in ancient geography, one of the divisions of Hispania, extending to the north of the Tagus, quite to the sea of Cantabria, at least to the Promontorium Celticum.

LUSTRAL DAY, [*Dies Lustricus*, Lat.] in antiquity, the day on which the lustrations were performed for a child, and its name given; usually the ninth day from the birth of a boy, and the eighth from that of a girl.

LUSTRAL WATER was used by the ancients in their ceremonies to sprinkle and purify the people. From them the Romanists have borrowed the holy water used in their churches.

LUSTRATIONS, in antiquity, were ceremonies by which the ancients purified their cities, fields, armies, or people, defiled by any crime or impurity. Some of these were public, others private. There were three methods of performing lustration, viz. by fire and sulphur, by water, and by air; which last was done by fanning and agitating the air round the thing to be purified.

LUSTRE, in commerce, denotes the gloss on any thing, particularly on manufactures of silk, wool, or stuff. It is likewise used to denote the composition or manner of giving that gloss. The lustre of silks is given them by washing in soap, then clear water, and dipping them in alum-water cold. To give stuffs a beautiful lustre: For every eight pounds of stuff allow a quarter of a pound of lintseed; boil it half an hour, and then strain it through a cloth, and let it stand till it is turned almost to a jelly: afterwards put an ounce and a half of gum to dissolve twenty-four hours; then mix the liquor, and put the cloth into this mixture, take it out, dry it in the shade, and press it. If once doing is not sufficient, repeat the operation. Curriers give a lustre to black leather, first with juice of barberries, then with gum-arabic, ale, vinegar, and Flanders glue, boiled together. For coloured leather, they use the white of an egg beaten in water.

LUSTRING, [from *lustre*, Fr.] a shining silk, commonly pronounced lustring.

LUSTRUM, in Roman antiquity, a general muster and review of all the citizens and their goods, which was performed by the censors every fifth year, who afterwards made a solemn lustration. See **LUSTRATION**.

LUTE, a musical instrument which consists of four parts, viz. the table, the body or belly, which has nine or ten sides; the neck, which has nine or ten stops or divisions, marked with strings; and the head or cross, where the screw for raising and lowering the strings to a proper pitch of tone are fixed. In the middle of the table there is a rose or passage for the sound; there is also a bridge that the strings are fastened to, and a piece of ivory between the head and the neck, to which the other extremities of the strings are fitted. In playing, the strings are struck with the right hand, and with the left the stops are pressed. The lutes of Bologna are esteemed the best on account of the wood, which is said to have an uncommon disposition for producing a sweet sound.

LUTE, in chemistry, a composition of certain viscid or tenacious matters, which becomes solid when dry; and which, on being applied to the junctures of vessels, close them so effectually as to prevent the admission or egress of air. Though the lute is chiefly used by chemists, it also comprehends any species of cement, applied to vessels, or furnaces, which are exposed to an ardent heat. It is variously prepared of rye-flour and water; quick-lime and the whites of eggs; iron-filings, brick-dust, and lintseed-oil; potters' earth, river-sand, horse-dung, pulverized glass, or flocks of wool mixed with salt-water or bullocks' blood. The best lute, however, and which is most easily procured in London, is Wind-or-loam: it should be moderately stiff, so that, when moistened with water, it may be pressed into the side or crevices of the furnace, &c. As soon as the clay begins to dry, it must be beaten closely down to the sides, and the fissures repeatedly filled up, till the whole be perfectly closed. See **CHEMISTRY**.

LUTETIA, or **LUTETIA PARISIORUM**, in ancient geography, a town of the Parisii, in Gallia Celtica, situated in an island in the Sequana, or Seine.

LUTHER, MARTIN, the great reformer, was born atisleben in Saxony, of mean parentage, in 1483. In 1501 he was sent to the university of Erfurt, where he studied philosophy and the civil law; but walking one day in the fields with a fellow-student, his companion was struck dead with lightning, which so affected Luther, that he determined to retire from the world. He accordingly went into a monastery of the order of St. Augustine, where he led a pious and studious life: and happening to meet with a Latin bible in the monastery, he read it with the utmost care and avidity, and was struck with the manifest difference between the doctrines of the Gospel and the practices of the Roman church. This impression became deeper in 1512, when he went to Rome

on some business belonging to his monastery. On his return he was created D.D. and became professor of divinity at the university of Wittenberg, then founded by Frederic elector of Saxony. In 1517, Leo X. published plenary indulgences for all sins committed by those who should purchase them. These pardons were sold in Germany by the Dominicans in the most shameful manner, and gave offence to all religious persons, and to Luther in particular, who published a Thesis on Indulgences at Wittenberg, in which he exposed in the strongest manner the iniquity of this odious traffic. The propositions of Luther's Thesis were opposed by Tetzel, the papal agent; but the people at large were convinced that the truth lay on the side of Luther. The dispute growing serious throughout Germany, the emperor earnestly pressed the pope to exert his influence to put a stop to it: and accordingly Luther was cited to appear at Rome, which he prudently declined. Leo also demanded of the elector Frederic to deliver Luther up to the papal legate, which he refused; at the same time requesting that the cause might be heard in Germany. To this the pope consented, and Luther appeared before the cardinal Catejan, at Augsburg, to whom he gave a full account of his faith; but being required to make an implicit submission to the decrees of the pope, he zealously refused. On this Leo issued a brief, threatening to excommunicate all who should presume to deny his power to grant plenary indulgences. Luther, on the other hand, appealed, in a public declaration from the pope, to a general council. The followers of Luther increased rapidly. Erasmus approved of his conduct in a great measure, and corresponded with him, but had not the courage to declare himself fully. The learned and amiable Melancthon attached himself firmly to Luther, and by his prudence and moderation rendered him essential service. In 1519 Luther had a dispute at Leipsic with Eccius, professor at Ingoldstadt. In 1520 the pope issued a formal condemnation of Luther, who immediately wrote a book, in which he called it "the execrable Bull of Antichrist;" and calling the students of Wittenberg together, he flung the pope's bull and decretals into the fire. The year following he attended the diet of Worms, by virtue of a safe-conduct from the emperor, and when his friends endeavoured to dissuade him from going, by urging the case of Huss, he said, that "If there were as many devils at Worms as tiles upon the houses he would go." He was here required to retract his opinions, and to promise submission to the pope, both which he resolutely refused. On his return through a wood he was seized by a party of horse, who conveyed him to a castle belonging to the elector of Saxony, where he was so secretly kept, that no one knew what was become of him, except the persons concerned in the affair. In the mean time the emperor Charles V. published an edict against him, and put under the ban of the empire those who should defend him. Luther, however, was secure in his retreat which he called his Hermitage and his Patmos; and employed his time in conferences with his chosen friends, and in writing books. After an absence of ten months he made his appearance again at Wittenberg, where he wrote a severe and uncourtly reply to Henry VIII. of England, who had published a book against him on the doctrine of the eucharist. About this time he published a translation of the New Testament into German, which was universally read, though proscribed by imperial authority. In 1524 Erasmus was prevailed on to write against Luther, and chose for his subject the freedom of the human will, which he defended against our reformer, who replied in a treatise entitled, *De Servio Arbitrio*, which was answered by Erasmus in another, called *Hyperaspistes*. In 1525 Luther married Catherine de Bore, a nun, who had escaped from a convent, on which his enemies accused him of immorality and impiety; but Luther defended his act on scriptural grounds. In 1529 the emperor convened a diet at Spire, to procure aid from the German princes against the Turks, and to devise means for allaying religious disputes. In this assembly it was ordered that the mass should be universally observed throughout the empire. Against this decree the elector of Saxony and Brandenburg, and other princes entered their protest, on which account the reformed party acquired the name of Protestants. These princes then entered into a league for their mutual defence against the emperor. In 1530 was drawn up by Melancthon the confession of Augsburg, which was received as the standard of the Protestant faith in Germany. In 1535 Luther's translation of the Bible into German

German was published. In 1537 an assembly for religious affairs was held at Smalcald, at which Luther and Melancthon were present. At this meeting Luther was seized with so severe a fit of the stone, that his life was despaired of. He, however, recovered, and went on writing books, and labouring to promote the great work for which he was raised up by Providence. He died at J-leben in 1546, and his remains were interred with great solemnity at Wittenberg. By his wife, Catherine de Bore, who died in 1552, he had three sons, and several of his descendants were living latterly in Germany. The mind of Luther was ardent and impetuous, but honest, and earnestly bent to the discovery and propagation of religious truth. His manners were becoming his profession, and his whole life evinced his zeal for the glory of God, and the welfare of man. His works were collected in seven volumes folio, at Wittenberg, after his death. (*Watkins.*)

LUTHERANISM, the sentiments of Martin Luther with regard to religion. See **LUTHER**. Lutheranism has undergone some alterations since the time of its founder. Luther rejected the Epistle of St. James, as inconsistent with the doctrine of St. Paul, in relation to justification; he also set aside the Apocalypse: both which are now received as canonical in the Lutheran church. Luther reduced the number of sacraments to two, viz. baptism and the eucharist: but he believed the impanation, or consubstantiation, that is, that the matter of the bread and wine remain with the body and blood of Christ; and it is in this article that the main difference between the Lutheran and English church consists. Luther maintained the mass to be no sacrifice; exploded the adoration of the host, auricular confession, meritorious works, indulgences, purgatory, the worship of images, &c. which had been introduced in the corrupt times of the Romish church. He also opposed the doctrine of free-will, maintained predestination, and asserted our justification to be solely by the imputation of the merits and satisfaction of Christ. He also opposed the fastings in the Romish church, monastical vows, the celibacy of the clergy, &c.

LUTHERANS, the Christians who follow the opinions of Martin Luther. See **LUTHER**. The Lutherans of all Protestants differ least from the Romish church; as they affirm that the body and blood of Christ are materially present in the Lord's supper though in an incomprehensible manner; and likewise represent some religious rites and institutions, as the use of images in churches, the distinguishing vestments of the clergy, the private confession of sins, the use of waters in the administration of the Lord's supper, the form of exorcism in the celebration of baptism, and other ceremonies of the like nature, as tolerable, and some of them as useful. The Lutherans maintain, with regard to the divine decrees, that they respect the salvation or misery of men, in consequence of a previous knowledge of their sentiments and characters, and not as free and unconditional, and as founded on the mere will of God. Towards the close of the seventeenth century, the Lutherans began to entertain a greater liberality of sentiment than they had before adopted; though in many places they persevered longer in severe and despotic principles than other Protestant churches. Their public teachers now enjoy an unbounded liberty of dissenting from the decisions of those creeds, which were once deemed almost infallible rules of faith and practice, and of declaring their dissent in the manner they judge most expedient. Mosheim attributes this change in their sentiments to the maxim which they generally adopted, that Christians were accountable to God alone for their religious opinions; and that no individual could be justly punished by the magistrate for his erroneous opinions, while he conducted himself like a virtuous and obedient subject, and made no attempts to disturb the peace and order of civil society.

LUTHERN, in architecture, a kind of window over the cornice, in the roof of a building; standing perpendicularly over the naked in a wall, and serving to illuminate the upper story. Lutherans are of various forms; as square, semicircular, round, called bull's eyes, flat arches, &c.

LUTON, a town of Bedfordshire, 20 miles S. of Bedford, and 34 N. of London. Lon. 0. 25. W. Lat. 52. 27. N.

LUTRA, in zoology. See **MUSTELA**.

LUTTER, a town of Brunswick, 13 miles S.E. of Hildesheim.

LUTTERWORTH, a town in Leicestershire, 88 miles N.N.W. of London. Lon. 1. 10. W. Lat. 52. 26. N.

LUTZELSTEIN, LUTZENSTEIN, or PETIT-PIERRE, a town of France, in the department of the Lower Rhine, 24 miles N.W. of Strasburg.

LUTZEN, a town of Upper Saxony, 9 miles E.S.E. of Merseburg, and 10 W.S.W. of Leipsic. Lon. 12. 37. E. Lat. 51. 20. N.

LUXATION, [from *luro*, Latin,] signifies the dislocation of any bone out of its natural articulation, so as to impede or destroy its proper motion. The general symptoms of this complaint are, inability to move the injured limb, pain, tension, and deformity, of the part affected: it is also frequently attended with inflammation and fever.

LUXEMBURG, one of the late provinces of the Netherlands. It was bounded on the east by the archbishopric of Treves; on the south by Lorrain; on the west by Champagne and the bishopric of Liege, which, with part of Limburg, bounded it on the north. It lies in the forest of Ardennes: in some places it is covered with mountains and woods; but in general it is fertile in corn and wine, and has a great number of iron-mines. The principal rivers are, the Moselle, Sour, Ourte, and Semoy.

LUXEMBURG, a city of France, in the department of Forets, and late province of the Austrian Netherlands. It was the capital of the duchy, as it now is of the department. It is 25 miles S.W. of Treves. Lon. 6. 10. W. Lat. 49. 37. N.

LUXEMBURG, FRENCH, a late province of France, comprehending part of the ancient duchy, and including the districts and towns of Thionville, Montmedy, Marville, Chevancy, Carignan, and Damvilliers. It now forms the department of the Moselle.

LUXEUIL, a town of France, in the department of the Upper Saone, 15 miles W. of Vesoul. Lon. 6. 24. E. Lat. 47. 50. N.

LUXURIANS FLOS, [Lat. a luxuriant or double flower:] a flower, some of whose parts are increased in number to the diminution or entire exclusion of others. The parts that are augmented or multiplied in luxuriant flowers, are the flower-cup and petals; the parts that are diminished, or entirely excluded, are the stamina or chives. See **BOTANY**.

LUXURY denotes voluptuousness, or an extravagant indulgence in whatever pleases the senses, such as the articles of food, dress, and equipage. The utility or detriment of luxury to a State, is a subject on which great difference of opinion prevails among political writers. Nor is it easily decided, whether this predominant feature in mankind may with more propriety be called the offspring of vice or folly; but luxury doubtless increases in proportion to the influx of trade; and is an evil which will ever remain an object of just reproach. For, by increasing the expences of a family, it presents an insuperable bar to matrimonial establishments, and thus contributes to the depopulation of a country. Farther, it impairs the health and ruins the constitution of its votaries; and, as the opulent leave their rural seats, in order to reside in cities, such change is attended with many bad consequences to themselves, as well as to their numerous domestics. Thus, the country is in a manner deserted: and thence we may account for the long train of evils arising from the indolence and libertinism of a city-life. One of the most pernicious consequences resulting from the rapid progress of luxury, is the high price of provisions, which is, in a great measure, occasioned by the keeping of useless servants, as well as of unnecessary horses: these partly consume, and partly waste, such a portion of food as might be more beneficially employed in the support of the industrious poor. Lastly, though luxury be the attendant on wealth; though it encourage arts, manufactures, agriculture, and commerce; and, when its prevalence does not corrupt the morals of a people, becomes a national benefit, by diffusing riches among all ranks, and enabling the poor to pay the most exorbitant prices of provisions; yet we presume to say, that the greatest benefit would result from the observance of sumptuary laws, which should limit the expences of individuals from exceeding a certain point: because that money, which is at present spent in the purchase of articles not strictly necessary to domestic life, might thus be diverted into its proper channel, and be more generally circulated throughout the country.

LUZ, a sea-port in the isle of Canary.

LUZARA, a town of Italy, in the department of the Mincio, and district (late duchy) of Mantua, 16 miles S. of Mantua. Lon. 10. 50. E. Lat. 45. 0. N.

LUZERNE,

LUZERNE, a county of Pennsylvania, 79 miles long from N. to S. and 75 broad from E. to W. It abounds with iron-ore, and iron-works are erected in it. Wilkesbarre is the capital.

LYBIA, or **LIBYA**, a name anciently given to all that part of Africa lying between the border of Egypt and the river Triton; and comprehending Cyrenaica, Marmarica, and Syrtica. See **LIBYA**.

LYCÆUM [Λυκæον, Gr.] in antiquity, a celebrated school or academy at Athens, where Aristotle explained his philosophy. The place was composed of porticoes, and trees planted in the quincunx form, where the philosophers disputed walking. Hence philosophy of the Lycæum is used to signify the philosophy of Aristotle, or the Peripatetic philosophy. Suidas observes, that the Lycæum took its name from its having been originally a temple of Apollo Lycæus; or rather a portico or gallery built by Lycæus the son of Apollo: but others mention it to have been built by Pisistratus or Pericles.

LYCÆUS, in ancient geography, a mountain of Arcadia, sacred to Jupiter; whence Jupiter Lycæus.

LICANTHROPY, [ληντρος, and ανθρωπος, Gr.] a kind of madness, in which men have the qualities of wild beasts.

LYCAON I., in fabulous history, the first king of Arcadia, son of Pelasgus and Melibœa. He built a town called Lycosura, on the top of mount Lycæus, in honour of Jupiter. He had many wives, by whom he had a daughter called Callisto, and 50 sons. He was succeeded by Nyctimas, his eldest son. He lived about B. C. 1820.

LYCAON II. king of Arcadia, celebrated for his cruelties. He was changed into a wolf by Jupiter, because he offered human victims on the altar of another Pan. Some attribute this metamorphosis to another cause. The sins of mankind, as they relate, were become so enormous, that Jupiter visited the earth to punish wickedness and impiety. He came to Arcadia, where he was announced as a god, and the people began to pay proper adoration to his divinity. Lycaon, however, who used to sacrifice all strangers to his wanton cruelty, laughed at the pious prayers of his subjects; and to try the divinity of the god, he served up human flesh on his table. This impiety so irritated Jupiter, that he immediately destroyed the house of Lycaon, and changed him into a wolf.

LYCAONIA, in ancient geography, a small country of the Hither Asia, situated near mount Taurus.

LYCAONIA, an island in the Tiber, joined to Rome by a bridge.

LYCHAM, or **LYTCHAM**, a town of Norfolk; 24 miles W. of Norfolk, and 92 N. N. E. of London. Lon. 0. 50. E. Lat. 52. 45. N.

LYCHNIS, in botany, the **CAMPION**, **BACHELOR'S-BUTTON**, **CATCH-FLY**, &c.; a genus of the pentagynia order, and pentandria class of plants; natural order, Caryophyllææ. Calyx one-leaved; oblong, smooth; petals five, with claws and a sub-bifid segment; capsule five-celled. It has 12 species, very hardy, with fibrous perennial roots; the stalks rise in spring, flower in summer, succeeded in the singles by plenty of seed in autumn, by which all the single varieties may be raised in abundance, but the doubles only by dividing the roots, and some by cuttings of the flower-stalks.

LYCIA, a country of Asia Minor, bounded by the Mediterranean on the S. Caria on the W. Pamphylia on the E. and Phrygia on the N. It was anciently called Milyas, and Tremile, from the Milyæ, or Solymi, a people of Crete, who came to settle there. It was named Lycia from Lycus the son of Pandion, who established himself there. The inhabitants have been greatly commended by the ancients for their sobriety and justice.

LYCIUM, in botany, a genus of the monogynia order, and pentandria class of plants; natural order, Luridæ. Corolla tubular, having its throat closed up with the beard of the filaments; berry two-celled; seeds many. There are 13 species natives of various countries.

LYCODONTES, in natural history, the petrified teeth of the lupus piscis, or wolf-fish, frequently found fossil.

LYCOMEDES, in fabulous history, a king of Scyros an island in the Ægean sea. He was son of Apollo and Parthenope. He was secretly entrusted with the care of young Achilles, whom his mother Thetis had disguised in women's cloaths, to remove him

from the Trojan war, where she knew he must unavoidably perish.

LYCOPERCON, in botany, a genus of the natural order fungi, and cryptogamia class of plants. Fungus roundish, fleshy, firm, becoming powdery, and opening at the top; seeds fixed to filaments connected with the inner coat of the plant. These singular fungi are described by Dr. Withering; there is also an elaborate dissertation on the British stellular lycopercions, by Mr. Woodward, in the second volume of the Transactions of the Linnean Society of London.

L. BOVISTA, or **COMMON PUFF-BALL**, is frequent in meadows and pastures in the autumn. It varies exceedingly in size, figure, superficies, and colour. In general, it consists of a sack or bag, having a root at its base, and the bag composed of three membranes, an epidermis, a tough white skin, and an interior coat which adheres closely to the central pith. The pith in the young plants is of a yellowish colour, at first firm and solid, but soon changes into a cellular spongy substance, full of a dark dull-green powder, which discharges itself through an aperture at the top of the fungus, which aperture is formed of lacerated segments, in some varieties reflexed. The powder is believed to be the seeds, which through a microscope appear of a spherical form, and to be annexed to elastic hairs.

LYCOPERDON TUBER, **TRUFFLES**, or **SUBTERRANEAN PUFF-BALLS**, a native of woods both in Scotland and England. It grows generally in clusters three or four inches under ground, without any visible root. The figure of it is nearly spherical, the size that of a potatoe; the exterior coat at first white, afterwards black, and studded with pyramidal or polyhedrous tubercles; the internal substance solid and callous, of a dirty white or pale brown colour, grained like a nutmeg with serpentine lines; in which, according to Micheli, are imbedded minute oval capsules, containing each from two to four round warted seeds. The truffles of Great Britain seldom exceed three or four ounces in weight; but in Italy, and some other parts of the continent, they are said to have been found of the enormous weight of from 8 to 14 lb. They are used at table, either fresh and roasted like potatoes, or dried and sliced into ragouts. They have a volatile and somewhat urinous smell, and are reputed to be aphrodisiacal. Dogs are with much pains taught to hunt for them by the scent, and to scratch up the ground under which they lie.

LYCOPodium, **CLUB MOSS**; a genus of the natural order musci, and cryptogamia class of plants. Fructifications in the axils of the scales digested into oblong imbricate spikes, or the leaves themselves, sessile; capsule kidney-shaped, two-valved, elastic, many-seeded; veil none. There are several species; six of these are natives of Britain, figured by Dillenius and others.

LYCOPOLIS, or **LYCON**, in ancient geography, so called from the worship of wolves, two towns of Egypt, viz. 1. in the Delta, or Lower Egypt, near the Mediterranean; 2. in the Thebais, or Higher Egypt, in the N. part, W. of the Nile.

LYCOPSIS, in botany, a genus of the monogynia order, and pentandria class of plants; natural order, Asperifoliæ. Corolla has an incurved tube.

LYCOPUS, in botany, a genus of the monogynia order, and diandria class of plants; natural order, Verticillatæ. Corolla four-cleft, with one of the segments emarginate; stamens distant; seeds four, retuse. It has three species.

LYCURGIA, a festival observed by the Spartans, in memory of their lawgiver Lycurgus.

LYCURGUS, the celebrated legislator of the Spartans, was the son of Eunomes king of Sparta. He travelled to Greece, to the isle of Crete, to Egypt, and even to the Indies, to converse with the sages and learned men of those countries, and to learn their manners, their customs, and their laws. After the death of his brother Polydeutes, king of Sparta, his widow offered the crown to Lycurgus, promising that she would make herself miscarry of the child of which she was pregnant, provided he would marry her; but Lycurgus nobly refused her offers, and afterwards contenting himself with being tutor to his nephew Charillus; restored to him the government when he came of age; but notwithstanding this regular and generous conduct, he was accused of a design to usurp the crown. This calumny obliged him to retire to the island of Crete, where he studied the laws and cus-

toms

sons of nations. On his return to Lacedæmon, he reformed the government; and, to prevent the disorders occasioned by luxury and the love of riches, he prohibited the use of gold and silver; placed all the citizens in a state of equality; and introduced the strictest temperance, the most exact discipline, and those admirable laws which (a few excepted) have been celebrated by all historians. It is said, that, to engage the Lacedæmonians to observe them inviolably, he made them swear not to change any part of them till his return; and that he afterwards went to the island of Crete, where he killed himself, after ordering his ashes to be thrown into the sea, lest, if his body should be carried to Sparta, the Lacedæmonians should think themselves absolved from their oath. He flourished about B. C. 870.

LYCUS, in ancient geography, a river of Phrygia; also the name of other four rivers, in Armenia, Assyria, Paphlagonia, and Sarmatia.

LYDD, a town of England in Kent, $2\frac{1}{2}$ miles S. W. of Romney. Lat. $50^{\circ} 57' 7''$ N. Lon. $0^{\circ} 54' 15''$ E. of Greenwich.

LYDDA, in ancient geography, a town and district of Judea, 14 miles N. E. of Joppa, and 32 W. of Jerusalem.

LYDGATE, JOHN, called the Monk of Bury, because he was a monk of the Benedictine convent at St. Edmund's-Bury. After studying some time in the English universities, he travelled to France and Italy; and, having acquired a competent knowledge of the languages of those countries, he returned to London, where he opened a school, in which he instructed the sons of the nobility in polite literature. At what time he retired to the convent of St. Edmund's-Bury, does not appear; but he was there in 1415, and was living in 1440, aged about 66; but when he died is not known. Pits says, he was an elegant poet, a persuasive rhetorician, an expert mathematician, an acute philosopher, and a tolerable divine. He was a voluminous writer; and his language is less obsolete, and his versification much more harmonious, than those of Chaucer, who wrote about 50 years before him. He wrote, 1. History of the Theban war, printed at the end of Chaucer's works, 1561, 1602, 1687. 2. Poemation of good counsel; Ibid. 3. The life of Hector; London 1594, fol. printed by Gross, and dedicated to Henry V. 3. Life of the Blessed Virgin; printed by Caxton. 4. The proverbs of Lydgate upon the fall of princes; printed by Wink. Word. Lond. 4to. 5. Dispute of the Horse, the Sheep, and the Goose, Caxton; 4to. 6. The Temple of Brass; among the works of Chaucer. 7. London Lickpenny: see Stowe's history, &c. Besides an incredible number of other poems and translations preserved in various libraries, and of which the reader will find a catalogue in Bishop Tanner.

LYDIA, in ancient geography, a celebrated kingdom of Asia Minor. All the ancient writers tell us, that Lydia was first called Mæonia or Meonia, from Meon king of Phrygia and Lydia; and that it was known under no other denomination till the reign of Atys, when it began to be called Lydia from his son Lydus. Bochart finding in his learned collection of Phœnician words the verb *luz*, signifying to wind, and observing that Lydia is watered by the Mæander, so famous for its winding, concludes that it was thence named Lydia or Ludia. The ancient name of Mæonia betakes to be a Greek translation of the Phœnician word *lud*; wherein he agrees in some measure with Stephanus, who derives the name of Mæonia from Mæon, the ancient name of the Mæander. Some take the word mæonia to be a translation of a Hebrew word signifying metal, because that country, say they, was in former times enriched with mines. Though Lydia and Mæonia are by most authors indifferently used for the same country, yet they are sometimes distinguished; that part where mount Tmolus stood, watered by the Pactolus, being properly called Mæonia; and the other, lying on the coast, Lydia. This distinction is used by Homer, Callimachus, Dionysius, and other ancient writers. In after ages, when the Ionians, who had planted a colony on the coast of the Ægean Sea, began to make some figure, that part was called Ionia, and the name of Lydia given to the ancient Mæonia. Lydia, according to Pliny, Ptolemy, and other ancient geographers, was bounded by Mysia Major on the N. by Caria on the S. by Phrygia Major on the E. and Ionia on the W. lying between 30° and 39° Lat. N. The kingdom of Lydia was not confined within these narrow boundaries, but extended from Halys to the Ægean sea. Pliny's description includes Æolia, lying between the Hermus and the Caicus.

LYDIUS LAPIS, in the natural history of the ancients, the touch-stone for trying gold and silver, called by some Heraclius lapis; both of which names were also applied by the ancients to the load-stone; and hence has arisen no small ambiguity in their works, as Pliny has observed.

LYGEUM, in botany, a genus of the monogynia order, and triandria class of plants; natural order, Gramina. Spatha one-leaved; corolla two on the same germ; nut two-celled. There is but one species, a native of Spain, where it is used for making baskets.

LYGII, LIGH, LUGH, or LOGIONES, in ancient geography, a people of Germany, W. of the Vistula, where it forms a bend like a crescent. Their name Lugi is derived from their close confederacy.

LYING TO, or LYING-BY, the situation of a ship, when she is retarded in her course, by arranging the sails in such a manner as to counteract each other with nearly an equal effort, and render the ship almost immovable, with respect to her progressive motion, or head-way. A ship is usually brought to by the main- and fore-top-sails, one of which is laid aback, whilst the other is full; so that the latter pushes the ship forward, whilst the former resists this impulse by forcing her astern. This is particularly practised in a general engagement, when the hostile fleets are drawn up in two lines of battle opposite each other. It is also used to wait for some other ship, either approaching or expected; or to avoid pursuing a dangerous course, especially in dark or foggy weather, &c.

LYME, a river of England, which runs between Dorset and Devon shires, into the Sea near Lyme Regis.

LYME, or LYME REGIS, a sea-port town of England, in Dorsetshire, 28 miles E. by S. of Exeter, and 143 W. S. W. of London. Lon. $2. 56$ W. Lat. $50. 39$ N.

LYMINGTON, a borough of Hampshire, 17 miles S. W. of Southampton.

LYMPH, [*lympa*, Lat.] a tasteless transparent liquid, that is absorbed from the surface; the cellular texture; as well as the viscera and their cavities throughout the animal body: it is conveyed into the thoracic duct, or canal of the breast, by means of certain vessels, thence called lymphatics, or lymphducts. The use of this organization is to return to the thoracic duct the superfluous nourishing fluid; the vapours of vascular cavities, and likewise all substances that are applied to the skin; from which circumstance some physiologists have conjectured the lymph to be the immediate matter of nutrition. See ANATOMY.

LYMPHATI, a name given by the Romans to such as were seized with madness; supposed to be used for Nymphati, because the ancients imagined that every person who had the misfortune to see a nymph was instantly struck with phrenzy.

LYMPHATIC VESSELS. See ANATOMY.

LYNCEUS, in fabulous history, the only one of the 50 sons of Ægyptus who was saved from being murdered by the 50 daughters of Danaus.

LYNCEUS, the son of Aphareus, one of the Argonauts. He was of great use, by enabling them to avoid the sand-banks and rocks in their way.

LYNCURIUM, a stone thought to be the same with the Tourmalin. The name is derived from *lynx*, and *urine*.

LYNN, or LYNN REGIS, a large well built town of Norfolk, 44 miles N. W. of Cambridge, and 106 N. of London. Lon. $0. 28$ E. Lat. $52. 45$ N.

LYNX, in zoology. See FELIS.

LYON, a river of Perthshire, which falls into the Tay.

LYON KING OF ARMS, FOR SCOTLAND, is the second King at arms for Great Britain. He is invested and crowned with great solemnity; and to him belongs the publishing of royal proclamations, marshalling funerals, reversing arms, &c.

LYONNOIS, a large late province of France, now included in the department of Rhone and Loire. It was bounded on the N. by Burgundy; E. by Dauphiny, Bresse, and the principality of Dombes; S. by Vivarais and Velay; and W. by Auvergne and a part of Bourbonnois. It comprehended Lower Lyonnois, Beaujolois, and Forez. It produces corn, wine, fruits, and excellent chesnuts. The principal rivers are the Saone, Rhone, and Loire. Lyons was the capital.

LYONS, a town of France, capital of the department of Rhone and Loire. Lon. 4. 55. E. Lat. 45. 46. N.

LYONS, ISRAEL, an eminent botanist and mathematician, the son of a learned Polish Jew, who was a Jeweller, and published a Hebrew Grammar, and observations on Scripture History. Israel was born at Cambridge in 1739. In 1758, he published a Treatise on Fluxions: in 1763 *Fasciculus Plantarum circa Cantabrigiam nascentium*. He read lectures at Oxford; and in 1773, accompanied Captain Phipps, (afterwards Lord Mulgrave,) towards the N. pole, by order of the Board of Longitude, who rewarded several of his inventions. He had a salary of 100*l.* a-year, for calculating the Nautical Almanack. He married, and died at London in 1775.

LYRA, in astronomy, a constellation in the northern hemisphere. See *ASTRONOMY*.

LYRE, [*lyra*, Lat.] an instrument of the stringed kind, much used by the ancients. From the lyre, which all agree to have been the first instrument of the string-kind, in Greece, arose an infinite number of others, differing in shape and number of strings, as the psalterion, trigon, sambucus, pectis, magadis, barbiton, testudo, (the two last are used promiscuously by Horace with cythara and lyra) epigonium, simmicion, and pandoron; which were all struck with the hand, a plectrum, or a little iron-rod. We have no satisfactory account of their shape, structure, or number of strings. The best evidences concerning them are the representations of that instrument in the hands of ancient statues, bas-reliefs, &c. Plate CIII. fig. 1, is a representation of the Testudo, or lyre of Amphion, in front, as it appears, on the base of the celebrated Toro Farnese at Rome. Fig. 2. The lyre held by Terpsichore, in the picture of that Muse, dug out of Herculaneum. Fig. 3. The Abyssinian testudo or lyre, used at present in the province of Tigre, from a drawing of Mr. Bruce, communicated to Dr. Burney. Fig. 4. An Etruscan lyre, with seven strings, in the collection of Etruscan, Greek, and Roman antiquities, published from the cabinet of Sir William Hamilton, Vol. I. Naples 1766, Plate six. Fig. 5. The Tripodian lyre of Pythagoras the Zacynthian, from a bas-relief in the Maffei palace at Rome representing the whole choir of the Muses. Fig. 6. represents a lyre in the famous ancient picture dug out of Herculaneum, upon which Chiron is teaching young Achilles to play.

LYRIC POETRY, such as the ancients sung to the lyre or harp. It was originally employed in celebrating the praises of gods and heroes, and its characteristic was sweetness. Who was the author of it is not known. It was much cultivated by the Greeks; and Horace was the first who attempted it in the Latin language. Anacreon, Alcaus, Stesichorus, Sappho, and Horace, were the most celebrated lyric poets of antiquity.

LYRODI, among the ancients, musicians who played on the lyre, and sung at the same time.

LYS, or **LIS**, a river of France, which rises near Lisburg, in the department of the Straits of Calais, and runs into the Scheldt at Ghent.

LYS, a department of France comprehending part of the late province of Austrian Flanders. Bruges is the capital.

LYS, a measure used by the Chinese in estimating distances: 200 lys makes 60 geographical miles, or one degree.

LYSANDER, a famous Spartan general, who conquered the Athenians at Egospotamos, and subjected their city to thirty tyrants.

LYSANDRIA, a Samian festival, celebrated with games and sacrifices in honour of the Lacedemonian general Lysander.

LYSIARCH, an ancient magistrate, who superintended the sacred games, and presided in matters of religion in the province of Lycia.

LYSIAS, an ancient Grecian orator, born at Syracuse in the 80th olympiad. At 15, he went to Thurion, a colony of the Athenians; and when grown up, assisted in the administration of the government many years. When about 47 years of age, he returned to Athens; whence, being afterwards banished by the 30 tyrants, he went to Megara. He was very familiar with Socrates, and other illustrious philosophers. He taught oratory, though he did not plead at the bar, but he supplied others with speeches. "Fuit Lysias in causis forensibus non versatus," (says Cicero,) "sed egregie subtilis scriptor atque elegans," &c. Plutarch and Photius relate, that 425 orations were formerly exhibited under the name

of Lysias; of which only 34 are now extant. The best edition is by Dr. John Taylor at London, 1739, 4to. Cambridge, 1740, 8vo.

LYSIMACHIA, **LOOSESTRIFF**; in botany, a genus of the monogynia order, and pentandria class of plants; natural order, Rotaceæ. Corolla wheel-shaped; capsule globular, beaked, ten-valved. There are twelve species, most of them hardy herbaceous perennials and biennials, rising with erect stalks from 18 inches to two or three feet high; garnished with narrow entire leaves.

LYSIPPUS, a celebrated Greek statuary, born at Sicyone. He was first a locksmith, afterwards a painter; but at last applied himself entirely to sculpture; in which he acquired an immortal reputation, and made a great number of statues that were the admiration of the people of Athens and Rome. His grand statue of the sun represented in a car drawn by four horses, was worshipped at Rhodes. He lived in the time of Alexander the Great, about 334 B. C. and left three sons, all famous statuary.

LYSTRA, in ancient geography, a town of Lycaonia, famous for being the birth-place of Timothy, and the scene of a miracle performed by Paul and Barnabas. Acts. xiv. 6—18. and xvi. 1.

LYTHRUM, **PURPLE LOOSESTRIFF**, in botany, a genus of the monogynia order, and decandria class of plants; natural order, Calycanthemæ. Calyx twelve toothed; petals six, inserted into the calyx; capsule two-celled; seeds numerous. It has eighteen species.

LYTTA, in zoology, a genus of insects of the order coleoptera. Antennæ filiform: feelers, four, unequal, the hind ones clavate; thorax roundish; head inflected, gibbous; shells soft, flexile, as long as the abdomen. There are upwards of thirty species of this plant.

LYTTLETON, **EDWARD**, lord Lyttleton, keeper of the great seal in the reign of Charles I. was eminent for his probity and his moderation at the commencement of that monarch's disputes with his subjects. Without forfeiting his fidelity to the king, he preserved the esteem of the parliament till 1644, when he was made colonel of a regiment in the king's army at York. He died in 1645. Besides several speeches which have been printed, he wrote reports in the common pleas and exchequer, printed in 1683, in folio; several arguments and discourses, &c.

LYTTLETON, **GEORGE** lord, a noble writer, was the eldest son of sir Thomas Lyttleton, of Hagley, in Worcestershire, and born there in 1709. He was educated at Eton, whence he removed to Christ-church, Oxford. In 1723 he went on his travels, and on his return he obtained a seat in parliament, where he distinguished himself as a frequent speaker on the side of the opposition, on which account he became secretary to Frederick prince of Wales, who adhered to the opposition party. In 1741 he married Miss Lucy Fortescue, sister of lord Fortescue, by whom he had a son and two daughters. This amiable woman died in 1747, and Mr. Lyttleton wrote a beautiful monody to her memory. In 1749 he took for his second wife the daughter of sir Robert Rich. On the change of ministry, by the resignation of sir Robert Walpole, he was made one of the lords of the treasury. In 1747 he published his Observations on the Conversion of St. Paul, a work of inestimable value. He acknowledged that in his younger years he had been led into scepticism; but maturer research made him a Christian. In 1751 he succeeded to the title of baronet by the death of his father; and in 1754 he was made cofferer and privy-counsellor. He was raised to the peerage in 1757. His last work was the History of Henry II. which appeared in 1764, in quarto; and a third edition in 1768. His lordship died the death of a Christian in 1773. Besides the performances abovementioned, he wrote Poems, Persian Letters, and Dialogues of the Dead.

LYTTLETON, **THOMAS**, lord, son of the preceding, was a young nobleman of promising talents, but of dissipated manners: his death is said to have been preceded by a very extraordinary circumstance: he saw in a dream, or otherwise, a young woman dressed in white, who warned him of his dissolution in three days from that time. On the third day, his lordship had a party to spend the evening with him, and about the time predicted said, he "believed he should jockey the ghost," but in this he was awfully mistaken, for a few minutes afterwards he was taken faint, and carried to bed, from whence he rose no more. He died in 1779, aged 35.

M

M HAS, in English, one unvaried sound, by compression of the lips; as, *mine, tame, camp*: it is never mute. M is the 12th in the alphabet, the ninth consonant, and the second liquid. The uniform sound of this letter is produced by striking the upper lip against the lower; in which its pronunciation agrees with that of *b*; the only difference consisting in a little motion made in the nose in pronouncing *m*, and not in *b*: whence those who have caught cold, for *m* ordinarily pronounce *b*; the nose in that case being disabled from making the necessary motion. Quintilian observes, that *m* sometimes ends Latin words, but never Greek ones; the Greeks always changing it into *n*, for the sake of the sound. As a numeral, M is used for a thousand. When a dash is put on the top of it thus ($\overline{M}$), it signifies 1000 times 1000, or a million. As an abbreviation, M stands for Manlius, Marcus, Martius, Mucius, and Monsieur; M. A. signifies magister artium, or master of arts; A. M. anno mundi, or the year of the world; M. D. doctor of medicine; MS. manuscript, and MSS. manuscripts; &c. M, in astronomical tables, &c. is used for meridional or southern; and sometimes for meridian or mid-day. M, in medicinal prescriptions, is frequently used for a maniple or handful: It is also often put at the end of a recipe, for misce, mingle; or for mixtura, a mixture. Thus, *m. f. julapium*, signifies mix and make a julep. In law, M. is the stigma burnt on the brawny part of the left thumb of a person convicted of manslaughter.

MABA, in botany, a genus of the triandria order, and diœcia class of plants. Calyx triid; male, corolla trifid; female, drupe superior, two-celled. The only species is *M. elliptica*, a smooth tree, native of the Friendly islands.

MABEA, a genus of the monœcia polyandria class and order. Calyx one-leaved; corolla none. There are two species, called pipewood, shrubs of the West Indies.

MACAO, a town of China, in Canton, on an island at the mouth of the Tae. Lon. (Pia Grand) $113^{\circ}35'15''$ E. of Greenwich. Lat. $22^{\circ}11'20''$ N.

MACAO, in ornithology. See **PSITTACUS**.

MACARIA, [*Μακαρία*, *i. e.* happiness,] in mythology, daughter of Hercules and Dejanira. The Athenians, decreed divine honours to her, and worshipped her as the goddess of happiness.

MACARIANS, in ecclesiastical history, the followers of Macarius, an Egyptian monk, who was distinguished towards the close of the 4th century for his sanctity and virtue.

MACARIANS, the followers of Macarius, a native of Ireland, who, about the close of the ninth century, propagated in France the error afterwards maintained by Averrhoes, that one individual intelligence or soul performed the spiritual and rational functions in all the human race.

MACARONIAN, or **MACARONIC**, a kind of burlesque poetry, consisting of a jumble of words of different languages, with words of the vulgar tongue Latinized, and Latin words modernized. Some derive the word from *Macaron*, Fr. or *Macaron*. See **MACAROON**.

MACAROON, [*macarone*, Italian,] a kind of sweet biscuit, made of flower, almonds, eggs, and sugar.

MACARSKA, a town of Dalmatia, capital of the primorie, or province of Vergoraz and Narenta. Lon. 17.57 . E. Lat. 43.42 . N.

MACASSAR, or **CELEBES**, an island of Asia, in the East Indian Ocean; E. of Borneo, S. of the Philippines, and W. of the Moluccas. The heat of the climate would be intolerable, were it not moderated by the N. winds, and the rains, which regularly fall five days before and after the full moon, and during two months that the sun is nearly vertical. The N. W. point of this island lies in Lon. 121.0 . E. Lat. 1.22 . N.

MACASSAR, a considerable kingdom in the above island. The soil is extremely fertile, and there are ripe fruits at all seasons. There are great numbers of monkeys, who are devoured by monstrous serpents; some of which are so large, that they will swallow one of these animals entire.

MACASSAR, the capital of the above kingdom. Lon. 119.49 . S. Lat. 4.50 . E.

MACBETH, a Scotch nobleman of the blood royal, who murdered Duncan I. king of Scotland, A. D. 1046; and, chasing Malcolm Canmore, his son and heir into England, usurped the crown. Siward earl of Northumberland, whose daughter Duncan had married, undertook, by order of Edward the Confessor, the protection of the fugitive prince; marched with an army into Scotland; defeated and killed Macbeth; and restored Malcolm to the throne of his ancestors. Shakespeare has made this transaction the subject of one of his best tragedies, though against all the rules of the ancient drama.

MACCABEES, two apocryphal books containing the history of the Maccabees and their wars against the Syrian kings in defence of their religion and liberties, so called from Mattathias or his son Judas Maccabeus, who was so named from the word מַכְבִּי, formed of the initials of מִי כִכְבָּה בְּאֵלֶם יְהוָה *q. d.* Who is like unto thee, O Lord, among the gods; which was the motto of his standard whence those people who fought under his standard were called Maccabees. The first book of the Maccabees is an excellent history, and comes nearest to the style of the sacred historians of any extant. It was written originally in the Chaldee language, of the Jerusalem dialect, and was extant in this language in the time of Jerom. From the Chaldee it was translated into Greek, from the Greek into Latin. It is supposed to have been written by John Hyrcanus the son of Simon, who was prince and high priest of the Jews near 30 years, and began his government at the time where this history ends. It contains the history of 40 years, from the reign of Antiochus Epiphanes to the death of Simon the high priest, that is, from A. M. 3829 to 3869; B. C. 131. The second book of the Maccabees begins with two epistles sent from the Jews of Jerusalem to the Jews of Egypt and Alexandria; both reckoned spurious. After these follows the preface to the history, which is an abridgement of a larger work, composed by one Jason, a Jew of Cyrene, who wrote in Greek the history of Judas Maccabeus and his brethren, and the wars against Antiochus Epiphanes, and Eupator. This book does not equal the accuracy of the first. It contains a history of about 15 years, from the execution of Heliodorus's commission, who was sent by Seleucus to carry away the treasures of the temple, to the victory obtained by Judas Maccabeus over Nicanor; that is, from A. M. 3828, to the year 3843. There are extant in the Polyglot bibles, both of Paris and London, Syriac versions of both these books; but they, as well as our English version, are derived from the Greek. There is also a third book of Maccabees, containing the history of the persecution of the Jews in Egypt, by Ptolemy Philopator, and their sufferings under it. It seems to have been written by some Alexandrian Jew in Greek, soon after the time of Jesus, the son of Sirach.

MACCLESFIELD, a large and handsome town of Cheshire. Lon. 2.10 . W. Lat. 53.15 . N.

MACE, a blunt weapon anciently much used by the cavalry of all nations. It was commonly made of iron; its figure much resembles a chocolate-mill; many specimens may be seen in the Tower. The mace in modern times has changed its form; and being no longer a war-instrument, is made of copper or silver gilt, ornamented with a crown, globe, and cross, and is now the chief ensign of authority throughout Great Britain.

MACE, in the materia medica the second coat or covering of

the kernel of the nutmeg, is a thin and membranaceous substance, of an oleaginous nature, and a yellowish colour; being met with in flakes of an inch or more in length, which are divided into a multitude of ramifications. It is of an extremely fragrant, aromatic, and agreeable flavour; and of a pleasant, but acrid oleaginous taste. It is carminative, stomachic, and astringent; and possesses all the virtues of nutmeg, but has less astringency. The oils of mace and nutmeg, whether prepared by distillation or expression, are so much of the same nature, that they may be indiscriminately used for one another on all occasions. They give ease in colics, and often in nephritic cases, taken internally from one drop to five or six of the distilled oil, or an equal quantity of the expressed; and externally, they are of use to rub paralytic limbs: they also assist digestion; and will often stop vomitings and hiccoughs, only by being rubbed on the region of the stomach. Nurses apply oil of mace by expression to children's navels to ease their gripes, and often with success; and we are assured, by authors of credit, that when rubbed on the temples, it promotes sleep.

MACEDON, or **MACEDONIA**, a celebrated kingdom of antiquity, bounded on the E. by the Ægean sea; on the S. by Thessaly and Epirus; on the W. by the Ionian sea or Adriatic; and on the N. at first by the Strymon and the Scardian mountains, but afterwards by the Nessus. The kingdom of Macedonia, extended in a direct line only 150 miles in length; but the windings of the coast lengthened it out to three times that extent; in which almost every convenient situation was occupied by a Grecian sea-port. The country was naturally divided by the Thermaic and Strymonic gulphs, into the provinces of Pieria, Chalcis, and Pangaia. The middle-region, which took its name from a city of Eubœa whence it was originally peopled, was very fertile and pleasant: the inland country, being diversified by lakes, rivers, and arms of the sea, was extremely convenient for inland navigation, while the towns of Amphipolis, Potidaa, Acanthus, and many others, afforded marts for the commerce of the republics of Greece, as well as of Thrace and Macedon. On one side of this district were the mountains of Pangaia, and on the other the plains of Pieria. Pieria extended 50 miles along the Thermaic gulph, to the confines of Thessaly and mount Pindus. The inland part of the country was beautifully diversified with shady hills and fountains; and so admirably calculated for solitary walks and retirement, that the ancients looked upon it to be the favourite haunt of the Muses, and accordingly bestowed upon them the title of Pierides. In the most early times this country was called Æmæthia, from Æmæthius one of its princes. The name of Macedon is said to have been derived from *Macedo*, a descendant of Deucalion; though others suppose it to have been only a corruption of Mygdonia, a district of the country. In those remote ages, Macedon, was divided into a great number of petty principalities, of which scarce even the names are now known.

MACEDONIANS, the natives of Macedonia. Baron de Tott says, the modern Macedonians, notwithstanding the despotism under which they groan, still inherit much of the bravery of their ancestors.

MACEDONIANS, in ecclesiastical history, the followers of Macedonius, patriarch of Constantinople, who through the influence of the Eunomians, was deposed by the council of Constantinople in 360, and sent into exile. He considered the Holy Ghost as a divine energy diffused throughout the universe, and not as a Person distinct from the Father and the Son.

MACERATA, a town of Italy, in the territory of the church, and marquise of Ancona. Lon. 13. 37. E. Lat. 43. 15. N.

MACHECOU, or **MACHECOUL**, a town of France in the department of the Lower Loire; 20 miles S. W. of Nantes.

MACHIAVEL, **NICHOLAS**, a famous political writer of the 16th century, of a distinguished family at Florence. He wrote in his native language with great elegance and politeness, though he understood very little Latin; but he was in the service of Marcellus Virgilius, a learned man, who pointed out to him many of the beautiful passages in the ancients, which Machiavel had the art of quoting properly in his works. He composed a comedy upon the ancient Greek model; in which he turned into ridicule many of the Florentine ladies, and which was so well received, that Pope Leo X. caused it to be acted at Rome. He was secretary, and afterwards historiographer, to the republic of Florence.

He died in 1530, of a remedy which he had taken by way of prevention. Of all his writings, that which has made the most noise, and has drawn upon him the most enemies, is a political treatise, entitled the Prince; which has been translated into several languages, and written against by many authors. The world is not agreed as to his motives in writing this work; some think he meant to recommend tyrannical maxims; others, that he only delineated them to excite abhorrence. He also wrote, "Reflections on Titus Livius," which are curious; "The History of Florence, from 1205 to 1494;" and a 4to. volume of Poems, &c. Mr. Harrington considers him as a superior genius, and as the most excellent writer on politics and government, that ever appeared.

MACHINE, in general, signifies any thing that serves to augment or to regulate moving powers: or it is any body destined to produce motion, so as to save either time or force. The word comes from the Greek, *μηχανή*, invention or art: and hence, in strictness, a machine is something that consists more in art and invention, than in the strength and solidity of the materials; for which reason the inventors of machines are called *ingenieurs* or *engineers*. Machines are either simple or compound. The simple ones are the seven mechanical powers, viz. lever, balance, pulley, axis and wheel, wedge, screw, and inclined plane. See **MECHANICS**. From these the compound ones are formed by various combinations, and serve for different purposes. See **HYDROSTATICS**, **MECHANICS**, **PNEUMATICS**, **STEAM-ENGINE**, &c.

MACHINES USED IN WAR, amongst the Greeks, were principally these: 1. *Κλίμακες*, or scaling ladders; 2. The battering ram; 3. The helepolis; 4. The *χιτών* or tortoise, called by the Romans *testudo*; 5. The *χώρα* or agger, which was faced with stone, and raised higher than the wall; 6. Upon the *χώρα* were built *πύργοι* or towers of wood; 7. *Πεζαί*, or osier-hurdles; 8. Catapulta, or *καταπέλται*, from which they threw arrows with amazing force; and 9. The *λίθοβολοι*, *πετροβολοι*, or *αβήκη*, from which stones were cast with great velocity. The principal warlike machines made use of by the Romans were, the ram, the lupus or wolf, the *testudo* or tortoise, the balista, the catapulta, and the scorpio.

MACHINERY, in epic and dramatic poetry, is when the poet brings some supernatural being upon the stage, to solve some difficulty, or perform some exploit out of the reach of human power. The ancient dramatic poets never made use of machines, unless where there was an absolute necessity for so doing: whence the precept of Horace:

*Nec Deus intersit, nisi dignus vindice nodus
Inciderit.*

It is quite otherwise with epic poets, who introduce them in every part of their poems. In Milton's *Paradise Lost*, the greater part of the actors are supernatural personages: Homer and Virgil do nothing without them: and, in Voltaire's *Henriade*, the poet has made excellent use of St. Lewis. As to the manner in which these machines should act, it is sometimes invisibly, by simple inspirations and suggestions; sometimes by actually appearing under some human form; and lastly, by dreams and oracles, which partake of the other two. But all these should be managed so as to keep within the bounds of probability.

MACHUL, an instrument of music among the Hebrews. Kircher apprehends that the name was given to two kinds of instruments, one of the strangled and the other of the pulsatile kind. See Plate CHH, fig. 7 and 8. That of the former sort had six chords; though there is great reason to doubt whether an instrument requiring the aid of the hair-bow, and so much resembling the violin, be so ancient. The latter was of a circular form, made of metal, and either hung round with little bells, or furnished with iron-rings suspended on a rod or bar that passed across the circle. Kircher supposes that it was moved to and fro by a handle fixed to it, and thus emitted a melancholy kind of murmur.

MACHYNLETH, a town of N. Wales, in Montgomeryshire. Lon. 3. 45. W. Lat. 52. 24. N.

MACKEREL. See **SCOMBER**.

MACLAURIN, **COLIN**, F. R. S. a most eminent mathematician and philosopher, was the son of a clergyman, and born at Kilmoddan in Scotland, in 1698. He was sent to the university of Glasgow in 1709; where he studied five years. His great genius for mathematics appeared so early as at 12 years of age; when, having accidentally met with an *Euclid*, he became in a few days master of the first six books without assistance: and in his 16th year

ear he had invented many of the propositions, afterwards published under the title of *Geometria Organica*. In his 15th year he took the degree of M. A. when he composed and defended a thesis On the power of Gravity, with great applause. After this he retired to a country-seat of his uncle, where he spent two or three years, as his parents were dead. In 1717, he stood candidate for the professorship of mathematics in the Marischal college of Aberdeen, and obtained it after a ten days trial with a very able competitor. In 1719, he went to London, where he became acquainted with Dr. Hoadly, then bishop of Bangor, Dr. Clarke, Sir Isaac Newton, and other eminent men, and was admitted F. R. S. In another journey in 1721, he contracted an intimacy with Martin Folkes, Esq. P. R. S. which lasted to his death. In 1722, Lord Polwarth, plenipotentiary to the congress of Cambray, engaged him to go as a tutor and companion to his eldest son, on his travels. After a short stay at Paris, and visiting other towns in France, they fixed in Lorraine; where Maclaurin wrote his piece On the Percussion of Bodies, which gained the prize of the Royal Academy of Sciences for 1724. But his pupil dying soon after at Montpellier, he returned immediately to Aberdeen, where he was hardly settled, when he received an invitation to Edinburgh, to supply the place of Mr. James Gregory. He had some difficulties to encounter, arising from competitors, which, however, were all surmounted, principally by Sir Isaac Newton; and in Nov. 1725, he was introduced into the university. In 1733, he married Anne, daughter of solicitor Stewart, by whom he had seven children, of whom five and his wife survived him. In 1734, Berkeley, bishop of Cloyne, published a piece called *The Analyst*; in which he took occasion, from some disputes that had arisen concerning the grounds of the fluxionary method, to explode the method itself, and to charge mathematicians in general with infidelity in religion. Maclaurin thought himself included in this charge, and began an answer to Berkeley's book; but, as he proceeded, so many new theories and problems occurred to him, that instead of a vindictory pamphlet, he published *A complete system of Fluxions*, with their application to the most considerable problems in geometry and natural philosophy: at Edinburgh, in 1742, 2 vols. 4to. He also published many useful tracts in the 4th and 6th vols. of the *Medical Essays*, at Edinburgh; as well as in the *Philos. Trans.*; as, 1. Of the construction and measure of curves, No. 356. 2. A new method of describing all kinds of curves, No. 359. 3. On equations with impossible roots, May 1726, No. 394. 4. On ditto, March 1729, No. 408. 5. On the description of curves, with farther improvements, Dec. 1732, No. 439. 6. A rule for finding the meridional parts of a spheroid, with the same exactness as of a sphere, Aug. 1741, No. 461. 7. and 8. Account of the treatise of fluxions, Jan. 27, and March 10, 1742, No. 467, and 469. 9. Of the basis of the cells, wherein the bees deposit their honey. In the midst of these studies, he was ready to lend his assistance in promoting any scheme for the service of his country. Under his direction the geography of the Orkney and Shetland islands was first accurately ascertained in 1739. He had another scheme for the improvement of geography and navigation, of a more extensive nature; which was the opening a passage from Greenland to the South Sea by the north pole. That such a passage might be found, he was so fully persuaded, that he used to say, if his situation could admit of such adventures, he would undertake the voyage at his own charge. In 1745, having been very active in fortifying the city of Edinburgh against the rebel army, he was obliged to fly to the north of England; where he was invited by Archbishop Herring, to reside with him during his stay; but being in this expedition exposed to cold and hardships, he contracted an illness which put an end to his life, in June 1746, at the age of 48. Mr. Maclaurin was not only a great but a good man. His peculiar merit as a philosopher was, that all his studies were accommodated to general utility; and we find, in many places of his works, an application even of the most abstruse theories, to the perfecting of mechanical arts. He revised Dr. David Gregory's *Practical Geometry*, and published it with additions, in 1745. On various occasions he served his friends and his country by his great skill. Frequent disputes having arisen concerning the gauging of vessels, he presented to the commissioners of excise two elaborate memorials, with their demonstrations, containing rules by which the officers now act. He made also calculations relating to the provision, established by law, for the children and widows of the Scot's

clergy, and of the professors of the universities, entitling them to certain annuities, upon the voluntary annual payment of a certain sum by the incumbent. He gained the prize of the Royal Academy of Sciences in 1724; and in 1740, the academy adjudged him a prize, for solving the motion of the tides from the theory of gravity; a question which had been given out the former year, without receiving any solution. He had only ten days to draw up this paper in. He afterwards revised the whole, and inserted it in his *Treatise of Fluxions*; as he did also the substance of the former piece. Since his death, two vols. more have appeared; his *Algebra*, and his *Account of Sir Isaac Newton's Philosophical Discoveries*.

MACQUER, PETER JOSEPH, was born at Paris, 9th October, 1718. He was descended of a respectable family, and was a member of the Academy of Sciences, and professor of pharmacy. He was engaged in the *Journal des Savans*, for the articles, *Medicine* and *Chemistry*: and had a share in the *Pharmacopœia Parisiensis*, published in 1758, in 4to. His other works are, 1. *Elements de Chimie theorique*; Paris, 1749, 1753, 12mo. which have been translated into English and German. 2. *Elements de Chimie pratique*, 1751, 2 vols. 12mo. These two works were republished together in 3 vols. 12mo. 3. *Plan d'un Cours de Chimie experimentale & raisonnée*, 1757, 12mo. in which he was associated with M. Beaumé. 4. *Formula Medicamentorum Magistralium*, 1763. 5. *L'Art de la Teinture en Soie*, 1763. 6. *Dictionnaire de Chimie, contenant la theorie & la pratique de cet art*, 1766, 2 vols. 8vo. which has been translated into German, with notes; and into English, with notes, by Mr. Keir. Macquer, by his labours and writings, contributed very much to the improvement of chemistry. He died at Paris, Feb. 16, 1784.

MACROBI, [from *μακρος βιος*, long life,] a people of Ethiopia, celebrated for their justice and the innocence of their manners, as well as for their uncommon longevity. A people in the island Meroe. The Hyperboreans were also called Macrobian.

MACROCEPHALUS, [from *μακρος*, great, and *κεφαλη*, head,] denotes a person with a head larger or longer than the common size. Macrocephali, or Long-heads, is a name given to a certain people, who, according to the accounts of authors, were famous for the unseemly length of their heads; yet custom so far habituated them to it, that instead of looking on it as a deformity, they esteemed it a beauty, and, as soon as the child was born, moulded and fashioned its head to as great a length as possible, and afterwards used all such rollers and bandages as might seem most likely to determine its growing long. The greater part of the islanders in the Archipelago, some of the people of Asia, and even some of Europe, still press their children's heads out lengthwise.

MACROCEPHALUS, in zoology, a genus of insects of the order hemiptera: snout inflected; the sheath one-valved, three-jointed, and furnished with three bristles; antennæ projecting, very short, submoniliform, clavate; head oblong, cylindrical above; scutell as long as the abdomen, depressed, membranaceous. The only species is, *M. cimicoides*, found in North America.

MACROCENMUM, in botany, a genus of the pentandria monogynia class and order; natural order, Contortæ. Corolla bell-shaped; capsule two-celled, two-valved, with the valves gaping outwardly at the sides; seeds imbricate. There are three species.

MACROCOLLUM, or **MACROCOLUM**, [from *μακρος*, large, and *κολλω*, I join,] among the Romans, the largest kind of paper then in use. It measured 16 inches, and often 24.

MACROCOSM, [*macrocosme*, French; *μακρος* and *κοσμος*,] the whole world, or visible system, in opposition to the microcosm, or world of man.

MACROLOBIUM, in botany, a genus of the triandria monogynia class and order; natural order, Lomentaceæ. Calyx double, outer two-leaved, inner one-leaved; petals five, upper one very large, the rest small, equal; germ pedicelled, legume. There are three species, all of them tall trees, natives of Guiana.

MACROPYRENIUM, in natural history, a genus of fossils consisting of crustated septariæ, with a long nucleus standing out at each end of the mass.

MACROTELOSTYLA, in natural history, a genus of crystals, composed of two pyramids joined to the end of a column; both pyramids and column being hexangular, and the whole body consequently composed of 18 planes.

MACTATION, [*mactatio*, Lat.] the act of killing the sacrifice;

fice; it was performed either by the priest himself, or some of his inferior officers, called *popæ*, *agones*, *cultuarii*, and *victimarii*; but, before the beast was killed, the priest turning himself to the East, drew a crooked line with his knife, from the forehead to the tail. Among the Greeks, this ceremony was performed most commonly by the priest, or, in his absence, by the most honourable person present. It the sacrifice was offered to the celestial gods, the victim's throat was bent up towards heaven; if to the infernal, or to heroes, it was killed with its throat towards the ground. The manner of killing the animal was by a stroke on the head, and after it was fallen, thrusting a knife into its throat. Much notice was taken, and good or ill success predicted, from the struggles of the beast, or its quiet submission to the blow, from the flowing of the blood, and the length of the time it lived after the fall, &c.

MACTRA, in natural history, a genus of the class *vermes*, and order *testacea*. Animal, a tethys; shell bivalve, sides unequal; middle-tooth of the hinge complicated, with a small hollow on each side; lateral ones inserted into each other. Twenty-seven species are enumerated.

MACULÆ, in astronomy, dark spots appearing on the luminous surfaces of the sun and moon, and even some of the planets. See **ASTRONOMY**.

MACUNA, one of the Navigator's Islands, in the S. Pacific Ocean. Lon. 169. 0 W. Lat. 14. 19. S.

MADAGASCAR, the largest of the African islands, is situated between 43° and 51° of Lon. E. and between 12° and 26° Lat. S. extending in length near 1000 miles from N. N. E. to S. S. W. and about 300 in breadth where broadest. This island according to many learned geographers, is the *Cerne* of Pliny, and the *Menuthiasle* of Ptolemy. It was discovered in 1506 by Laurence Almeyda; but the Persians and the Arabians were acquainted with it from time immemorial, under the name of *Serandib*. Alphonso Albuquerque ordered Ruy Pereira dy Continto to visit the interior parts, and that general intrusted Tristan d'Acunha with the survey. The Portuguese called it the island of St. Laurence; the French, who visited it in the reign of Henry IV. named it *Ile Dauphine*; its proper name is *Madegasse*, now, by common consent, *Madagascar*. The climate of this island is uncommonly fine. It is every where watered by rivers and rivulets which rise from a long chain of mountains that runs through its whole extent from E. to W. The two highest promontories are called *Vivagora* and *Botismene*. These mountains, according to the Abbé Rochon, contain a variety of precious minerals and useful fossils. The soil is so fertile, that the inhabitants scarce need to stir the ground with a rake. They scrape little holes at a small distance from each other, into which they scatter a few grains of rice, and cover them with their feet; and so great is the fertility, that the lands sown in this careless manner produce an hundred fold. The forests present a prodigious variety of the most useful and beautiful trees; ebony, wood for dyeing, bamboos of an enormous thickness, and palm-trees of every kind. The timber used in ship-building is as common as those kinds so much prized by the cabinet-maker. Besides the aromatic and medicinal herbs which abound in the forests, the island produces flax and hemp of a length and strength which surpass any in Europe. Sugar, wax, honey, tobacco, indigo, white pepper, gum-lac, ambergris, silk, and cotton, would long since have been objects of commerce, if the Europeans had furnished the inhabitants with the necessary instruction and instruments for preparing and improving these productions. The sugar-canes are much larger and finer than any in the West Indies; being as thick as a man's wrist, and so full of juice, that a foot of them will weigh two pounds. One of them will support a traveller for two or three days. Here are also plenty of tamarinds; and such quantities of limes and oranges, that very large casks may be filled with their juices at a trifling expence, as they may be purchased for iron-pots, muskets, powder, ball, &c. While Admiral Watson's squadron staid here in 1754, Mr. Ives preserved about half a hogshead of those juices, which proved afterwards of great service to the ship's crews. But no good water is to be had at St. Augustine, in the S. W. part of the island, where ships usually touch, unless boats are sent for it four or five miles up the river. There are great abundance and variety of provisions of every kind, which a fine climate and fertile soil can produce. The oxen are large and fat: and the sheep differ little

from the goats. Vast quantities of locusts rise here from the low lands in thick clouds, extending sometimes to an incredible length and breadth. The natives eat these insects, and even prefer them to their finest fish.

MADDER. See **RUBIA**.

MADDER, LITTLE FIELD. See **SHERARDIA**.

MADDER, PETTY. See **CRUCIANELLA**.

MADEIRA, the largest of the Madeira Islands, from which the rest take their name, is about 55 English miles long, and 10 miles broad; and was first discovered on the 2d July, in 1419, by Joao Gonzales Zarco. It is divided into two capitánias, or governments, named Funchal and Maxico, from their chief towns. The climate is excellent, the weather in general mild and temperate in summer, the heat is very moderate on the higher parts of the island, and in winter the snow remains there for several days. The inhabitants are of a tawny colour, and well shaped; though they have large feet, owing to the efforts they make in climbing the craggy parts of this mountainous country. Their faces are oblong, their eyes dark; their black hair naturally falls in ringlets, and begins to crisp in some individuals, which may be owing to intermarriages with negroes; in general, they are hard-featured, but not disagreeable. Their women are frequently ill-favoured. They are small, have prominent cheek-bones, large feet, an ungraceful gait, and the colour of the darkest brunette. The proportion of the body, the fine form of their hands, and their large lively eyes, in some measure compensate for these defects. Madeira consists of one large mountain, which rises every where from the sea towards the centre of the island, converging to the summit, in the midst of which is an excavation, called the *Val* by the inhabitants, always covered with a fresh and delicate herbage. From the calcined appearance and the soil, it seems probable that the island has been formerly a volcano, and, that the *Val* was its crater. Their supply of water is very scanty and as this article is absolutely necessary to the vineyards, it is not without great expence that a new vineyard can be planted; for the maintenance of which, the owners must purchase water at a high price, from those who are constantly supplied with it. Wherever a level piece of ground can be contrived in the higher hills, the natives make plantations of eddoes inclosed by a dike to cause stagnation, as that plant succeeds best in swampy ground. The leaves serve as food for hogs, and the country people eat the roots. The sweet potatoe too, is cultivated, and makes a principal article of diet; together with chesnuts, which grow in extensive woods on the higher parts of the island, where the vine will not thrive. Wheat and barley are likewise sown in spots where the vines are decaying through age, or where they are newly planted. But the crops do not produce above three months provisions; the inhabitants are therefore obliged to have recourse to other food, beside importing considerable quantities of corn from N. America in exchange for wine. The chief produce of Madeira is the wine, from which it has acquired fame and support. Wherever the soil, exposure, and supply of water, will admit of it, the vine is cultivated. One or more walks, about a yard or two wide, intersect each vineyard, and are inclosed by stone-walls two feet high. Along these walks, which are arched over with laths about seven feet high, they erect wooden pillars at regular distances, to support a lattice-work of bamboos, which slopes down from both sides of the walk, till it is only a foot and a half or two feet high, in which elevation it extends over the whole vineyard. The vines are in this manner supported from the ground, and the people have room to root out the weeds which spring up between them. In the season of the vintage, they creep under this lattice-work, cut off the grapes, and lay them into baskets; some bunches of these grapes weigh 6lb. and upwards. This method of keeping the ground clean and moist, and ripening the grapes in the shade, contribute to give the Madeira wines that excellent flavour and body for which they are remarkable. The owners of vineyards are, however, obliged to allot a certain spot of ground for the growth of bamboos; for the lattice-work cannot be made without them; and some vineyards lie quite neglected for want of this useful reed. The inclosures of the vineyards consist of walls, and hedges of prickly pear, pomegranates, myrtles, brambles, and wild roses. The gardens produce peaches, apricots, quinces, apples, pears, walnuts, chesnuts, and many other European fruits; together with some tropical plants, such as bananas, goavas, and pine-apples.

ples. All the common domestic animals of Europe are found at Madeira; and their mutton and beef, though small, is very well tasted. The wild animals of the feathered tribe are numerous; but of wild quadrupeds, there is only the common grey rabbit. Turkeys, geese, ducks, and hens, are very rare. There are no snakes, but all the houses, vineyards, and gardens, swarm with lizards; which they catch by hundreds in brass-kettles, as, when once they are in, they cannot get out again from the smoothness of the insides. The shores of Madeira, and the neighbouring Salvages and Desertas, are not without fish; but as they are not in plenty enough for the rigid observance of Lent, pickled herrings are brought from Gottenburg in English bottoms, and salted cod from New York and other American ports, to supply the deficiency.

MADEIRAS, a cluster of islands in the Atlantic ocean in W. Long. 16° and between 32° and 33° N. Lat.

MADIAN, in ancient geography, a town of Arabia Petraea, near the Arnan; so called from one of the sons of Abraham by Keturah; in ruins in Jerom's time.

MADIAN. See **MIDIAN**.

MADNESS, CANINE. See **HYDROPHOBIA**, and **MEDICINE**.

MADOX, THOMAS, a learned and indefatigable English Antiquary, of the eighteenth century, born in the seventeenth, but of whose birth, birth-place, family, and death, we find nothing on record. Patronized by the learned Lord Somers, he published, in 1702, "A Collection of Antique Charters and Instruments, taken from the Originals, from the Norman Conquest to the End of the Reign of Henry VIII." In 1711, he published a work of still more importance, viz. "The History and Antiquities of the Exchequer of the Kings of England, from the Conquest to the end of the Reign of Edward II." &c. in fol. which was reprinted in 1769, in 4to. This was dedicated to Queen Anne, with a long prefatory epistle to Lord Somers; and appears to have procured him the office of Historiographer Royal. His last work was "Firma Burgi, or a Historical Essay concerning the Cities, Towns, and Boroughs, of England;" dedicated to King George I. He also compiled a valuable "Collection of Transcripts, in 94 vols. fol. and 4to. consisting chiefly of Extracts from Records in the Exchequer, the Rolls in the Tower, the Cottonian Library," &c. intended to afford materials for a Feudal History of England from the earliest times. These volumes, which cost him thirty years labour, were presented by his widow to the British Museum; and Mr. Madox often said, that, when young, he would have given 1500 guineas for them.

MADRAS, or **FORT ST. GEORGE**, a town and fort of Hindoostan, on the coast of Coromandel, built by Sir W. Langhorne, in 1640, by order of the English East India Company, in the reign of Charles II. It fronts the sea, and has a salt-water river on its back-side, which hinders the fresh-water springs from coming near the town, so that they have no good water within a mile. In the rainy seasons it is incommoded by inundations; and from April to September, the heat would be intolerable were it not for the sea-breezes. It consists of two towns; one, called the White Town, is walled round, has several bulwarks and bastions; is 400 paces long and 150 broad, and is divided into regular streets. It has two churches, for Protestants, and Papists; a good hospital, a town-hall, and a prison. It is incorporated, and has a mayor and aldermen, &c. The Black Town is inhabited by Gentoos, Mohammedans, Jews, Portuguese, and Armenian Christians; each of whom have their temples or churches. Both are ruled by the English governor and his council. The diamond-mines are only distant a week's journey, which renders them pretty plentiful, but there are no large diamonds since the great one was procured by Governor Pitt. It lies 100 miles N. by E. of Pondicherry, 758 S. E. of Bombay, and 1030 S. W. by W. of Calcutta. Lon. 80. 25. E. Lat. 13. 5. N.

MADRE DE POPA, a town of South America, in Terra Firma. Lon. 76. 0. W. Lat. 11. 0. N.

MADREPORA, in natural history, a genus of the vermes zoophyta class and order. Animal resembling a medusa; coral with lamellate star-shaped cavities. There are about 120 species, separated into distinct divisions. A. composed of a single star. B. with numerous separate stars, and continued gills. C. with numerous united stars. D. aggregate, undivided, with distinct

stars and porous tuberculous prominent undulations. E. branched, with distinct stars and tuberculous porous undulations. For figures of two species, see Plate XCVIII.

MADREPORITE, a mineral found in the valley of Russback, in Salzburg, and so called from its external resemblance to madrepora. It is found in large masses, is brittle and moderately heavy. Its component parts are,

Carbonate of lime.....	93.00
Carbonate of magnesia.....	0.50
Carbonate of iron.....	2.25
Charcoal.....	0.50
Silica.....	4.50

99.75

Loss..... 25

100

MADRID, a town of Spain, in New Castile, capital of the kingdom, situated in Lon. 3. 20. W. Lat. 40. 26. N. It stands in the centre of a large plain, surrounded with mountains, and in the very heart of Spain, on the banks of the Manzanares. The city is, in general, well laid out; the streets are wide, clean, and well paved; and the houses lofty, but built of brick, with lattice-windows, excepting those of the rich, which are of glass; only, during the summer-heats, they use gauze, to let in the fresh air. There are two stately bridges over the Manzanares, and many magnificent churches, convents, hospitals, and palaces. At the E. end of the town is the Prado, a delightful plain, planted with regular rows of poplar-trees, and watered with many fountains; where the inhabitants of all ranks resort. The principal square is the Plaza Mayor, which is 1536 feet in circuit, and is surrounded with piazzas, and 150 elegant and lofty houses, five stories high. Madrid lies 265 miles N. E. of Lisbon, 590 S. by W. of London, 625 S. S. W. of Paris, and 750 N. W. of Rome. Lon. 3. 39. W. Lat. 40. 25. N.

MADRID, New, a town of Louisiana, W. of the Mississippi, Lon. 89. 50. W. Lat. 30. 36. N.

MADRIER, in the military art, a long and broad plank of wood, used for supporting the earth in mining and carrying on a sap, and in making coffers, caponiers, galleries, and for many other uses at a siege. Madriers are also used to cover the mouths of petards after they are loaded, and are fixed with the petards to the gates or other places designed to be forced open.

MADURA, a province of Hindostan, sixty miles long and fifty broad, bounded on the E. by Tanjour and Marava; S. E. by the sea; W. by the Balagat mountains, which separate it from Malabar, and N. by Visiapour and Carnate. The chief commodities are rice, elephants teeth, and cotton-cloth; of which last a great deal is made, very fine. The Dutch have a rich pearl-fishery.

MADURA, the capital of the above province, 182 miles S. S. E. of Seringapatam, and 236 S. S. W. of Madras. Lon. 78. 11. E. Lat. 9. 50. N.

MADURA, an island, with its capital, in the East Indian Ocean, seventy-five miles long, and from nine to fifteen broad; very fertile in rice, and containing three provinces. Lon. 112. 49. E. Lat. 7. 5. S.

MADWORT. See **ALYSUM**.

MEANDER, in ancient geography, a celebrated river of Asia Minor, rising near Calanae. It flows through Caria and Ionia into the Aegean sea between Miletus and Priene, after receiving the waters of the Marsyas, Lycus, Eudon, Lethæus, &c. It is celebrated among the poets for its numerous windings, which amount to not less than 600; and hence all windings are called meanders.

MEATE, or **MEATS**, an ancient people of Britain, who inhabited the middle-part of the island, and hence are styled by Dr. Anderson, in his Royal Genealogies, the Mid-land Britons.

MECENAS, CAIUS CILNIUS, the great friend and counsellor of Augustus, and the celebrated and liberal patron and protector of men of letters. He was descended from the kings of Etruria, but his immediate forefathers were only of the equestrian order. He is supposed to have been born at Rome, as his family lived there; but nothing is known of him previous to the death of Cæsar, A. U. C. 709; when Octavius Cæsar went to Rome, to take

take possession of his uncle's inheritance; and Mæcenas became first publicly known. From that time he accompanied him through all his fortunes, and was his adviser upon all occasions, so that Pædo Albinovanus called him Cæsar's right-hand. In A. U. C. 710, Mæcenas distinguished himself by his courage and military skill at the battle of Modena, as he did afterwards at Philippi. After this last battle began his memorable friendship with Horace, who was a tribune in the army of Brutus, and was taken prisoner. Mæcenas recommended him to Augustus, who restored to him his estate with no small additions. Mæcenas, after the civil wars, indulged himself at vacant hours in literary amusements, and the conversation of men of letters. His house was open to all the learned of his time; Virgil, Horace, Propertius, Varius, Fundanius, Pæscus Aristius, Plotius Tucca, Valgius, Asinius Pollio, and many others. He died in the year 8 B. C. or 745 A. U. C. But his name will ever be venerated by men of letters, on account of the disinterested patronage and support he gave to all the wits and learned men of his time, whence his name has become almost an appellative for a patron of learning and genius. He wrote some tragedies, and several other works, which are all lost.

MAELSTROM, a very dangerous whirlpool on the coast of Norway, province of Nordland, and district of Lofoden, near the island of Moskoe, whence it also has its name of Moskoe-strom. Of this amazing whirlpool, Jonas Ramus gives the following account: "The mountain of Helseggen, in Lofoden, lies a league from the island of Ver, and betwixt these two runs that large and dreadful stream called Moskoestrom, from the island of Moskoe, which is in the middle of it, together with several circumjacent isles, as Ambaaran, half a quarter of a league N. Islesen, Høeholm, Kiedholm, Suarven, and Buckholm. Moskoe lies about half a quarter of a mile south of the island of Ver, and betwixt them these small islands, Otterholm, Flimen, Sandflesen, Stockholm. Betwixt Lofoden and Moskoe, the depth of the water is between thirty-six and forty fathoms; but on the other side, towards Ver, the depth decreases so as not to afford a convenient passage for a vessel, without the risk of splitting on the rocks, which happens even in the calmest weather: when it is flood, the stream runs up the country between Lofoden and Moskoe with a boisterous rapidity; but the roar of its impetuous ebb to the sea is scarcely equalled by the loudest and most dreadful cataracts; the noise being heard several leagues off, and the vortices or pits are of such an extent, and depth, that if a ship comes within its attraction, it is inevitably absorbed and carried down to the bottom, and there beat to pieces against the rocks; and when the water relaxes, the fragments are thrown up again. But these intervals of tranquillity are only at the turn of the ebb and flood, in calm weather: and last but a quarter of an hour, its violence gradually returning. When the stream is most boisterous, and its fury heightened by a storm, it is dangerous to come within a Norway mile of it; boats, ships, and yachts, having been carried away, by not guarding against it before they were within its reach. It likewise happens frequently, that whales come too near the stream, and are overpowered by its violence; and then it is impossible to describe their howlings and bellowings in their fruitless struggles to disengage themselves. A bear once attempting to swim from Lofoden to Moskoe, with a design of preying upon the sheep at pasture in the island, afforded the like spectacle to the people; the stream caught him, and bore him down, whilst he roared terribly so as to be heard on shore. Large stocks of firs and pine-trees, after being absorbed by the current, rise again, broken and torn to such a degree as if bristles grew on them. This plainly shews the bottom to consist of craggy rocks, among which they are whirled to and fro. This stream is regulated by the flux and reflux of the sea; it being constantly high and low water every six hours. In 1645, early in the morning of Sexagesima Sunday, it raged with such noise and impetuosity, that on the island of Moskoe, the very stones of the houses fell to the ground." When this whirlpool is agitated by a storm, its vortex will reach vessels five or six miles distant. Lon. 10. 40. E. Lat. 68. 8. N.

MÆMACTERIA, sacrifices offered to Jupiter at Athens, in the winter-month Mæmactæron.

MÆMACTERION, was the fourth month of the Athenian year, containing twenty-nine days, and answering to the latter part of our September, and the beginning of October:

MENALUS, in ancient geography, a mountain of Arcadia sacred to Pan, and greatly frequented by shepherds. It received its name from Menalus, a son of Lyaon. It was covered with pine-trees, whose echo and shade have been greatly celebrated by all the ancient poets.

MÆONIA, or **MÆONIA**, a country of Asia Minor, forming part of Lydia. It is watered by the Pactolus. The rest on the sea-coast was called Lydia. See **LYDIA**.

MÆONIDÆ, a name given to the Muses, because Homer, their greatest worthiest favourite, was supposed to be a native of Mæonia.

MÆONIDES, a surname of Homer, because, according to the opinion of some writers, he was born in Mæonia, or because his father's name was Mæon.

MAESLAND, or **MAESLAND SLUYS**, a town of Holland, in the department of Delft, and late province of S. Holland, ten miles W. of Rotterdam.

MESTRICHT, a town of France, in the late Austrian Netherlands, and bishopric of Liege, now capital of the department of the Lower Meuse. It is seated on the Maese, which separates it from Wyck, with which it communicates by a handsome bridge. In 1530, the emperor, Charles V. annexed it to Brabant. It revolted from the Spaniards in 1570, but was reduced in 1579. Lewis XIV. took it in 1673; but it was restored to the Dutch by the treaty of Nimeguen, in 1678. On the 23rd Feb. 1793, it was bombarded by the French under General Miranda; but on the first of March was relieved by General Clairfait, who defeated the republicans, and compelled them to raise the siege, with the loss of 2000 men and nine pieces of artillery. On the 23d Sept. 1794, it was again invested by 200,000 French troops under General Kleber, but stood a regular siege till the fourth of November, when it surrendered, with its garrison of about 8000 men. During the bombardment, which lasted three days, about 2000 houses were demolished. It is fifty-five miles E. of Brussels. Lon. 5. 41. E. Lat. 50. 51. N.

MAESYCK, a town of France, in the department of the Ourte, and late bishopric of Liege, eight miles S. W. of Ruremond.

MAGADOXO, a kingdom of Africa, with its capital on the coast of Ajan. Lon. 45. 15. E. Lat. 3. 0. N.

MAGAS, [from μαγική, *magikê*, to sing or play in unison or octave,] a musical instrument in use among the ancients. There were two kinds of magades, the one a stringed instrument, formed of twenty chords arranged in pairs, and tuned to unison or octave, so that they yielded ten sounds; the invention whereof is ascribed by some to Sappho; by others, to the Lydians; and by some, to Timotheus of Miletus. The other was a kind of flute, which at the same time yielded very high and very low notes.

MAGAZINE, [*maghsan*, Arab. a treasure,] a place in which stores are kept, or arms, ammunition, provisions, &c. Every fortified town ought to be furnished with a large magazine, which should contain stores of all kinds, sufficient to enable the garrison and inhabitants to hold out a long siege, and in which smiths, carpenters, wheel-wrights, bakers, &c. may be employed in making every thing belonging to the artillery, as carriages, waggons, &c.

MAGAZINE, on ship-board, is a close room or store-house, built in the fore or aft-part of the hold, to contain the gunpowder used in battle. This apartment is strongly secured against fire, and no person is allowed to enter it with a lamp or candle; it is therefore lighted, as occasion requires, by the candles or lamps in the light-room contiguous to it.

MAGAZINE, POWDER, is that where the gunpowder is kept in very large quantities. Authors differ greatly both with regard to the situation and construction; but all agree, that they ought to be arched and bomb-proof. In fortifications, they are frequently placed in the rampart; but of late they have been built in different parts of the town. The first powder-magazines were made with Gothic arches: but M. Vauban, finding them too weak, constructed them in a semi-circular form; whose dimensions are sixty feet long within, and twenty-five broad; the foundations are eight or nine feet thick, and eight feet high from the foundation to the spring of the arch; the floor is two feet from the ground, which keeps it from dampness. An engineer of great experience some time ago had observed, that after the centres of semi-circular arches are struck, they settle at the crown and rise up at the hanches, even with a straight horizontal extrados, and still much

more

more so in powder-magazines, whose outside at top is formed like the roof of a house, by two inclined planes joining in an angle over the top of the arch, to give a proper descent to the rain; which effects are exactly what might be expected agreeable to the true theory of arches. Now, as this shrinking of the arches must be attended with very ill consequences, by breaking the texture of the cement after it has been in some degree dried, and also by opening the joints of the voussoirs at one end, so a remedy is provided for this inconvenience with regard to bridges, by the arch of equilibration in the late Dr. Hutton's book on bridges; but as the ill effect is much greater in powder-magazines, the same ingenious gentleman proposed to find an arch of equilibration for them also, and to construct it when the span is twenty feet, the pitch or height ten (which are the same dimensions as the semi-circle), the inclined exterior walls at top forming an angle of 113 degrees, and the height of their angular point above the top of the arch equal to seven feet. This curious question was answered in 1775 by the Rev. Mr. Wildbore. See Hutton's *Miscellaneous Mathematica*, page 263.

MAGAZINES, LITERARY; a well known species of periodical publications, of which the first that appeared was the *Gentleman's*, set on foot by Mr. Edward Cave, in 1731. This, as Dr. Kippis observes, "may be considered as something of an epocha in the literary history of this country. The periodical performances before that time were almost wholly confined to political transactions, and to foreign and domestic occurrences; but the monthly magazines have opened a way for every kind of enquiry and information. The intelligence and discussion contained in them are very extensive and various; and they have been the means of diffusing a general habit of reading through the nation, which in a certain degree hath enlarged the public understanding. Many young authors, who have afterwards risen to considerable eminence in the literary world, have here made their first attempts in composition. Here too are preserved a multitude of curious and useful hints, observations, and facts, which otherwise might have never appeared; or if they had appeared in a more evanescent form, would have incurred the danger of being lost."

MAGDALEN ISLANDS, a cluster of islands in the Gulf of St. Lawrence; fourteen leagues N. W. of Cape Breton. The largest lies in Lon. 61. 20. W. Lat. 47. 25. N.

MAGDALEN, RELIGIOUS OF ST. or MAGDALENETTES, a name given to divers communities of nuns, consisting generally of penitent courtizans. Such are those at Metz, established in 1452; those at Paris, in 1492; those at Naples, first established in 1324, and endowed by Queen Sancha; and those of Rouen and Bourdeaux, which had their original among those of Paris in 1618.

MAGDALENA, one of the Marquesas Islands, about five leagues in circuit. Lon. 133. 49. W. Lat. 10. 25. S.

MAGDEBURG, a late duchy of Germany, in Lower Saxony; bounded on the N. by Mecklenburgh; S. and S. W. by the principality of Anhalt and Halberstadt, E. by Upper Saxony and Brandenburg; and W. by the duchy of Wolfenbüttele. This country is, for the most part, level; but sandy, marshy, or overgrown with woods. There are salt-springs in it so rich, that they are sufficient to supply all Germany with salt. The Holz circle is the most fruitful part of it. In the Saale circle, where wood is scarce, there is pit-coal: and at Rothenburg is a copper-mine. The duchy is well watered by the Elbe, which passes through it; and the Saale, Havel, Aller, Olre, and Elster, either rise in, or wash some part of it, in their course. The principal places are, Magdeburg, Halle, and Glauche.

MAGDEBURG, the capital of the above duchy, as well as of Lower Saxony, and formerly of all Germany, is forty miles W. of Brandenburg, and 125 S. E. of Hamburg. Lon. 11. 45. E. Lat. 52. 11. N.

MAGELLAN, FERDINAND, a celebrated Portuguese mariner in the sixteenth century. He went into the service of the emperor Charles V. and sailed from Seville with five vessels in 1519, when he discovered and passed through the strait to which he gave his name, and sailed through the S. Sea to the Ladrone Islands, where, according to some, he was poisoned in 1520: though others say that he was killed in a mutiny of his people in the Island of Mutan, on account of his severity. His voyage round the world was written by one on board, and has been often printed in English.

MAGELLAN, STRAITS OF, a narrow passage between Terra del

Fuego, and the S. extremity of America, first discovered by Magellan.

MAGELLANIA, or TERRA MAGELLANICA, a vast tract of land in South America, extending from the province of Rio de la Plata, to the utmost verge of the South Continent: viz. from Lat 35° to 54° S. It is bounded on the N. by Chili and Cuyo; E. by the Pacific Ocean; S. by the Straits of Magellan; and W. by the South Sea and Chili. Magellan discovered only Cape Virgin and Desire; but the Missionaries have discovered several different nations in this country; particularly the Chunians and Huillans. The former inhabit the country and several islands N. of the latter; who dwell near Magellan's Straits. The Chunians are tyrannised over, hunted, and sold for slaves, by the Huillans. The soil is barren; the climate cold and inhospitable; the E. coasts are marshy.

MAGGIORA, MAGGIORE, or LOCARNO, LAKE, or LAKE MAJOR, a lake lying partly in Italy, and partly in Switzerland, thirty-five miles long and six broad. It abounds with trout, perches, &c.

MAGGOT, the common name of the fly-worm generated in flesh, from the egg of the large blue flesh-fly, known under the name of blue-bottle. Its body is white and fleshy, destitute of legs or feet, and composed of a number of rings, similar to those of caterpillars; and the insect is capable of assuming various figures, being at times more or less extended in length, and consequently of a greater or smaller size, according to its different contraction. Although we are not acquainted with any remedy, by which meat or cheese infested with maggots may be recovered, and rendered fit for use, yet we shall suggest a simple expedient for preventing the generation of such vermin. In hot climates, where the flesh of animals undergoes putrefaction within a few hours, it will be advisable to cover the meat with the leaves of the Swallow-wort (*Stapelia variegata* and *hirsuta*), natives of Africa; or with those of the Fetid Goose-foot or Orache (*Chenopodium olidum*), either of which possess a very fetid smell, that attracts the oviparous flies to deposit their eggs on these leaves, mistaking them for putrid flesh; but, as the young brood cannot subsist on vegetable food, they speedily perish. Funke remarks, that a couple of flies, according to a probable computation, may produce in one year, two millions of descendants. See *Musca*.

MAGI, or MAGIANS, an ancient religious sect in Persia, and other eastern countries, who maintained that there were two principles, one the cause of all good, the other the cause of all evil: and, abominating the adoration of images, they worshipped God only by fire; which they looked upon as the brightest and most glorious symbol of Oromasdes, or the good God; as darkness is the truest symbol of Arimanius, or the evil god. This religion was reformed by Zoroaster, who maintained that there was one supreme independent Being; and under him two principles or angels, one the angel of goodness and light, and the other of evil and darkness: that there is a perpetual struggle between them, which shall last to the end of the world; that then the angel of darkness and his disciples shall go into a world of their own, where they shall be punished in everlasting darkness; and the angel of light and his disciples shall go into a world of their own, where they shall be rewarded in everlasting light. The priests of the magi were the most skilful mathematicians and philosophers of the ages in which they lived, inasmuch that a learned man and a magian became equivalent terms. The vulgar looked on their knowledge as supernatural; and hence those who practised wicked and mischievous arts, taking upon themselves the name of magians, drew on it that ill signification which the word magician now bears among us. This sect still subsists under the denomination of Gours or Gabres, in Persia, where they watch the sacred fire with the greatest care, and never suffer it to be extinguished.

MAGIC, [*magia*, Gr.] in its ancient sense, is the science or discipline and doctrine of the magi, or wise men of Persia. See *Magi*.

Magic, in a modern sense, is a science which teaches to perform wonderful and surprising effects. The word originally carried with it a very innocent, and even a laudable, meaning; being used purely to signify the study of wisdom, and the more sublime parts of knowledge; but as the ancient magi engaged also in astrology, divination, sorcery, &c. the term magic in time became odious, and was only used to signify an unlawful and diabolical kind

of science, depending on the assistance of the devil and departed souls. Agrippa divides magic into three kinds; viz. natural, celestial, and ceremonial, or superstitious.

I. **MAGIC, CELESTIAL**, borders nearly on judicial astrology: it attributes to spirits a kind of rule or dominion over the planets, and to planets a dominion over men; and on these principles builds a ridiculous kind of system.

II. **MAGIC, NATURAL**, is the application of natural active causes to passive subjects: by means whereof many surprising, but yet natural, effects are produced. In this way many of our experiments in natural philosophy, especially those of electricity, optics, and magnetism, have a kind of magical appearance, and among the ignorant and credulous might easily pass for miracles. Such, without doubt, have been some of those miracles wrought by ancient magicians, whose knowledge of the various powers of nature, there is reason to believe, was much greater than modern vanity will sometimes allow. Baptista Porto has a treatise of natural magic, or of secrets for performing very extraordinary things by natural causes. The natural magic of the Chaldeans was nothing but the knowledge of the powers of simples and minerals.

III. **MAGIC, SUPERSTITIOUS, or GOETIC**, consists of the invocation of devils. Its objects and effects are diabolical in the extreme, so as to exceed the usual powers of nature; and is produced by virtue of some compact, either tacit or express, with evil spirits. This species of magic appears to have had its origin in Egypt, the native country of paganism. The first magicians mentioned in history were Egyptians; and that people, so famed for early wisdom, believed not only in the existence of demons, the great agents in magic, but also that different orders of those spirits presided over the elements of earth, air, fire, and water, as well as over the persons and affairs of men. Hence they ascribed every disease with which they were afflicted to the immediate agency of some evil demon. When any person was seized with a fever, for instance, they did not think it necessary to search for any natural cause of the disease; it was immediately attributed to some demon, which had taken possession of the body of the patient, and could not be ejected but by charms and incantations. That magicians could not only cure the sick, but inflict diseases, and work miracles, by means of their subservient demons, was universally believed. Ancient writers are full of the wonders which they performed.

MAGIC LANTERN. See **OPTICS**.

MAGIC SQUARE, a square figure, formed of a series of numbers in mathematical proportion; so disposed in parallel and equal ranks, as that the sums of each row, taken either perpendicularly, horizontally, or diagonally, are equal. Let the several numbers which compose any square number (for instance, 1, 2, 3, 4, 5, 6, &c. to 36, inclusive, the square number) be disposed in their natural order, after each other in a square figure of thirty-six cells, each in its cell; if now you change the order of these numbers, and dispose them in the cells in such manner as that the six numbers which fill an horizontal rank of cells, being added together, shall make the same sum with the six numbers in any other rank of the cells, whether horizontal or vertical, and even the same number with the six in each of the two diagonal-ranks; this disposition of numbers is called a magic square, in opposition to the former disposition, which is called a natural square. See the figures following:

Natural square.

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36

Magic square.

29	12	28	9	7	26
32	31	3	4	36	5
23	18	15	16	19	20
14	24	21	22	13	17
2	1	34	33	6	35
11	25	10	27	30	8

One would imagine that these magic squares had that name given them in regard to this property of all their ranks, which, taken

any way, make always the same sum, appeared extremely surprising, especially in certain ignorant ages, when mathematics passed for magic; but there is a great deal of reason to suspect, that these squares merited their name still farther, by the superstitious operations they were employed in, as the construction of talismans, &c. for, according to the childish philosophy of those days, which attributed virtues to numbers, what virtues might not be expected from numbers so wonderful? However, what was at first the vain practice of makers of talismans and conjurers, has since become the subject of serious research among mathematicians; not that they imagine it will lead them to any thing of solid use or advantage (magic squares savour too much of their original to be of much use); but only as it is a kind of play, where the difficulty makes the merit, and it may chance to produce some new views of numbers, which mathematicians will not lose the occasion of. Eman. Moschopolus, a Greek author of no great antiquity, is the first that appears to have spoken of magic squares: and by the age wherein he lived, there is reason to imagine he did not look on them merely as a mathematician. However, he has left us some rules for their construction. In the treatise of Cor. Agrippa, so much accused of magic, we find the squares of seven numbers, viz. from three to nine inclusive, disposed magically; and it must not be supposed that those seven numbers were preferred to all the other without some very good reason; in effect, it is because their squares, according to the system of Agrippa and his followers, are planetary. The square of 3, for instance, belongs to Saturn; that of 4 to Jupiter; that of 5 to Mars; that of 6 to the Sun; that of 7 to Venus; that of 8 to Mercury; and that of 9 to the moon. M. Bachet applied himself to the study of magic squares, on the hint he had taken from the planetary squares of Agrippa, as being unacquainted with the work of Moschopolus, which is only in manuscript in the French king's library; and, without the assistance of any author, he found out a new method for those squares whose root is uneven, for instance 25, 49, &c. but he could not make any thing of those whose root is even. After him came M. Frenicle, who took the same subject in hand. A certain great algebraist was of opinion, that whereas the 16 numbers which compose the square might be disposed 2092278988000 different ways in a natural square (as from the rules of combination it is certain they may), they could not be disposed in a magic square above 16 different ways; but M. Frenicle shewed that they might be thus disposed 878 different ways: whence it appears how much his method exceeds the former, which only yielded the fifty-fifth part of magic squares of that of M. Frenicle. To this inquiry he thought fit to add a difficulty that had not before this time been considered; the magic square of 7, for instance, being constructed, and its 49 cells filled, if the two horizontal ranks of cells, and at the same time, the two vertical ones, the most remote from the middle, be retrenched; that is, if the whole border or circumference of the square be taken away, there will remain a square whose root will be 5, and which will only consist of 25 cells. Now it is not at all surprising that the square should be no longer magical, because the ranks of the large ones were not intended to make the same sum, excepting when taken entire with all the seven numbers that fill their seven cells; so that being mutilated each of two cells, and having lost two of their numbers, it may be well expected that their remainders will not any longer make the same sum. But M. Frenicle would not be satisfied, unless when the circumference or border of the magic square was taken away, and even any circumference at pleasure, or, in fine, several circumferences at once, the remaining square was still magical: which last condition, no doubt, made these squares vastly more magical than ever. Again, he inverted that condition, and required that any circumference taken at pleasure, or even several circumferences, should be inseparable from the square; that is, that it should cease to be magical when they were removed, and yet continue magical after the removal of any of the rest. M. Frenicle, however, gives no general demonstration of his methods, and frequently seems to have no other guide but chance. It is true, his book was not published by himself, nor did it appear till after his death viz. in 1693. In 1703 M. Poignard, canon of Brussels, published a treatise of sublime magic squares. Before him there had been no magic squares made but for serieses of natural numbers that formed a square; but M. Poignard made two very considerable improvements.

1. Instead of taking all the numbers that fill a square, for instance the 36 successive numbers, which would fill all the cells of a natural square whose side is 6, he only takes as many successive numbers as there are units in the side of the square, which in this case are six; and these six numbers alone he disposes in such manner in the 36 cells, that none of them are twice repeated in the same rank, whether it be horizontal, vertical, or diagonal; whence it follows, that all the ranks, taken all the ways possible, must always make the same sum, which M. Poignard calls repeated progression. 2. Instead of being confined to take these numbers according to the series and succession of the natural numbers, that is, in an arithmetical progression, he takes them likewise in a geometrical progression, and even in an harmonical progression. But with these two last progressions the magic must necessarily be different to what it was: in the squares filled with numbers in geometrical progression, it consists in this, that the products of all the ranks are equal; and in the harmonical progression, the numbers of all the ranks continually follow that progression; he makes squares of each of these three progressions repeated. This book of M. Poignard, gave occasion to M. de la Hire to turn his thoughts the same way, which he did with such success, that he seems to have well nigh completed the theory of magic squares. He first considers uneven squares: all his predecessors on the subject having found the construction of even ones by much the more difficult; for which reason M. de la Hire reserves those for the last. This excess of difficulty may arise partly from hence, that the numbers are taken in arithmetical progression. Now in that progression, if the number of terms be uneven, that in the middle has some properties, which may be of service; for instance, being multiplied by the number of terms in the progression, the product is equal to the sum of all the terms. M. de la Hire proposes a general method for uneven squares, which has some similitude with the theory of compound motions, so useful and fertile in mechanics. As that consists in decomposing motions, and resolving them into others more simple; so does M. de la Hire's method consist in resolving the square that is to be constructed into two simple and primitive squares. It must be owned, however, it is not quite so easy to conceive those two simple and primitive squares in the compound or perfect square, as in an oblique motion to imagine a parallel and perpendicular one. As to the even squares, he constructs them like the uneven ones, by two primitive squares; but the construction of primitives is different in general, and may be so a great number of ways: and those general differences admit of a great number of particular variations, which give as many different constructions of the same even square. It scarce seems possible to determine exactly, either how many general differences there may be between the construction of the primitive squares of an even square and an uneven one, nor how many particular variations each general difference may admit of; and, of consequence, we are still far from being able to determine the number of different constructions of all those that may be made by the primitive squares. We shall treat of M. de la Hire's methods of constructing squares with even and odd roots, in the subsequent part of this article, after we have first touched upon the discoveries of the ancients upon this subject.

OF ODD MAGIC SQUARES.

There are several rules for the construction of these squares; but the most convenient is that which, according to M. de la Loubere, is employed by the Indians of Surat, among whom magic squares seem to be held in as much estimation as they were formerly among the ancient visionaries before-mentioned. We shall here suppose an odd square, the root of which is 7, and that it is required to fill it up with the first 49 of the natural numbers. In this case begin by placing unity in the middle-cell of the horizontal band at the top; then proceed from left to right, ascending diagonally, and when you go beyond the square, transport the next number 2 to the lowest of that vertical band to which it belongs; set 3, 4, in the next cells ascending diagonally from left to right, and as 5 would go beyond the square, transport it to the most distant cell of the horizontal band to which it belongs; set 6, 7, in the next cells ascending diagonally from left to right; and as the following cell, where 8 would fall, is already occupied by 1, place 8 immediately below 7; place 9, 10, in the two next cells ascending diagonally, as seen in the following square; and

then, in consequence of the first rule of transposition, set 11 at the bottom of the sixth vertical band; then 12 in the next cell to it ascending diagonally from left to right; then 13, in consequence of the second rule of transposition, in the last cell on the left of the fifth horizontal band; then 14 in the cell next to it ascending diagonally from left to right; then 15 under it, according to the third rule of transposition; after which continue to fill up the cells from 15 ascending diagonally towards the right with the numbers 16, 17, 18, 19, and as you can ascend no farther place the following number at the bottom of the last vertical band, agreeably to the first rule of transposition, and 21, in consequence of the second, in the bottom-cell but one of the first vertical band; and 22 under it according to the third rule; after which proceed to fill up the diagonal with the numbers 23, 24, 25, 26, 27, 28, and, as you can ascend no higher, place 29 under 28; if you proceed in this manner, the remaining cells may be filled up without any difficulty, as seen in the subjoined square.

30	39	48	1	10	19	28
38	47	7	9	18	27	29
46	6	8	17	26	35	37
5	14	16	25	34	36	45
13	15	24	33	42	44	4
21	23	32	41	43	3	12
22	31	40	49	2	11	20

The following are the squares of 3, 5, 9, and 11, filled up by the same method; and as these examples will be sufficient to exercise such as have a taste for amusements of this kind, we shall proceed to give a few general remarks on the properties of squares constructed after this manner.

8	1	6
3	5	7
4	9	2

17	24	1	8	15
23	5	7	14	16
4	6	13	20	22
10	12	19	21	3
11	18	25	2	9

47	58	69	80	1	12	23	34	45
57	68	79	9	11	22	33	44	46
67	78	8	10	21	32	43	54	56
77	7	18	20	31	42	53	55	66
6	17	19	30	41	52	63	65	76
16	27	29	40	51	62	64	75	5
26	28	39	50	61	72	74	4	15
36	38	49	60	71	73	3	14	25
37	48	59	70	81	2	13	24	35

68	81	94	107	120	1	14	27	40	53	66
80	93	106	119	11	13	26	39	52	65	67
92	105	118	10	12	25	38	51	64	77	79
104	117	9	22	24	37	50	63	76	78	91
116	8	21	23	36	49	62	75	88	90	103
7	20	33	35	48	61	74	87	89	102	115
19	32	34	47	60	73	86	99	101	114	6
31	44	46	59	72	85	98	100	113	5	18
43	45	58	71	84	97	110	112	4	17	30
55	57	70	83	96	109	111	3	16	29	42
56	69	82	95	108	121	2	15	28	41	54

1. According to this disposition, the most regular of all, the middle-number of the progression occupies the centre, as 5 in the square of 9 cells, 13 in that of 25, 25 in that of 49, 41 in that of 81, and 61 in that of 121; but this is not necessary in the arrangement of all magic squares.

2. In each of the diagonals, the numbers which occupy the cells equally distant from the centre, are double that in the centre: thus $68 + 54 = 93 + 29 = 118 + 4 = 22 + 100 = 66 + 56 = 63 + 57 = 64 + 58$, &c. are double the central number 61.

3. The case is the same with the cells centrally opposite, that is to say, those similarly situated in regard to the centre, but in opposite directions both laterally and perpendicularly: thus 69 and 53 are cells centrally opposite; and the case is the same with 120 and 2, 11 and 111, &c. &c.

Moschopolus, a modern Greek author, constructs this kind of magical squares in the following manner, which, though not altogether so simple as the Indian method, is nevertheless equally ingenious: this Greek writer begins by placing unity immediately below the central cell; then sets the following numbers descending from left to right; and when a number goes beyond the square, he carries it to the highest cell of the vertical band to which it belongs; he then continues descending obliquely from left to right, and when a number goes without the square on the right, he carries it to the most distant cell on the left, from which he continues descending according to the first rule: if he meets with a cell already filled up, he carries his figure two cells below that last written; and when he arrives at the end of the diagonal, he carries the following number as high as possible in the same vertical band. In the last place, when a number, which ought to be carried two cells lower than the one last placed, goes beyond the square, he carries it to the top of the same band. This description of his method, together with the two following examples of the square of five and seven, will be sufficient to give the reader a correct idea of it.

11	24	7	20	3
4	12	25	8	16
17	5	13	21	9
10	18	1	14	22
23	6	19	2	15

22	47	16	41	10	35	4
5	23	48	17	42	11	29
30	6	24	49	18	36	12
13	31	7	25	43	19	37
38	14	32	1	26	44	20
21	39	8	33	2	27	45
46	15	40	9	34	3	28

But these two methods fall much below the following, invented by M. Poignard, canon of Brussels, and improved and enlarged by M. de la Hire; for the preceding are limited, whereas the one alluded to is capable of giving an almost infinite number of combinations. Let it be required, for example, to fill up a square having an odd root, such as 9. Having constructed the square of cells, place in the first horizontal row, at the top, the nine first numbers of the natural progression, in any order at pleasure, which we shall suppose to be 8, 9, 5, 1, 3, 2, 4, 6, 7; then make choice of a number which is prime to the root 5, and which, when diminished by unity, does not measure it: let this number be 5; and for that reason begin with the fifth figure of the series, and reckon from it to fill up the second horizontal band 3, 2, 4, 6, 7, 8, 9, 5, 1; then begin again by the fifth next figure, including the 3, that is to say by 7, which will give for the third band, 7, 8, 9, 5, 1, 3, 2, 4, 6; by following the same process we shall then have the series of numbers, 1, 3, 2, 4, 6, 7, 8, 9, 5, for the fourth horizontal band; proceed in this manner till the whole is filled up. This square will be one of the components of the required square; and is itself magic, for the sum of each band, whether vertical, horizontal, or diagonal, amounts to the same sum, *i. e.* 45.

8	9	5	1	3	2	4	6	7
3	2	4	6	7	8	9	5	1
7	8	9	5	1	3	4	6	2
1	3	2	4	6	7	8	9	5
6	7	8	9	5	1	3	2	4
5	1	3	2	4	6	7	8	9
4	6	7	8	9	5	1	3	2
9	5	1	3	2	4	6	7	8
2	4	6	7	8	9	5	1	3

Now construct a second geometrical square of 81 cells, in the first horizontal band of which inscribe the multiples of the root 9, beginning with a cipher, viz. 0, 9, 18, 27, 36, 45, 54, 63, 72; and in any order at pleasure, as *e. gr.* 36, 0, 54, 45, 9, 18, 63, 27, 72; then fill up the square in the same manner as the preceding, taking care not to assume the same number in the series always to begin with. Thus, *e. gr.* as in the former square the fifth figure in the series was taken, in the present case the sixth may be assumed; and thus we shall have a square of the multiples, as seen in the following figure. This is the second component of the required magic square, and is itself magic, since the sum in every band in all directions is the same.

36	0	54	45	9	18	63	27	72
18	63	27	72	36	0	54	45	9
0	54	45	9	18	63	27	72	36
63	27	72	36	0	54	45	9	18
54	45	9	18	63	27	72	36	0
27	72	36	0	54	45	9	18	63
45	9	18	63	27	72	36	0	54
72	36	0	54	45	9	18	63	27
9	18	63	27	72	36	0	54	45

Now to obtain the magic square required, nothing is necessary but to inscribe in a third square, of 81 cells, the sum of the numbers found in the corresponding cells of the preceding two; for example $8 + 36$ or 44 in the first cell of the first horizontal band; $9 + 0$ or 9 in the next square of the same band; $5 + 54$ or 59 in the third square of the same band, $1 + 45$ or 46 in the fourth square of the same band, $3 + 9$ or 12 in the fifth square of the same band; $2 + 18$ or 20 in the sixth square of the same band; $4 + 63$ or 67 in the seventh square of the same band; $6 + 27$ or 33 in the last but one of the same band; $7 + 72$ or 79 in the top-square of the ninth vertical band; $3 + 18$ or 21 in the second square of the first vertical band, &c. &c. &c. by proceeding in this manner we shall have the following square of 81 cells, which will necessarily be magic.

44	9	59	46	12	20	67	33	79
21	65	31	78	43	8	63	40	10
7	62	54	14	19	66	29	76	42
64	30	74	40	6	61	53	18	23
60	52	17	27	68	28	75	38	4
32	73	39	2	58	51	16	26	72
49	15	25	71	36	77	37	3	56
81	41	1	57	47	13	24	70	35
11	22	69	34	80	45	5	55	48

By these means any of the numbers may be placed in any particular square required; for example 81 in the central cell; nothing is necessary for this purpose, but to fill up the middle-band with the series of numbers in such a manner that 9 may be in the centre, as seen in the annexed figure; and then to fill up the rest of the square according to the above rules, beginning at the highest band when the lowest has been filled up.

4	2	9	5	1	6	3	8	7
1	6	3	8	7	4	2	9	5
7	4	2	9	5	1	6	3	8
5	1	6	3	8	7	4	2	9
8	7	4	2	9	5	1	6	3
9	5	1	6	3	8	7	4	2
3	8	7	4	2	9	5	1	6
2	9	5	1	6	3	8	7	4
6	3	8	7	4	2	9	5	1

To form the second square place 72 in the centre, as seen in the following figure, and fill up the remaining cells in the same manner as before directed, taking care not to assume the same quantities as in the former for beginning the bands.

18	36	45	54	27	9	72	0	63
9	72	0	63	18	36	45	54	27
36	45	54	27	9	72	0	63	18
72	0	63	18	36	45	54	27	9
45	54	27	9	72	0	63	18	36
0	63	18	36	45	54	27	9	72
54	27	9	72	0	63	18	36	45
63	18	36	45	54	27	9	72	0
27	9	72	0	63	18	36	45	54

In the last place form a third square by adding together the numbers in the similar cells, and you will have the following square when 81 will necessarily occupy the central cell.

N. B. If it be required that 1 shall occupy the central cell of the third square, the numbers of the first square must be so disposed that 1 shall occupy its centre; and the numbers of the second square must also be so arranged that 0 shall be placed in the middle.

middle. If it be required that 2 be placed in the centre of the third square, nothing is necessary in this case but to place 2 in the centre of the first square, and 0 in the centre of the second; and in like manner we must proceed for any other number which is required to be placed in any particular cell of the third square; by taking care so to dispose the numbers of the two first squares, that the sum of the numbers in the two corresponding cells of the first and second square shall amount to the number proposed to be placed in the corresponding cell of the third square.

22	38	54	59	28	15	75	8	70
10	78	3	71	25	40	47	63	32
43	49	56	36	14	73	6	66	26
77	1	69	21	44	52	58	29	18
53	61	31	11	81	5	64	24	89
9	68	19	42	48	62	34	13	74
57	35	16	76	2	72	23	37	51
65	27	41	46	60	30	17	79	4
33	12	80	7	67	20	45	50	55

OF EVEN MAGIC SQUARES.

The construction of these squares is attended with considerably more difficulty than that of the odd squares; and the degree of difficulty is different according as they are evenly even or oddly even: for this reason we must divide them into two classes. Squares evenly even are those the root of which when halved is even, or can be divided by 4 without a remainder; of this kind are the squares of 4, 8, 12, 16, 20, 24, 28, &c. The oddly even are those whose root when divided by 2 gives an odd number; as those of 6, 10, 14, 18, 22, 26, 30, &c. In order to construct the magic square of 4, which is evenly even, we must begin by filling up first the two diagonals; and for that purpose count the natural numbers in order 1, 2, 3, &c. on the cells of the first horizontal band, from left to right; and then proceed to the second band, and when you come to the cells belonging to the diagonals, inscribe the numbers counted as you fall upon them, by which means you have the arrangement as represented in the first of the following figures. When the diagonals have been thus filled, to fill up the cells which remain vacant begin to count the same numbers, proceeding from the last cell of the last horizontal band to the right hand, and going from right to left, and in like manner in the next above it, and when any cells are found empty, fill them up with the numbers that belong to them; in this manner you will have the square filled up magically, as seen in the last of the following figures and the sum of each band and diagonal will be 34.

1			4
	6	7	
	10	11	
13			16

1	15	14	4
12	6	7	9
8	10	11	5
13	3	2	16

Obs. 1. It is not necessary, in order to form a magic square of 16 cells by the preceding rule, that the arithmetical ratio of the numbers occupying the cells should be only 1; the rule, will hold good, (as in the case of the odd squares,) if any other arithmetical ratio be adopted; as in the first of the six subjoined squares, where 2 is the common ratio; and the series of the numbers, 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31. *Obs. 2.* It is also not necessary that the arithmetical progression be continued; it may be disjunct, provided the numbers in the vertical bands preserve an arithmetical progression, as for example, the numbers 9, 10, 11, 12, 13, 14, 15, 16, 49, 50, 51, 52, 53, 54, 55, 56, in the second of the following figures. The third figure exhibits these numbers magically arranged in a square of 16 cells. The fourth figure is the magic arrangement of the continued series of numbers, 1, 4, 7, 10, 13, 16, 19, 22, 25, 28, 31, 37, 40, 43, 46. The fifth figure is the magic arrangement of the disjunct series of numbers, 1, 2, 3, 4, 5, 7, 8, 57, 58, 59, 60, 61, 62, 63, 64. The last figure is a magic arrangement of the disjunct series 17 to 24 and 85 to 92.

1	29	27	7	9	10	11	12	9	55	54	12
23	11	13	17	13	14	15	16	52	14	15	49
15	19	21	9	49	50	51	52	16	50	51	13
25	5	3	31	53	54	55	56	53	11	10	56

1	43	40	10	1	63	62	4	17	91	90	20
34	16	19	25	60	6	7	57	88	22	23	85
22	28	31	13	8	58	59	5	24	86	87	21
37	7	4	45	61	3	2	64	89	19	18	92

GENERAL METHOD FOR CONSTRUCTING MAGIC SQUARES EVENLY EVEN.

Fill the top horizontal band of the first square with the numbers of the root of the required square in such a manner that the cells equally distant from the central one of the first horizontal band shall be occupied by numbers the sum of which will amount to the root of the square $\div 1$, as, *e. gr.* 5 in a square of 16 cells, 9 in a square of 64 cells, &c. &c. The second horizontal band must be the reverse of the first; the third, like the first, the fourth like the second, &c. till you come to the two middle-bands, the latter of which must be occupied with figures exactly in the same order with its immediately preceding band; and so complete the square as that the latter half of the horizontal bands shall be exactly the reverse of the former. In the constructing of the second square, dispose the numbers of the multiples of the root, (beginning with 0, and omitting the last multiple,) so that the sum of the cells equally distant from the centre of the first vertical band shall amount to the number of cells in the square minus the root of the square. Fill the second vertical band with the numbers of the first vertical band reversed; let the third vertical band be like the first, the fourth like the second, &c. &c. and complete this square in the same manner as the former by making the latter half of the vertical bands exactly the reverse of the former. The third square, which is the one required, is formed by the addition of the similar cells of the two first. We here give the magic squares of 4 and 8 in illustration of the preceding rules.

4	3	2	1	12	0	0	12	16	3	2	13
1	2	3	4	8	4	4	8	9	6	7	12
1	2	3	4	4	8	8	4	5	10	11	8
4	3	2	1	0	12	12	0	4	15	14	1

5	6	1	2	7	8	3	4
4	3	8	7	2	1	6	5
5	6	1	2	7	8	3	4
4	3	8	7	2	1	6	5
4	3	8	7	2	1	6	5
5	6	1	2	7	8	3	4
4	3	8	7	2	1	6	5
5	6	1	2	7	8	3	4

8	48	8	48	48	8	48	8
56	0	56	0	0	56	0	56
16	40	16	40	40	16	40	16
24	32	24	32	32	24	32	24
32	24	32	24	24	32	24	32
40	16	40	16	16	40	16	40
0	56	0	56	56	0	56	0
48	8	48	8	8	48	8	48

13	54	9	50	55	16	51	12
60	3	64	7	2	57	6	61
21	46	17	42	47	24	43	20
28	35	32	39	34	25	38	29
36	27	40	31	26	33	30	37
45	22	41	18	23	48	19	44
4	59	8	63	58	1	62	5
53	14	49	10	15	56	11	52

METHOD FOR CONSTRUCTING SQUARES ODDLY EVEN.

Construct the three first squares exactly in the same manner as directed with regard to squares which are evenly even as below.

6	2	3	4	5	1
1	5	4	3	2	6
6	2	3	4	5	1
6	2	3	4	5	1
1	5	4	3	2	6
6	2	3	4	5	1

0	30	0	0	30	0
24	6	24	24	6	24
12	18	12	12	18	12
18	12	18	18	12	18
6	24	6	6	24	6
30	0	30	30	0	30

A

6	32	3	4	35	1
25	11	28	27	8	30
18	20	15	16	23	13
24	14	21	22	17	19
7	29	10	9	26	12
36	2	33	34	5	31

B

To render the square magic, leaving the corners fixed, transpose the other numbers of the upper horizontal band, and of the first vertical one, on the left, by reversing all the remainder of the band; writing 35, 4, 3, 32, instead of 32, 3, 4, 35, and in the vertical one 7, 24, 18, 25 instead of 25, 18, 24, 7, as in the following figure. It will be necessary also to exchange the numbers in the two cells of the middle of the second horizontal band at the top, of the lowest of the second vertical band on the left, and of the last on the right. The numbers in the cells A and B must also be exchanged, as well as those in C and D; by which means we shall have the square corrected and magically arranged, as may be seen by a close inspection of the following figure, the sum of each band of which amounts to 111.

6	35	4	33	32	1
7	11	27	28	8	30
24	14	15	16	23	19
13	20	21	22	17	18
25	29	10	9	26	12
36	2	34	3	5	31

For an account of Magic squares with borders, and in compartments, with their singular varieties, as also an account of Geometrical magic squares. See SQUARE, MAGIC. We now proceed to notice the late Dr. Franklin's discoveries upon this subject

This ingenious gentleman seems to have carried this curious speculation farther than any of his predecessors in the same way. He has constructed not only a magic square of squares, but likewise a magic circle of circles, of which we shall give some account

for the amusement of our readers. The magic square of squares is formed by dividing the great square. See the following figure, an explanation of which is given after the Table.

A MAGIC SQUARE OF SQUARES.

200	217	232	249	8	25	40	57	72	89	104	121	136	153	168	185
58	39	26	7	250	231	218	199	186	167	154	135	122	103	90	71
198	219	230	251	6	27	38	59	70	91	102	123	134	155	166	187
60	37	28	5	252	229	220	197	188	165	156	133	124	101	92	69
201	216	233	248	9	24	41	56	73	88	105	120	137	152	169	184
55	42	23	10	247	234	215	202	183	170	151	138	119	106	87	74
203	214	235	246	11	22	43	54	75	86	107	118	139	150	171	182
53	44	21	12	245	236	213	204	181	172	149	140	117	108	85	76
205	212	237	244	13	20	45	52	77	84	109	116	141	148	173	180
51	46	19	14	243	238	211	206	179	174	147	142	115	110	83	78
207	210	239	242	15	18	47	50	79	82	111	114	143	146	175	178
49	48	17	16	241	240	209	208	177	176	145	144	113	112	81	80
196	221	228	253	4	29	36	61	68	93	100	125	132	157	164	189
62	35	30	3	254	227	222	195	190	163	158	131	126	99	94	67
194	223	226	255	2	31	34	63	66	95	98	127	130	159	162	191
64	33	32	1	256	225	224	193	192	161	160	129	128	97	96	65

This great square is divided into 256 small squares, in which all the numbers from 1 to 256 are placed in 16 columns, which may be taken either horizontally or vertically. The properties are as follow:

1. The sum of the 16 numbers in each column, vertical and horizontal, is 2056.
2. Every half-column, vertical and horizontal, makes 1028, or half of 2056.
3. Half a diagonal ascending added to half a diagonal descend-

ing, makes 2056; taking these half-diagonals from the ends of any side of the square to the middle thereof; and so reckoning them either upward or downward, or sidewise from left to right hand, or from right to left.

4. The same, with all the parallels to the half-diagonals, as many as can be drawn in the great square: for any two of them being directed upward and downward, from the place where they begin to that where they end, their sums will make 2056. The same downward and upward in like manner: or all the same if taken sideways

sideways to the middle, and back to the same side again. N. B. One set of these half-diagonals and their parallels may be drawn in the same square upward and downward. Another such set may be drawn from any of the other three sides.

5. The four corner-numbers in the great square, added to the four central numbers therein, make 1028; equal to the half-sum of any vertical or horizontal column which contains 16 numbers; and equal to half a diagonal or its parallel.

6. If a square hole (equal in breadth to four of the little squares) be cut in a paper, through which any of the 16 little squares in the great square may be seen, and the paper be laid on the great square, the sum of all the 16 numbers, seen through the whole, is equal to the sum of the 16 numbers in any horizontal or vertical column, viz. to 2056.

The magic circle of circles, (Plate CLIII. fig. 2,) is composed of a series of numbers from 12 to 75 inclusive, divided into eight concentric circular spaces, and ranged in eight radii of numbers, with the number 12 in the centre; which number, like the centre, is common to all these circular spaces, and to all the radii. The numbers are so placed, that the sum of all those in either of the concentric circular spaces above-mentioned, together with the central number 12, make 360; equal to the number of degrees in a circle. The numbers in each radius also, together with the central number 12, make just 360. The numbers in half of any of the above circular spaces, taken either above or below the double horizontal line, with half the central number 12, make 180; equal to the number of degrees in a semicircle. If any four adjoining numbers be taken, as if in a square, in the radial divisions of these circular spaces, the sum of these, with half the central number, make 180. There are, moreover, included, four sets of other circular spaces, bounded by circles which are eccentric with respect to the common centre; each of these sets containing five species. The centres of the circles which bound them are at A, B, C, and D. The set whose centre is at A is bounded by dotted lines; the set whose centre is at C is bounded by lines of short unconnected strokes; and the set round D is bounded by lines of unconnected longer strokes, to distinguish them from one another. In drawing this figure by hand, the set of concentric circles should be drawn with black ink, and the four different sets of eccentric circles with four kinds of ink of different colours; as blue, red, yellow, and green, for distinguishing them readily from one another. These sets of eccentric circular spaces intersect those of the concentric, and each other; and yet the numbers contained in each of the eccentric spaces, taken all around through any of the 20 which are eccentric, make the same sum as those in the concentric, namely 360, when the central number 12 is added. Their halves also, taken above or below the double horizontal line, with half the central number, make 180. Observe, that there is not one of the numbers but what belongs at least to two of the circular spaces, some to three, some to four, some to five; and yet they are all so placed as never to break the required number 360 in any of the 28 circular spaces within the primitive circle. To bring these matters in view, all the numbers as above mentioned are taken out, and placed in separate columns as they stand around both the concentric and eccentric circular spaces, always beginning with the outermost and ending with the innermost of each set, and also the numbers as they stand in the eight radii, from the circumference to the centre; the common central number 12 being placed the lowest in each column.

1. In the eight concentric circular spaces.

14	72	23	65	21	67	12	74
25	63	16	70	18	68	27	61
30	56	39	49	37	51	28	58
41	47	32	54	34	52	43	45
46	40	55	33	53	35	44	42
57	31	48	38	50	36	59	29
62	24	71	17	69	19	60	26
73	15	64	22	66	20	75	13
12	12	12	12	12	12	12	12
360	360	360	360	360	360	360	360

2. In the eight radii.

14	25	30	41	46	57	62	73
72	63	56	47	40	31	24	15
23	16	39	32	55	48	71	64
65	70	49	54	33	38	17	22
21	18	37	34	53	50	69	66
67	68	51	52	35	36	19	20
12	27	28	43	44	59	60	75
74	61	58	45	42	29	26	13
12	12	12	12	12	12	12	12
360	360	360	360	360	360	360	360

3. In the five eccentric circular spaces whose centre is at A.

14	72	23	65	21
63	16	70	18	68
39	49	37	51	28
54	34	52	43	45
33	53	35	44	42
48	38	50	36	59
24	71	17	69	19
73	15	64	22	66
12	12	12	12	12
360	360	360	360	360

4. In the five eccentric circular spaces whose centre is at B.

30	56	39	49	37
47	32	54	34	52
55	33	53	35	44
38	50	36	59	29
17	69	19	60	26
64	22	66	20	75
72	23	65	21	67
25	63	16	70	18
12	12	12	12	12
360	360	360	360	360

5. In the five eccentric circular spaces whose centre is at C.

46	40	55	33	53
31	48	38	50	36
71	17	69	19	60
22	66	20	75	13
65	21	67	12	74
16	70	18	68	27
56	39	49	37	51
41	47	32	54	34
12	12	12	12	12
360	360	360	360	360

6. In the five eccentric circular spaces whose centre is at D.

62	24	71	17	69
15	64	22	66	20
23	65	21	67	12
70	18	68	27	61
49	37	51	28	58
32	54	34	52	43
40	55	33	53	35
57	31	48	38	50
12	12	12	12	12
360	360	360	360	360

If, now, we take any four numbers, as in a square form, either from No. 1, No. 2. (as we suppose from No. 1.) as in the margin, and add half the central number 12 to them, the sum will be 180; equal to half the number in any circular space taken above or below the double horizontal line, and equal to the number of degrees in a semicircle. Thus 14, 72, 25, 63, and 6, make 180.

14 72
25 63
6

MAGISTRY, in chemistry, is a name given to almost all precipitates. Magistry and precipitate are synonymous; but chemists chiefly use precipitates as a general term, and apply that of magistry to some particular precipitates only which are used in medicine and in the arts; as the magisteries of bismuth, crab's-eyes, &c.

MAGLIABECHI, ANTHONY, a person of great learning, and remarkable for an amazing memory, born at Florence in 1633. His father died when he was only seven years old. His mother had him taught grammar and drawing, and then put him apprentice to one of the best goldsmiths in Florence. When about sixteen years old, his passion for learning began to shew itself; and he laid out his money in buying books. Becoming acquainted with Michael Ermini, librarian to the cardinal de Medicis, he soon perfected himself by his assistance in the Latin tongue, and in a little time became master of the Hebrew. His name soon became famous among the learned. A prodigious memory was his distinguishing talent; and he retained not only the sense of what he read, but frequently the words, and the spelling. A gentleman, to prove the force of his memory, lent him a MS. he was going to print. Some time after it was returned, the gentleman, coming to him with a melancholy countenance, pretended it was lost, and requested Magliabechi to recollect what he remembered of it; upon which he wrote the whole, without missing a word. He generally shut himself up the whole day, and opened his doors in the evening to the men of letters who came to converse with him. His attention was so absorbed by his studies, that he often forgot the most urgent wants of nature. Cosmo III. grand duke of Florence, made him his librarian; but he still continued negligent in his dress, and simple in his manners. An old cloak served him for a morning gown in the day, and for bed-cloaths at night. The duke, however, provided for him a commodious apartment in his palace, which he was with difficulty persuaded to take possession of; but which he quitted four months after, and returned to his house. His modesty, sincerity, and beneficence, were remarkable. He patronized men of learning; assisted them with his advice and information, and furnished them with books and MSS. He detested every thing that looked like constraint; and therefore the grand duke always dispensed with his personal attendance, and sent him his orders in writing. Though he lived a most sedentary life, he reached the 81st year of his age; and died in the midst of the public applause, enjoying, during the latter part of his life, such affluence as few have ever procured by their learning. He left a very fine library to the public, with a fund for its support.

MAGLIANO, a town of Italy, in the Pope's late dominions, and district of Sabina, 30 miles N. of Rome. Lon. 12. 35. E. Lat. 42. 25. N.

MAGNA ASSISA ELIGENDA is a writ anciently directed to the sheriff for summoning four lawful knights before the justices of assize, in order to choose twelve knights of the neighbourhood, &c. to pass upon the great assize between such a person plaintiff and such a one defendant.

MAGNA CHARTA, the great charter of the liberties of Britain, and the basis of our laws and privileges. This charter may be said to derive its origin from king Edward the Confessor, who granted several privileges to the church and state by charter: these liberties and privileges were also granted and confirmed by king Henry I. by a celebrated great charter now lost; but which was confirmed or re-enacted by king Henry II. and king John. Henry III. the successor of this last prince, after having caused twelve men to make enquiry into the liberties of England in the reign of Henry I. granted a new charter; which was the same as the present magna charta. This he several times confirmed, and as often broke; till, in the 37th year of his reign, he went to Westminster-hall, and there, in the presence of the nobility and bishops, who held lighted candles in their hands, magna charta was read, the king all the time holding his hand to his breast, and at last solemnly swearing faithfully and inviolably to observe all the things therein contained, &c. Then the bishops extinguishing the candles, and throwing them on the ground, they all cried out, "Thus let him be extinguished, and stink in hell, who violates this charter." It is observed, that, notwithstanding the solemnity of this confirmation, king Henry, the very next year, again invaded the rights of his people, till the barons enter-

ed into a war against him; when, after various success, he confirmed this charter, and the charter of the forest, in the 52d year of his reign. This charter confirmed many liberties of the church, and redressed many grievances incident to feudal tenures, of no small moment at the time; though now, unless considered attentively and with this retrospect, they seem but of trifling concern. But, besides these feudal provisions, care was also taken therein to protect the subject against other oppressions, then frequently arising from unreasonable amercements, from illegal distresses or other process for debts or services due to the crown, and from the tyrannical abuse of the prerogative of purveyance and pre-emption. It fixed the forfeiture of lands for felony in the same manner as it still remains; prohibited for the future the grants of exclusive fisheries; and the erection of new bridges so as to oppress the neighbourhood. With respect to private rights, it established the testamentary power of the subject over part of his personal estate, the rest being distributed among his wife and children; it laid down the law of dower, as it hath continued ever since; and prohibited the appeals of women, unless after the death of their husbands. In matters of public police and national concern, it enjoined an uniformity of weights and measures; gave new encouragements to commerce, by the protection of merchant strangers; and forbade the alienation of lands in mortmain. With regard to the administration of justice: besides prohibiting all denials or delays of it, it fixed the court of common pleas at Westminster, that the suitors might no longer be harassed with following the king's person in all his progresses; and at the same time brought the trial of issues home to the very doors of the freeholders, by directing assizes to be taken in the proper counties, and establishing annual circuits: it also corrected some abuses then incident to the trials by wager of law and of battle; directed the regular awarding of inquest for life or member; prohibited the king's inferior ministers from holding pleas of the crown, or trying any criminal charge, whereby many forfeitures might otherwise have unjustly accrued to the exchequer; and regulated the time and place of holding the inferior tribunals of justice, the county-court, sheriff's torn, and court-leet. It confirmed and established the liberties of the city of London, and all other cities, boroughs, towns, and ports, of the kingdom. And lastly, (which alone would have merited the title that it bears, of the great charter,) it protected every individual of the nation in the free enjoyment of his life, his liberty, and his property, unless declared to be forfeited by the judgement of his peers or the law of the land. This excellent charter, so equitable, and beneficial to the subject, is the most ancient written law in the kingdom. By the 25th Edward I. it is ordained, that it shall be taken as the common law; and by the 43d Edward III. all statutes made against it are declared to be void.

MAGNANIMITY, a greatness of mind which appears most conspicuous in circumstances of trial and adversity. Mr. Stretch well observes of it, in his Beauties of History, that "it is the good sense of pride, and the noblest way of acquiring applause." It renders the soul superior to trouble, disorder, and emotion, which the appearance of great danger might excite; and it is by this quality, that heroes maintain their tranquillity, and preserve the free use of their reason in the most surprising and dreadful accidents. It admires the same quality in an enemy; and fame, glory, conquests, desire of opportunities to pardon and oblige their opposers, are what glow in the minds of the brave. Magnanimity and courage are inseparable. Instances need not be quoted. The histories of Greece, Rome, Great Britain, &c. abound with them.

MAGNESA, or **MAGNESIA**, in ancient geography, a town or district of Thessaly, at the foot of mount Pelus.

MAGNESIA, in ancient geography, a maritime district of Thessaly, lying between the S. part of the Sinus Thermaicus and the Pegasus on the S. and to the E. of the Pelasgiotis.

MAGNESIA, a town of Asia Minor on the Mæander, about 13 miles from Ephesus.

MAGNESIA, in chemistry, an earth discovered about the beginning of the 18th century. Dr. Black first gave a complete investigation of its nature. Magnesia, before his time, was generally confounded with lime; he, however, by the most accurate experiments shewed that it possessed properties different from all the other earths. This earth exists under the form of a white spongy powder,

der, soft to the touch, without smell, and having a slightly bitter taste. Its specific gravity is 2.3. It slightly changes vegetable colours to a green. Magnesia, when quite pure, is infusible, though exposed to the most intense heat: even in the focus of a very powerful burning mirror, or in the heat excited by oxygen gas, it cannot be melted. When made into a paste with water it contracts like alumina, if exposed to a sudden heat. It is almost insoluble in water. There is no action between magnesia and hydrogen, or carbon, and very little between it and phosphorus. It combines readily with the acids, and with them forms neutral salts. Of these the greater number are soluble or crystallizable, and have a bitter taste. Although magnesia exists in great abundance in combination with other substances, it is not found native in quantities sufficiently large and pure for general use. It may, however, be prepared by dissolving separately equal portions of Epsom salt and pearl-ashes, in double their quantity of warm water, when the sediment is to be strained: the two liquids are now to be mixed; adding eight times their proportion of warm water. The whole is suffered to boil a few minutes, being carefully stirred with a wooden spatula, to prevent the powder from adhering to the bottom of the vessel. Now the liquid is to stand at rest, till the heat be somewhat diminished, when it should be filtered through a cloth, on which the magnesia will remain: lastly, it is to be washed till it be totally divested of its saline taste. White magnesia is of considerable service for preventing or removing many disorders of children, especially of such as are troubled with a redundancy of acid in the first passages; for which purpose it is preferable to the calcareous absorbents. But even magnesia is frequently misapplied, and ought never to be given to infants dis-

posed to flatulency, or where no symptoms of acidity can be discovered; as it is otherwise apt to lodge in the bowels, and produce obstinate costiveness; being in itself an inactive earth, unless combined with acids. Hence it is often, and very properly, conjoined with rhubarb; so that children above one year old may take from five to ten grains of the former, and from one to two grains of the latter; while adults generally require one or two scruples of magnesia, and from five to ten grains of rhubarb for a moderate dose.

MAGNET, or LOADSTONE, a sort of ferruginous stone, in weight and colour resembling iron-ore, though somewhat harder and more heavy; endowed with various extraordinary properties, attractive, directive, inclinatory, &c. See MAGNETISM. It is also called Lapis Heraclæus, from Heraclæa, a city of Magnesia, a district of ancient Lydia, where it is said to have been first found, and from which it is usually supposed to have taken its name. Others derive the word from a shepherd named Magnes, who first discovered it with the iron of his crook on mount Ida. It is also called Lapis Nauticus, from its use in navigation; and siderites, from its attracting iron, which the Greeks call σιδηρολιθός. The magnet is usually found in iron-mines, and sometimes in very large pieces half magnet half iron. Its colour is different according to the different countries it is brought from, Norman observes, that the best are those brought from China and Bengal, which are of an iron or sanguine colour; those of Arabia are reddish; those of Macedonia, blackish; and those of Hungary, Germany, England, &c. the colour of unwrought iron. Neither its figure nor bulk is determined; being found of different forms and sizes.

MAGNETISM.

MAGNETISM, that power by which the loadstone is influenced, manifesting itself by certain attractive and directive virtues, which constitute the properties of the magnet. The attractive power of the magnet was known to the ancients; and is mentioned even by Plato and Euripides, who call it the Herculean-stone, because it commands iron which subdues every thing else. But the knowledge of its directive power, whereby it disposes its poles along the meridian of every place, and occasions needles, pieces of iron, &c. touched with it, to point nearly north and south, is of a much later date; though the exact time of its discovery, and the discoverer himself, are not ascertained. The earliest account recorded of these is in 1260, when Mark Polo the Venetian is said to have introduced the mariner's compass; though not as an invention of his own, but as derived from the Chinese, who are said to have had the use of it long before; though some imagine that the Chinese rather borrowed it from the Europeans. Flavio Bembo, or Gioia, a Neapolitan, who lived in the 13th century, is usually supposed to have the best title to the discovery; though Sir G. Wheeler mentions, that he had seen a book of astronomy much older, which supposed the use of the needle; though not as applied to the uses of navigation, but of astronomy. And Guyot de Provins, an ancient French poet, who wrote about 1180, makes express mention of the loadstone and the compass; and obliquely hints at their use in navigation. The variation of the magnet, or its declination from the pole, was first discovered by Seb. Cabot, a Venetian, in 1500; and the variation of that variation, by Mr. Gellibrand, an Englishman, about the year 1625. Lastly, the dip or inclination of the needle, when at liberty to play vertically, to a point beneath the horizon, was first discovered by another of our countrymen, Mr. R. Norman, about 1576.

PRINCIPAL PHENOMENA OF THE MAGNET.

1. A magnet, whether natural or artificial, attracts iron, and all substances which contain it in its metallic state. The semimetal called nickel, and perhaps some others, are attracted by the magnet, though freed from iron as much as possible.

2. If a magnet be suspended by a thread, nicely placed on a pivot, or set to float in a basin of water, it will turn one and constantly the same side nearly towards the north pole of the earth,

the other of course turning towards the south. Hence these parts of the magnet have been called its poles, taking the designations of north and south from those parts of the world towards which they turn. This property is called the polarity of the magnet; and when it is in the act of turning itself into this position, it is said to traverse. A plane drawn perpendicular to the horizon through both poles of a magnet, after it has turned itself, is called the magnetic meridian; and the angle it makes with the meridian of the place is called the declination of the magnet or of the magnetic needle.

3. When either the north or the south poles of two magnets are placed near to each other, they repel; but a north and a south pole attract each other.

4. A magnet placed in such a manner as to be entirely at liberty, inclines one of its poles to the horizon, and of course elevates the other above it. This property is called the inclination or dipping of the magnet; and is most conspicuous in artificial magnets or needles, which may be accurately balanced before the magnetic virtue is imparted to them.

5. By proper management any magnet may be made to communicate its virtue to a piece of steel or iron, which virtue it will retain for a longer or shorter time according to circumstances.

6. Both the declination and the dip are different in different parts of the earth, and neither of them remains the same at the same place in different periods. Concerning this variation in the dip or inclination of the magnetic needle, there have been many conjectures and opinions offered by writers on this subject; and theorists have framed theories, some of which are not a little curious, but none of them in any degree satisfactory, so that the knowledge of the cause of this surprising and important phenomenon still remains in darkness, and among the desiderata of the philosopher. The variations are indeed so irregular and so different in different places, that the observations on them afford but few data for investigating the cause: it is evident that more than one cause operate in this instance: for besides the general change of declination arising from some unknown cause; there is a difference of the declination arising from heat, so that according to the temperature, and hence according to the time of the day, or season of the year, the declination is found to increase or decrease.

The

The following table shews the mean declination of the needle at different times in Paris and London.

Year.	Paris.	Year.	Lon on.
1580	11° 30' E.	1576	11° 15' E.
1610	8 0 E.	1634	4 5 E.
1640	3 0 E.	1657	0 0
1666	0 0	1665	1 22 W.
1670	1 30 W.	1692	6 0 W.
1700	8 12 W.	1730	10 15 W.
1728	14 0 W.	1756	15 15 W.
1771	19 45 W.	1774	21 16 W.
		1776	21 47 W.

Near the equator in lon. 40° East, the highest variation from the year 1700 to 1756 was 17° 15' West; and the least 16° 30' W. In lat. 15° N. and lon. 60° W. the variation was constantly 5° E. In lat. 10° S. and lon. 60° E. the variation decreased from 17° W. to 7° 15' W. In lat. 10° S. and lon. 5° W. it increased from 2° 15' to 12° 45' W. In lat. 15° N. lon. 20° W. it increased from 1° W. to 9° W. In the Indian seas the irregularities were greater; for in 1700, the West variations seem to have decreased regularly from lon. 30° E. to lon 100° E. but in 1756, the variations decreased so fast, that there was East variation in lon. 80° 85' and 90° E. and yet, in lon. 95° and 100° E. there was W. variation.

In the year 1775, in lat. 58° 17' S. and lon. 31° 44' W. it was 6° 16' W. In lat. 2° 24' N. and lon. 32° 12' W. it was 0° 14' 45" W. In lat. 50° 6' 30" N. and lon. 4° 0' W. it was 19° 28' W.

The inclination does not vary so much as the declination, thus, the inclination or dip of the magnetic needle at London in 1576, was 71° 50'. In 1653, 72° 45'. In 1676, 73° 30'. In 1720, 75° 10'. In 1723, about 75°, &c. The mean dip of the needle at London in 1775 and 1776, was 72° 30'.

7. Almost all minerals are attracted by the magnet, at least after having been exposed to the action of fire. This is probably owing to the general diffusion of iron throughout almost all terrestrial substances.

8. The degree of magnetic attraction depends upon the strength of the magnet, the weight and shape of the iron presented to it, the magnetic or unmagnetic state of the body, and the distance between them. A piece of clean and soft iron is more powerfully attracted than any other ferruginous substance of the same size and shape. Steel is attracted less powerfully. The attraction is strongest at the poles, diminishing according to the distance from them, and entirely ceasing at the equator or middle-point betwixt the poles. It is strongest near the surface of the magnet, diminishing as we recede from it; but the proportion in which this diminution takes place has not been exactly determined. M. Muschenbroeck made the following experiments to determine this point:

I. A cylindrical magnet, two inches long, and weighing sixteen drachms, was suspended by an accurate balance above a cylinder of iron exactly of the same shape and dimensions, and the degree of attraction betwixt the two measured by weights put into the opposite scale; the magnet being successively placed at different distances from the iron. The results were, that at six inches distant, it attracted three grains; at three inches, six grains; at one inch, eighteen grains; and at no distance, or in close contact, fifty-seven grains.

II. A spherical magnet of the same diameter with the cylindrical one, but of greater strength, was affixed to one of the scales of the balance, and the cylindrical magnet used in the former experiment placed upon the table with its south pole upwards, facing the north pole of the spherical magnet; when the attractions were at six inches distance, twenty-one grains; at three inches, forty-four; at one, a hundred; and at no distance, two hundred and sixty grains.

III. Changing the cylindrical magnet for the iron-cylinder above-mentioned, the attractions were, at six inches distant, seven

grains; at three inches, twenty-five; at one, ninety-two; and at no distance, three hundred and forty grains.

IV. Using a globe of iron of the same diameter with the magnet instead of the cylinder, the attractions were, at eight inches distant, one grain; at six, three and a quarter; at three, sixteen; at one, sixty-four; and at no distance, two hundred and ninety.

In the experiments with the cylinder, the magnet attracted a shorter cylinder with less force, but in the same proportion. From the others, it appears, that one magnet attracts another with less force than a piece of iron, but that the attraction begins from a greater distance; whence it must follow a different law of decrease.

9. The attraction between the magnet and a piece of iron is subject to variation from the mere shape of the latter, there being a limit in the weight and shape of the iron, in which it will attract it more forcibly than any other; but this can only be determined by actual experiment.

10. Although magnetic attraction generally takes place only between the opposite poles of two magnets, yet it often happens, that though the north pole of one magnet be presented to the north pole of another, that they shew neither attraction nor repulsion; but that when placed very near each other, they will attract. This is explained by M. Cavallo in the following manner: "When a piece of iron, or any other substance that contains iron, is brought within a certain distance of a magnet, it becomes itself a magnet, having the poles, the attractive power, and, in short, every property of a real magnet. That part of it which is nearest to the magnet acquires a contrary polarity; but it often happens that one of the magnets, being more powerful than the other, will change the pole of that other magnet in the same manner as it gives magnetism to any other piece of iron which is exposed to its influence; and then an attraction will take place between two poles apparently of the same names; though, in fact, it is an attraction between poles of different names, because one of them has actually been changed. Thus, suppose that a powerful magnet has been placed with its north pole very near the north pole of a weak magnet, it will be found, that, instead of repelling, they will attract each other, because that part of the weak magnet which before was a north pole, has been changed into a south pole by the action of the strong magnet."

11. Neither the attraction nor the repulsion of magnetism is sensibly affected by the interposition of bodies of any sort, excepting iron or ferruginous substances. Thus suppose, that, when a magnet is placed an inch distant from a piece of iron, an ounce, or any determinate weight, is required to move it; the same will be required, though a plate of metal, glass, or any other substance excepting iron be interposed. Neither the absence nor presence of air has any effect upon it.

12. By heat, the power of a magnet is weakened; and when it arrives at that degree called a white heat, it is entirely destroyed. On the other hand, the attraction is increased considerably by adding more and more weight to the magnet: for thus it will be found that the magnet will keep suspended this day a little more weight than it did the day before; which additional weight being added to it on the following day, or some day after, it will be able to suspend a weight still greater, and so on as far as a certain limit. On the other hand, by an improper situation, or by diminishing the quantity of iron appended to it, the power will decrease very considerably.

13. The magnetic attraction is communicable to any given piece of steel only in a certain degree; and therefore if a magnet be strong enough to give the maximum of attraction to the piece, it cannot be afterwards rendered more powerful by applying another magnet, however strong. Thus, indeed, the steel may be made stronger for a few minutes; but this overplus of attraction begins to go off as soon as the strong magnet is withdrawn; and the power, continuing gradually to diminish, settles in a short time at that degree which is its limit ever after.

14. If a piece of iron be held to one of the poles of a magnet, the attractive power of the other pole will thus be augmented. Hence we may understand why a magnet will lift a greater weight from a piece of iron than from wood or any other substance, viz. that the iron appended to the magnet becomes itself a magnet while it remains in that situation; and thus, having two poles, the iron which is placed near the one increases the attractive power of the

the other which adheres to the magnet, and enables it to sustain a greater weight than it would otherwise do.

15. Soft iron acquires the magnetic power by being appended to a magnet; but it lasts only while the iron remains in that situation, vanishing as soon as the magnet and iron are separated from each other. With hard iron, but especially steel, the case is quite different; and the harder the iron or steel is, the more permanent is the magnetism which it acquires; though in proportion to this same hardness it is difficult to impregnate it with the virtue.

16. The smallest natural magnets generally possess the greatest proportion of attractive power; so that there have frequently been seen magnets not weighing more than 20 or 30 grains, which would take up 40 or 50 times their own weight; but the greatest proportion of attractive power, perhaps ever known, belonged to the magnet worn by Sir Isaac Newton in his ring. It weighed only three grains, yet was able to take up 746 grains, or nearly 250 times its own weight; and Mr. Cavallo has seen one which could not weigh more than six or seven grains, and yet was capable of lifting 300. A semi-circular steel-magnet made by Mr. Canton, weighing one ounce and 13 penny-weights, took up 90 ounces; but magnets of above two pounds seldom lift more than five or six times their own weight, and indeed seldom so much. It frequently happens, that a piece cut off from a large natural magnet will lift more than the stone itself did when whole; which is to be attributed to the heterogeneous nature of the stone itself; for if part of it be impure, it is plain that this must obstruct the virtue of the remainder, which consequently must act more powerfully when the obstruction is removed.

17. As the two magnetic poles taken together are capable of lifting a much greater weight than a single one, and as they are generally situated in opposite parts of its surface, it has been customary to adapt two broad pieces of soft iron to them, letting the pieces project on one side of the magnet; because, in that case, the pieces themselves being rendered magnetic, another piece of iron could be conveniently adapted to their projections so as to let both poles act in concert. These pieces of iron are generally held fast upon the magnet by means of a brass or silver box; in which case the magnet is said to be armed, and the pieces of iron are called its armature. For the same purpose, and to avoid the armature, artificial magnets have been commonly made in the shape of a horse-shoe having their poles in the two extremities. This is by far the best shape for magnets; and the horse-shoe ones are always more powerful than straight magnetic bars.

18. Though, properly speaking, no magnet can have more than two poles, viz. a north and a south one, yet it frequently happens that both the natural and artificial kind are divided as it were into several magnets; each of which having likewise a north and south pole, the whole appears to have a number of poles, some of one denomination and some of the other. This plurality of poles arises sometimes from the shape, but more commonly from the heterogeneous nature, of the magnet itself: and with respect to those which have more than two poles, the following laws have been observed: 1. That the parts adjacent to one pole are endowed with a contrary polarity. 2. That the poles of one denomination are not always equal in number, but that they never differ by more than one: thus if the magnet has four south poles, it will either have three, four, or five north poles. Good and properly shaped magnets, however, have only two poles directly opposite to one another; though in truth it is always one half, or at least a great part of the magnet, that possess one kind of polarity, the other having the contrary kind; the two points, which we call the poles, being only those where the attractive virtue is strongest. Those two points, in good magnets, are joined by a line passing through the centre, which line is called the axis of the magnet; and a circle, whose plane is perpendicular to the axis encompassing the middle of the magnet, is called its equator; and to complete the supposed similarity between the terraqueous globe and magnetical bodies, the latter have frequently been formed of a spherical shape, with the poles and equator marked upon their surface; in which case they have got the name of *terrellas* or small earths. On breaking a magnet into two or three parts, each one becomes a perfect magnet, though they have not always an equal number of poles of the same denomination. The poles of the broken pieces generally answer to those of the whole magnet which were nearest them, though this does not always hold good. The polarity of the mag-

net is its most valuable property, as upon it depends the construction of the magnetic needle, or mariner's compass, so useful in navigation.

19. The directive, or polar power of a magnet, extends farther than its attractive power: thus if a magnet, freely suspended, be placed in the neighbourhood of another, it will be found that they can affect each other's direction when their attraction towards iron or towards each other cannot be perceived. This may be easily tried by placing one of them in a scale of a balance, and the other at a distance below it. To account for the curious and useful properties of the magnet several theories have been proposed, but these properties depend on a cause so remote from the information of our senses, that it is no wonder we have not yet had a complete and satisfactory theory. The idea of its being occasioned by a fluid entering in at one pole and passing out at another, took its rise, and became pretty general, from the following experiment: Having put a small artificial magnet among some iron-filings laid upon a piece of paper, give the table a few gentle knocks with your hand, so as to shake the filings a little, and they will dispose of themselves as represented in fig. 1. and 2. Plate CIV. where *AB* and *CD* represent the two poles of the magnet, and the dotted lines the disposition of the filings. But Mr. Cavallo observes, that this experiment cannot be any proof of the fluid's circulation; "Because if the fluid, of whatever nature it may be, did really circulate from one pole to the other, and had any action on the filings, these would be all driven towards that pole to which the fluid directed its course. The true cause of the disposition of the filings is their becoming actually magnetic, and their two extremities being possessed of contrary polarities. Now, when there are many particles of iron near the magnet, those which touch its surface are rendered magnetic; consequently they attract other particles, and these being also rendered magnetic, attract others, and so on, forming strings of small magnets, which gradually increase in power as they recede from the magnetic poles, by a little consideration it will appear, that the farthest ends of these strings or lines which proceed from the parts adjacent to one of the poles of the magnet, for instance the *N.* are likewise possessed of the *N.* polarity; and the farthest extremities of those which proceed from the parts adjacent to the *S.* pole of the magnet, are possessed of the *S.* polarity: hence, when they come sufficiently near, they attract the extremities of the former strings, and consequently form the curves delineated on the figure. The shaking of the table in this experiment serves to stir the filings, by making them jump up a little way, and thus place themselves in the proper situation; otherwise the action of the magnet will not have proper power sufficient to dispose properly those particles which stand at a considerable distance. The late discoveries in electricity have suggested another theory, viz. that the magnetic phenomena may be occasioned by a fluid analogous to the electric, or perhaps by the very same. To ascertain this theory, the phenomena of magnetism and electricity have been compared, and the analogy between them marked. This analogy consists principally in the following particulars:

1. Electricity is of two kinds, positive and negative, each of which repels its own kind, and attracts the opposite. In magnetism, the *N.* and *S.* poles do the same; each being repulsive of its own kind of magnetism, and attracting the opposite.

2. In electricity, whenever a body in its natural state is brought near an electrified one, it becomes itself electrified, and possessed of the contrary electricity; after which an attraction takes place. In like manner, when a piece of iron or steel is brought within the influence of a magnet, it becomes itself possessed of a magnetism contrary to that which the magnet possesses, and is of course attracted.

3. One sort of electricity cannot be produced without the other, neither is it possible to produce one kind of magnetism without the other also.

4. The electric power may be retained by certain substances, as amber, glass, &c. but easily pervades other substances, which are therefore called conductors. Magnetism has a similar conductor in soft iron; for by means of it the virtue may be extended farther than can be done without it; at the same time that the iron itself loses all magnetic power the moment it is separated from the magnet. Hardened iron, cast iron, and steel, perform a part analogous to that of electrics; for the virtue does not easily per-

vade them, but is retained, and may be communicated by them to other unmagnetic pieces, as the electric virtue is to bodies by an excited electric. As to other substances, they seem not to be conductors of magnetism, because the fluid pervades them as if nothing were present, and they cannot transmit the virtue farther than it would go without them. With soft iron it is otherwise. Thus, if to one of the poles of a magnet we append a piece of iron of considerable length, the end farthest from the magnet will likewise attract iron with much more force than the magnet could do at that distance without it, while at the same time this attractive power is plainly that of the magnet itself, and not inherent in the iron, as it vanishes the moment we separate them. If a piece of hard steel of an equal length with the iron be appended to the magnet by one of its ends, the distant end will not shew any attraction, and it will be a considerable time before the magnetic virtue can diffuse itself for any distance along it: but when the separation is made, the steel will be found to be magnetic, and will preserve its virtue for a long time.

5. The electric virtue exerts itself most powerfully on points, which carry it off or receive it in vast quantities. In like manner a magnet will hold a piece of iron more powerfully by a corner, or blunt point, than by a flat surface. On sharp points indeed the magnet has but little hold by reason of the deficiency of surface.

6. From some experiments related under Electricity, it appears possible to superinduce the negative and positive electricities upon one another; and in magnetics it is possible to do the same. Thus, if we place a wire of some length upon a pivot, so that it can turn very easily, by touching both ends of it upon the poles of a magnet it will acquire a polarity; one end being repelled by one pole and attracted by the other. If now we give the N. end, for instance, a very slight touch with the N. pole of the magnet, we will find that it has a small degree of S. magnetism superinduced upon it, so that on approaching the S. pole of the magnet it will be repelled; but by approaching the magnet nearer, or holding the wire for a little from flying away, the S. magnetism of the wire will be entirely destroyed, and the N. magnetism appear as before. This experiment is not very easily made; its success depends on having the first magnetism as strong and the second as weak as possible. These are the most remarkable particulars in which magnetism and electricity agree; but the differences between them are no less remarkable. The magnetic power affects none of our senses, and perceptibly attracts only iron; while electricity attracts and repels bodies of every kind indiscriminately. The electric virtue resides on the surface, but that of the magnet pervades the whole substance. A magnet loses nothing of its power by communicating its virtue to other bodies, but electricity always does; and, lastly, the magnetic virtue is permanent; whereas that of electricity, without the greatest care, is exceedingly perishable, and easily dissipated. Notwithstanding these disagreements, however, the analogies betwixt magnetism and electricity are so great, that the hypothesis of a magnetic as well as of an electric fluid has now gained general credit; and upon this hypothesis Professor Epinus has attempted to solve the phenomena of magnetism in the following manner:

1. This fluid is sufficiently subtle to penetrate the substance of all terrestrial bodies, and like the electric fluid is supposed to be repulsive of itself.

2. There is a mutual attraction between the magnetic fluid and iron, but an indifference betwixt it and all other bodies.

3. There is a great resemblance betwixt ferruginous bodies and electrics, as the magnetic fluid passes with difficulty through the former.

4. Iron and all ferruginous substances contain a quantity of magnetic fluid equably dispersed through their substance when those bodies are not magnetic. In this state they shew neither attraction nor repulsion, because the repulsion between the particles of magnetic fluid is balanced by the attraction between the matter of those bodies and the fluid; in which case these bodies are said to be in a natural state; but when in a ferruginous body the quantity of magnetic fluid is driven to one, then the body becomes magnetic; one extremity of it being now overcharged with magnetic fluid and the other undercharged. Bodies, thus rendered magnetic, exert a repulsion between their overcharged extremities in virtue of the repulsion between the particles of that excess of magnetic fluid, which is more than overbalanced by the

attraction of their matter. There is an attraction exerted between the overcharged extremity of one magnetic body and the undercharged extremity of the other, on account of the attraction between that fluid and the matter of the body: but to explain the repulsion which takes place betwixt their undercharged extremities, we must either imagine that iron when deprived of magnetic fluid is repulsive of itself, or that the undercharged extremities appear to repel each other only because either of them attracts the opposite overcharged extremities. A ferruginous body, therefore, according to this hypothesis, is rendered magnetic by having the equable diffusion of magnetic fluid through its substance disturbed, so as to have an overplus of it in one or more parts and a deficiency in others, its magnetism remaining as long as its impermeability prevents the restoration of the balance between the overcharged and undercharged parts. A piece of iron is rendered magnetic by the vicinity of a magnet; because when the overcharged parts, or pole of the magnet, is presented to it, the overplus of the magnetic fluid in that pole repels the fluid from the nearest extremity of the iron; which therefore becomes undercharged, or possessed of the contrary polarity, to the most remote part of the iron, which consequently becomes overcharged, or possessed of the same polarity as the present pole of the magnet. When the piece of iron is rendered magnetic by presenting it to the undercharged extremity or pole of the magnet, then the part of the iron which is nearest to it becomes overcharged, &c. because that part of the magnet, being deprived of its magnetic fluid, attracts the magnetic fluid of the iron to the extremity of the iron which lies nearest to itself. Hence to give magnetism to a piece of steel, the strength of the magnet employed must be such as to overcome the resistance which the substance of the steel makes against the free passage of the magnetic fluid; hence a piece of soft steel is rendered magnetic more easily than a hard one, and a strong magnet will render magnetic such bodies as a weak one cannot affect. When two magnets of equal power have their opposite poles presented to each other, they mutually preserve and strengthen the powers of each other; but when poles of the same denomination are forced together, if the powers are equal, they mutually weaken each other; or if unequal, the weaker will have its poles altered, or perhaps its attractive power entirely destroyed in a short time. This theory seems not to be tenable. It is impossible to shew why the mere turning of a bar upside down should accumulate the fluid, unless it were supposed to be a gravitating fluid, towards the earth; and even on this extravagant supposition, it would still be impossible to account for the same fluid being repelled by the earth in the southern hemisphere; for if the N. magnetism be an accumulation, the S. must be a deficiency, and vice versa. Another hypothesis is advanced by Mr. Cavallo, who considers it as so well established, "that there can hardly be a philosopher sceptical enough to doubt of its truth." This is, that "the earth itself is a magnet;" a hypothesis advanced above a century ago, by Dr. Gilbert of Colchester. This, Mr. Cavallo says, is proved almost to a demonstration in the following manner:

1. Almost all the phenomena which may be exhibited with a common magnet may also be exhibited with the earth, as far as it can be tried, And,

2. Vast masses of iron or ferruginous matter actually magnetic are dug out of the earth almost in every part of it. In support of the above position, he adduces the phenomena of the compass, dipping-needle, and the magnetism which soft iron receives when properly situated. All these may be imitated by a common magnet. An objection, however, occurs, that the most remarkable phenomenon of all, viz. the attraction of iron, is wanting. No experiment has yet shewn that this metal is attracted more powerfully near the poles than at the equator itself; yet this ought to be the case in such a large magnet-body. The dipping of the needle may indeed shew, that in this hemisphere there is a superiority of attraction between one end of the needle and the earth; but it remains to be proved, whether this superiority resides in the needle or in the earth itself. The following consideration seems to shew that the power, whatever it is, resides in the needle; namely, that at the equator, the needle ought to remain in an E. and W. direction, if so placed; because of the equal attraction of the N. and S. poles. Were the needle carried to the poles itself, we can only suppose that it would point perpendicularly downwards; in every other case, the attraction will not be perpendicular.

lular, but oblique; and supposing us to recede from the point of perpendicular attraction only a few miles, the obliquity would become so great, that no attraction or repulsion towards that point could be distinguishable from an horizontal direction. The inclination of the needle therefore shews, that it is not actuated by the influence of a distant point in the earth; but by some power in the atmosphere immediately acting upon the needle, and directing its course either to the earth, or from it, in a certain position. Those who maintain the magnetism of the earth, have been considerably embarrassed with some of the mutual phenomena. The variation of the compass first shewed that the needle was not influenced by those points on which the earth turns round in its diurnal course. This was attempted to be solved by another hypothesis, viz. that the earth had two magnetical poles by which the needle is influenced, and two others round which it turns on its axis. This hypothesis was likewise embarrassed by the continual shifting of the variation either to the E. or W. Another supposition was made by Dr. Halley; viz. that there is a large magnet in the body of the earth, which not being fixed to the external part, moved with respect to it, and of consequence occasioned the variation. This was likewise overthrown, by observing that the variation of the compass was irregular; and differed so much in different parts of the world, that it could not be owing to any regular cause diffused over the whole. Four magnetic poles were then supposed to lie within the earth, and to be moveable with respect to each other; and that therefore the variation, whose theory would now be very intricate, ought to be derived from all their actions conjointly; but, notwithstanding all this complication of poles, it might still be objected, that some kind of regularity, not observed in the variation of the magnetic compass, ought to have taken place. The celebrated Euler adopted the theory of Gilbert and Cavallo, but supposes only two poles; and upon this principle, has reduced the computation of the variations of the needle to a wonderful simplicity. Mr. Churchman has also adopted the opinion of a magnetic nucleus within the earth, with only two poles; whereby he accounts for all the variations of the needle. But notwithstanding these great names, and plausible theories, many are still of opinion, that the earth neither is, nor contains, a magnet, but is surrounded by a fluid whose motion is productive of magnetism in iron. This fluid they suppose to be the Electric Fluid, which they consider as passing through the substance of the earth from the equator towards the polar regions, getting out again in the vicinity of the poles, ascending into the high atmospheric regions, and then returning to the equatorial parts from whence it came. On this supposition, which appears to be confirmed by various natural phenomena, it is easy to see, why in the northern and southern parts the direction of the currents issuing from the earth should always become more and more perpendicular to the earth as we approach the poles, and on the contrary why their direction must be horizontal or nearly so in the equatorial parts. The discovery of this general cause therefore seems to be the nearest approach we can as yet make to the knowledge of the origin of magnetical phenomena. In what manner iron more than other metals is influenced by this fluid, or why the direction of a current of electric matter either to or from the earth, should cause such strong attraction as magnetical bodies are some times endowed with, we have as yet no data for understanding.

THE METHOD OF MAKING ARTIFICIAL MAGNETS.

Magnetism is communicated merely by presenting a piece of iron or steel to one of the poles of a magnet or loadstone, even without touching it; though a strong and permanent power cannot be given without contact, or even stroking the one upon the other for a number of times. In this operation, that part of the ferruginous body which touches the pole of the magnet acquires the contrary magnetism; that is, if it touch the north pole, it will turn towards the south, et vice versa. The power acquired is strongest when soft iron is applied, weaker with hardened iron, and weakest of all with hard steel: but the permanency of it follows just the reverse of this rule: for steel or hardened iron will preserve its virtue for many years, but soft iron loses it the moment we withdraw the magnet. When we desire a strong and permanent virtue, therefore, it is best to use the hardest steel, and to impregnate it by means of one or more powerful magnets; taking care that the north pole of the magnet which gives the vir-

tue be applied to that end of the steel which is to be made the south pole. The same method may be employed in rendering a weak magnet more powerful than before, or in restoring the virtue to one which has lost it. The operation of communicating magnetism to pieces of steel or iron, is called touching them; and as this is of the utmost utility in navigation, for the purpose of giving polarity to needles, very considerable pains have been bestowed upon the subject, in order to discover the methods of giving them the magnetic virtue in the most effectual and permanent manner. When only one magnetic bar is to be made use of, one of its poles must be applied to the end of the needle or steel-bar to be impregnated; and drawn along the surface of it to the other extremity several times. By this method, that other extremity of the needle which the magnet touched last acquires the contrary magnetism. This method, however, is never found to be equally effectual with that in which two magnets, or both poles of one magnet, are made use of. A magnet cannot communicate a degree of magnetism stronger than that which itself possesses; but two or more magnets, joined together, may communicate a greater power to a piece of steel, than either of them possesses singly: hence we have a method of constructing very powerful magnets, by first constructing several weak artificial magnets, and then joining them together to form a compound magnet, and to act more powerfully upon a piece of steel. The following is an excellent method of communicating the magnetic virtue:

1. Place two magnetic bars, A, B, fig. 3, in a line with the north, or marked end of one, opposed to the south, or unmarked end of the other; but at such a distance from each other, that the magnet to be touched may rest with its marked end on the unmarked end of A, and its unmarked end on the marked end of B; then apply the north end of the magnet E, and the south end of D, to the middle of the bar C, the opposite ends being elevated as in the figure; draw E and D asunder along the bar C, one towards A, the other towards B, preserving the same elevation; remove E and D a foot or two from the bar when they are off the ends; then bring the north and south poles of these magnets together, and apply them again to the middle of the bar C as before: repeat the same process five or six times, then turn the bar, and touch the opposite surface in the same manner, and afterwards the two remaining surfaces; by this means the bar will acquire a strong fixed magnetism.

2. Place the two bars which are to be touched parallel to each other; and then unite the ends by two pieces of soft iron, called supporters, in order to preserve, during the operation, the circulation of the magnetic matter; the bars are to be placed so that the marked end D, fig. 4, may be opposite the unmarked end B; then place the two attracting poles G and I on the middle of one of the bars to be touched, raising the ends, so that the bars may form an obtuse angle of 100 or 120 degrees; the ends G and I of the bars are to be separated two or three tenths of an inch from each other. Keeping the bars in this position, move them slowly over the bar A B, from one end to the other, going from end to end about fifteen times. Having done this, change the poles of the bars (i. e. the marked end of one is always to be against the unmarked end of the other), and repeat the same operation on the bar C D, and then on the opposite faces of the bars. The touch thus communicated may be further increased, by rubbing the different faces of the bars with sets of magnetic bars, disposed as in fig. 5. In these operations all the pieces should be well polished, the sides and ends made quite flat, and the angles quite square. A magnet bent so that the two ends almost meet, is called a horse-shoe magnet, fig. 6. To render it magnetic, place a pair of magnetic bars against the ends of the horse-shoe, with the south end of the bar against that of the horse-shoe which is intended to be the north, and the north end of the bar to that which is to be the south; the contact, or lifter of soft iron, to be placed at the other end of the bars. Also rub the surfaces of the horse-shoe with a pair of bars placed in the form of a compass, or with another horse-shoe magnet, turning the poles properly to the poles of the horse-shoe magnet; being careful that these bars never touch the ends of the straight bars. If the bars are separated suddenly from the horse-shoe magnet, its force will be considerably diminished; to prevent this, slip on the lifter, or support, to the end of the horse-shoe magnet, but in such a manner, however, that it may not touch

touch the bars; the bars may then be taken away, and the support slid to its place. Magnetism is best communicated to compass-needles by the two following methods: Procure a pair of magnetic bars, not less than six inches in length. Fasten the needle down on a board, and with a magnet in each hand draw them from the centre upon the needle outwards; then raise the bars to a considerable distance from the needle, and bring them perpendicularly down upon the centre, and draw them over again. This operation repeated about twenty times will magnetize the needle, and its ends will point to the poles contrary to those that touched them. Over one end of a combined horse-shoe magnet, of at least two in number, and six inches in length, draw from its centre that half of the needle which is to have the contrary pole to the end of the magnet: raise the needle to a considerable distance, and draw it over the magnet again; this repeated about twenty times at least, and the same for the other half, will sufficiently communicate the power. A set of bars are exceedingly useful for magnetizing other bars, or needles of compasses, &c. their power may also be increased when lost or impaired by mismanagement, &c. A set of such bars, viz. six bars and the two iron-conductors, may be preserved in a box; taking care to place the north pole of one contiguous to the south pole of the next, and that contiguous to the north pole of the third, &c. as shewn in fig. 7. After what has been said above, we need not describe how a knife, or any piece of steel, &c. may be rendered magnetic, or in what manner a weak magnet may be rendered more powerful. But it may perhaps be necessary to say something concerning the communication of magnetism to the horse-shoe magnet or crooked bars like A B C, fig. 8. Place the crooked bar flat upon a table, and to its extremities apply the magnetic bars D F, E G; joining their extremities F G, with the conductor or piece of soft iron F' G; then to its middle apply the magnetic bars placed at an angle: or you may use two bars only, placed as shewn in fig. 8, and stroke the crooked bar with them from end to end, following the direction of that bent bar; so that on one side of it the magnetic bars may stand in the direction of the dotted representation L K. In this manner, when the piece of steel A B C has been rubbed a sufficient number of times on one side, it must be turned with the other side upwards, &c. In communicating magnetism, it is best to use weak magnets first, and those that are stronger afterwards; but you must be very careful not to use weak after strong magnets. A magnet loses nothing of its own power by communicating to other substances, but is rather improved. Every kind of violent percussion weakens the power of a magnet. A strong magnet has been entirely deprived of its virtue, by receiving several smart strokes of a hammer; indeed, whatever deranges or disturbs the internal pores of a magnet will injure its magnetic force. Fill a small dry glass-tube with iron-filings; press them in rather close, and then touch the tube as if it was a steel-bar, and the tube will attract a light needle; shake the tube, so that the situation of the filings may be disturbed, and the magnetic virtue will vanish. Magnets should never be left with two north or two south poles together; for when they are thus placed, they diminish and destroy each other's power. Magnetic bars should therefore be always left with the opposite poles laid against each other, or by connecting their opposite poles by a bar of iron. The power of a magnet is increased by letting a piece of iron remain attached to one or both of its poles. A single magnet should therefore be always thus left. The difference of steel in receiving magnetism is very great, as is easily proved by touching in the same manner, and with the same bars, two pieces of steel of equal size, but of different kinds. With some sorts of steel, a few strokes are sufficient to impart to them all the power they are capable of receiving; other sorts require a longer operation; sometimes it is impossible to give them more than a small degree of magnetism. A piece of spring-tempered steel will not retain as much magnetism as hard steel; soft steel still less, and iron retains scarcely any. Iron, when oxydized, loses its magnetism. Mr. Cavallo gives the following receipt for imitating the natural magnets. "Take some martial athiops, or which is more easily procured, reduce into very fine powder the scales which fall from red-hot iron when hammered, and abound in smiths' shops. Mix this powder with drying linseed-oil, so as to form it into a very stiff paste, and shape it in a mould so as to give it any form you require; whether of a terrella, a human head, or any other. This done; put it into a

warm place for some weeks, and it will dry so as to become very hard; then render it magnetic by the application of powerful magnets, and it will acquire a considerable power." In making artificial magnets of steel, without the use of another magnet, none has succeeded better than Mr. Canton, whose process is as follows: Take 12 bars; six of soft steel; each three inches long, one quarter of an inch broad, and one-twentieth of an inch thick; with two pieces of iron, each half the length of one of the bars, but of the same breadth and thickness: also six pieces of hard steel, each five inches and a half long, half an inch broad, and three-twentieths of an inch thick; with two pieces of iron half the length, but the whole breadth and thickness of one of the hard bars; and let all the bars be marked with a line quite round them at one end. Then take an iron-poker and tongs, or two bars of iron, (the larger and the longer used, the better) and fixing the poker upright between the knees, hold to it, near the top, one of the soft bars, having its marked end downwards, by a piece of sewing silk, which must be pulled tight by the left hand, that the bar may not slide: then grasping the tongs with the right hand, a little below the middle, and holding them nearly in a vertical position, let the bar be stroked by the lower end from the bottom to the top, about ten times on each side, which will give it a magnetic power sufficient to lift a small key at the marked end: which end, if the bar was suspended on a point, would turn towards the N. and is therefore called the north pole; and the unmarked end is, for the same reason, called the south pole. Four of the soft bars being impregnated after this manner, lay the two fig. 13, parallel to each other, at the distance of one-fourth of an inch, between the two pieces of iron belonging to them, a N. and S. pole against each piece of iron: then take two of the four bars already made magnetical and place them together so as to make a double bar in thickness, the N. pole of one even with the S. pole of the other: and the remaining two being put to these, one on each side, so as to have 2 N. and 2 S. poles together; separate the N. from the S. pole at one end by a large pin, and place them perpendicularly with that end downward on the middle of one of the parallel bars, the two N. poles towards its S. and the two S. poles towards its N. end: slide them backward and forward three or four times the whole length of the bar, and removing them from the middle of this, place them on the middle of the other bar as before directed, and go over that in the same manner; then turn both the bars the other side upwards, and repeat the former operation: this done, take the two from between the pieces of iron; and, placing the two outermost of the touching bars in the room, let the other two be the outermost of the four to touch these with; and this process being repeated till each pair of bars have been touched three or four times over, put the six together after the manner of the fourth fig. 13, and touch them with two pair of the hard bars placed between their irons, about half an inch from each other; then lay the soft bars aside; and with the four hard ones, let the other two be impregnated, fig. 14, holding the touching bars apart at the lower end near two-tenths of an inch; to which distance let them be separated after they are set on the parallel bar, and brought together again before they are taken off: then proceed according to the method described above, till each pair have been touched two or three times over. But as this vertical way of touching a bar will not give it quite so much of the magnetic virtue as it will receive, let each pair be now touched once or twice over in their parallel position between the irons, with two of the bars held horizontally, or nearly so, by drawing at the same time the N. pole of one from the middle over the S. end, and the S. of the other from the middle over the N. end of a parallel bar: then bringing them to the middle again, without touching the parallel bar, give three or four of these horizontal strokes to each side. The horizontal touch, after the vertical, will make the bars as strong as they possibly can be made, as appears by their not receiving any additional strength, when the vertical touch is given by a great number of bars, and the horizontal by those of a superior magnetic power. The whole process may be gone through in about half an hour; and each of the large bars, if well hardened, may be made to lift 28 Troy ounces, and sometimes more. And when these bars are thus impregnated, they will give to an hard bar of the same size its full virtue in less than two minutes; and therefore will answer all the purposes of magnetism in navigation and experimental philosophy much better than the loadstone, which is known not to have

have a sufficient power to impregnate hard bars. The six being put into a case and disposed as in fig. 7, so that two poles of the same denomination may not be together, and their irons with them as one bar, they will retain the virtues they have received; but if their power should, by making experiments, be ever so far impaired, it may be restored without any foreign assistance in a few minutes. And if a much larger set of bars should be required, these will communicate to them a sufficient power to proceed with: and they may, in a short time, by the same method, be brought to their full strength. To expedite the process of making magnets, the bars should be fixed in a groove, or between brass-pins, to prevent them from sliding; or they may be kept steady by a weight and ruler, as in fig. 14.

THE CONSTRUCTION AND THE USE OF THE PRINCIPAL MAGNETICAL INSTRUMENTS.

The magnetical instruments may be reduced to three principal heads; viz. 1st, the magnets or magnetic bars, which are necessary to magnetize needles of compasses, or such pieces of steel, iron, &c. as may be necessary for divers experiments; and which have already been sufficiently explained. 2dly, the compasses, such as are used in navigation, and for other purposes, which are only magnetic needles justly suspended in boxes, and which, according to the purposes for which they are particularly employed, have several appendages, or differ in size, and in accuracy of divisions, &c. whence they derive the different names of pocket-compasses, steering-compasses, variation-compasses, and azimuth-compasses: and 3dly, the dipping-needle. The magnetic needles which are commonly used at sea, are between four and six inches long; but those which are used for observing the daily variation, are made a little longer, and their extremities point the variation upon an arch or circle properly divided and affixed to the box. The best shape of a magnetic needle is represented in figs. 9, and 10; the first of which shews the upper side, and the second a lateral view of the needle, which is of steel, having a pretty large hole in the middle, to which a conical piece of agate is adapted by means of a brass-piece O, into which the agate-cap (as it is called) is fastened. Then the apex of this hollow cap rests upon the point of a pin F, which is fixed in the centre of the box, and upon which the needle, being properly balanced, turns very nimbly. For common purposes, those needles have a conical perforation made in the steel itself, or in a piece of brass which is fastened in the middle of the needle. For a description of the mariner's compass, see COMPASS, MARINER'S. The azimuth-compass is nothing more than a mariner's compass, to which two sights are adapted, through which the sun is to be seen, in order to find its azimuth, and from thence to ascertain the declination of the magnetic needle at the place of observation; see fig. 11. The particulars in which it differs from the usual compass, are the sights F, G; in one of which, G, there is an oblong aperture with a perpendicular thread or wire stretched through its middle; and in the other sight F, there is a narrow perpendicular slit. The thread or wire H I is stretched from one edge of the box to the opposite. The ring A B of the gimbals rests with its pivots on the semicircle C D, the foot E of which turns in a socket, so that whilst the box K, M, is kept steady, the compass may be turned round, in order to place the sights F, G, in the direction of the sun. The pivots of the gimbals of this, as well as of the common sort of compasses, should lie in the same plane with the point of suspension of the needle, in order to avoid as much as possible the irregularity of the vibrations. There are, on the inside of the box, two lines drawn perpendicularly along the sides of the box, just from the points where the thread H I touches the edge of the box. These lines serve to shew how many degrees the north or south pole of the needle is distant from the azimuth of the sun; for which purpose, the middle of the apertures of the sights F, G, the thread H I, and the said lines, must be exactly in the same vertical plane. The use of the thread H I, which is, often omitted in instruments of this sort, is likewise to shew the degrees between the magnetic meridian and the azimuth, when the eye of the observer stands perpendicularly over it. On the side of the box of this sort of compasses, there generally is a nut or stop, which, when pushed in, bears against the card and stops it, in order that the divisions of the card which coincide with the lines in the box, may be more commodiously read off. The dipping-needle,

though of late much improved, is however still far from perfection. The general mode of constructing it is to pass an axis quite through the needle, to let the extremities of this axis, like those of the beam of a balance, rest upon its supports, so that the needle may move itself vertically round, and when situated in the magnetic meridian, it may place itself in the magnetic line. The degrees of inclination are shewn upon a divided circle, in the centre of which the needle is suspended. Fig. 12, represents a dipping-needle of the simplest construction; A B is the needle, the axis of which F E rests upon the middle of two lateral bars C D, C D, which are made fast to the frame that contains the divided circle A I B K. This machine is fixed on a stand G; but, when used at sea, it is suspended by a ring H, so as to hang perpendicularly. When the instrument is furnished with a stand, a spirit-level O is generally annexed to it, and the stand has three screws, by which the instrument is situated so that the centre of motion of the needle, and the division of 90° on the lower part of the divided circle, may be exactly in the same line, perpendicular to the horizon. See LEVEL. We shall here add a few experiments further to elucidate the magnetic phenomena.

1. TO DETERMINE WHETHER ANY SUBSTANCE IS ATTRACTED BY THE MAGNET OR NOT.

If the substance to be examined contain iron, the attraction will evidently shew itself on bringing near it a magnetic bar. The quantity of attraction will always be known by the force requisite to separate them, and its proportion is estimated by the degree of that force. If the attraction be so small that it cannot be thus perceived, it must be put to swim upon water in an earthen or wooden vessel, by means of a piece of wood or cork. In this way the attraction will be much more easily manifested by the body coming towards the magnet when approached to it. It will sometimes be necessary to bring the magnet within one-tenth of an inch of the body to be attracted; and as the latter advances, care must be taken to withdraw the magnet; for if they be suffered to strike against each other, the body, if hard, will generally recede; and it will likewise be proper to present the magnet to the body when the latter is at rest. If it be suspected that the given body have some magnetism already, the same process is required; only observing to present a piece of soft and clean iron to the body when swimming upon water or quicksilver. A piece of iron about half an ounce weight, and an inch in length, will be very proper for this purpose.

2. TO FIND THE POLES OF A MAGNETIC BODY.

Present the various parts of the body successively to one of the poles of a magnetic needle, and it will soon be discovered which parts of the given body are possessed of a contrary polarity by the needle's standing perpendicularly towards them. One of the poles being thus discovered, turn the opposite pole of the magnetic needle towards the body, and it will soon find out its other pole. When the magnetism of the body to be examined is very weak, there will be danger of reversing the polarity by bringing the needle too near; and as the distance at which this effect will take place cannot be determined, it will always be proper to keep it so far distant, that it can only sensibly effect the needle. Where there are only two poles, they may be found out merely by sprinkling some iron filings upon the body; for these will stand erect upon the polar points.

3. EFFECTS OF THE MAGNET ON SOFT IRON.

Having placed a magnetic needle upon the table, bring a bar of soft iron about eight inches long, and a quarter of an inch thick, so near that it may draw one end of the needle a little out of the way. In this situation approach gradually the north pole of a magnet to the other extremity of the bar, and the north end of the needle will recede from the bar more and more, in proportion as the magnet is brought nearer the bar. If the experiment be repeated with the other pole of the magnet, the north end of the needle will then be attracted by the bar. The reason of this is, that when we bring the north pole of the magnet towards one end of the bar, the latter acquires a south polarity, and the other one, of course, a north polarity. Hence the needle is repelled, because magnetic poles of the same kind repel one another; but

when the south pole is brought near the end of the bar, that end which approaches receives the north polarity, and the other, of course, the south; whence the needle, instead of being repelled, is now attracted. By approaching a small magnetic needle to different parts of the bar, it will be found that one-half of it possesses one kind of polarity, and the other the contrary kind; the magnetic centre, however, or the limit betwixt the two polarities, is not always in the middle of the bar, but is generally nearer that end which is presented to the magnet. The difference increases as the bar is lengthened; and when the latter exceeds a certain length, it acquires several poles. This depends on the strength of the magnet; and when it happens, the first magnetic centre comes very near to the end of the bar which stands next the magnet, and the successive centres are formed betwixt every two poles. Thus, supposing the north pole of a magnet to be brought to the end of such a bar, the end it touches becomes a south pole; a few inches farther a north polarity takes place, after that a south polarity, and so on. The poles become weaker and weaker as they recede from the end which the magnet touches; so that if the bar be of considerable length, they totally vanish long before they come to the other end. Hence, by applying a magnet to one end of a long bar, we shall not thereby give any magnetism to the other; and this shall happen when a magnet capable of lifting two pounds of iron is applied to a bar of about an inch square, and five feet long.

4. THE ACTION OF MAGNETISM SHOWN BY THE REPULSION OF TWO PIECES OF WIRE.

Tie two pieces of soft iron-wire, AB, AB, fig. 15 and 16, each to a separate thread, AC, AC, which join at top, and forming them into a loop, suspend them so as to hang freely. Then bring the marked end D, fig. 17, which is the north, of a magnetic bar just under them, and the wires will immediately repel each other, as shewn in fig. 16; and this divergency will increase to a certain limit, according as the magnet is brought nearer, and vice versa. The reason of this phenomenon is, that by the action of the north magnetic pole D, both the extremities B, B, of the wires, acquire the same, viz. the south polarity; consequently they repel each other; and the extremities A, A, acquire the north polarity, in consequence of which they also repel each other. If instead of the north pole D, you present the south pole of the magnetic bar, the repulsion will take place as before; but now the extremities B, B, acquire the north, and the extremities A, A, acquire the south polarity. On removing the magnet, the wires, if of soft iron, will soon collapse, having lost all their magnetic power; but if steel-wires, or common sewing-needles be used, they will continue to repel each other after the removal of the magnet: the magnetic power being retained by steel. The experiment may be agreeably diversified by using four or more needles, and presenting a N. pole to one pair, and a S. to another, &c.

5. IN WHAT CIRCUMSTANCES A MAGNET CAN SUPPORT THE GREATEST WEIGHT.

By a crooked wire we may shew that the power of a magnet varies according to circumstances. Thus, let a piece of wire about a quarter of an inch in diameter, and four or five inches long, be bent in the form represented by ACB, fig. 18, with a sharp corner at C. Tie it fast to a cross-bar, or let it be held by an assistant with the corner downwards. Then apply either pole of the magnet DE to one of its extremities; and if in this situation a small piece of iron, as H, be put to the corner C, it will remain suspended. On applying the contrary pole of another magnet to the other extremity of the wire, the piece of iron will immediately fall off; but if a pole of the same kind be applied, it will not only be still kept suspended, but be more strongly attracted than before. In this experiment, the first magnet is assisted by the action of the second, but to strengthen a magnet in this manner, it does not appear necessary to use a magnet at all. Thus, having found by trial how much a magnetic bar can lift, procure an oblong piece of iron about four inches long, and somewhat heavier than the bar can bear. Apply one end of this to the pole of the bar holding it with your hand till you place under the other end a larger piece of iron. It will then be found that the magnet will support the piece of iron which it could not do before. The lower piece of iron is to be placed between an half and three quarters of an inch below

the under-part of the oblong piece which hangs at the magnet. The same effect will be produced by the opposite pole of another magnet; but a pole of the same kind would weaken the attraction. Place a magnetic bar AB, fig. 19, so that one of its poles may project a short way beyond the table, and apply an iron-weight C to it; then take another magnetic bar, DE, like the former, and bring it parallel to, and just over, the other, at a little distance, and with the contrary poles towards each other; in consequence of which the attraction of B will be diminished, and the iron C, if sufficiently heavy, will drop off, the magnet AB being then only able to support a smaller piece of iron. By bringing the magnets still nearer to each other, the attraction of B will be diminished still farther; and, when the two magnets come quite into contact (provided they are equal in power), the attraction between B and C will vanish entirely; but if the experiment be repeated with this difference, viz. that the homologous poles of the magnets be brought towards each other, then the attraction between B and C, instead of being diminished, will be increased.

6. THE GENERATION OF POLES, AND OF MAGNETIC CENTRES, IN THE PARTS OF A BROKEN MAGNET.

Take a magnetic bar about six or eight inches long, and a quarter of an inch diameter, whose magnetic centre will be in the middle, or near it. Break off about one-third part by a smart stroke of a hammer, and it will be found that the broken part, though in the magnet it had but one polarity, will now have acquired a N. and S. pole, with a magnetic centre, as if it were a distinct magnet. The experiment may be diversified as follows: having made a steel-bar about six inches long, and one-fourth of an inch thick quite hard, break it into two unequal parts. Join these, and press them hard together, giving it the magnetic virtue at the same time by two powerful magnets; while the parts remain in this position, so that the bar looks as if it had not been broke, it will have only two poles; but as soon as they are separated, each part will be found to become a distinct magnet, having a N. and S. pole proper to itself.

7. TO REMOVE THE MAGNETIC CENTRE IN A MAGNET.

This may be done in various ways; as, by striking a magnetic bar repeatedly, heating it, hard rubbing, &c.; but in all these methods the magnetism of the bar is diminished at the same time that the centre is removed; so that they ought not to be continued beyond what is necessary to produce a sensible removal of the magnetic centre.

8. THE DISADVANTAGES OF USING MAGNETS OF UNEQUAL POWER, AND OF STEEL NOT PROPERLY HARDENED.

Having communicated the magnetic virtue to a steel-bar by a magnet of any given power, then rub it with a weaker magnet, and it will be found, that the power of the bar, instead of being augmented, will be diminished; being no stronger than if it had been rubbed only with the weak magnet. The impropriety of using soft steel in making artificial magnets may be understood from the following example: take two wires about fourteen inches long, and one-eighth of an inch in thickness; let one be of very hard steel, the other of soft steel or iron, though not of the softest sort; then, by means of magnetic bars, give the virtue to those wires, treating them both in the same manner, and it will be generally found that the hard wire will have only two poles, but the other a greater number.

9. TO EXHIBIT THE DIRECTION IN WHICH IRON-FILINGS ARRANGE THEMSELVES BY MEANS OF THE MAGNETIC VIRTUE.

Lay a sheet of paper flat upon a table, strew some iron-filings upon the paper, place a small magnet among them; then give a few gentle knocks to the table, so as to shake the filings, and you will find that they dispose themselves about the magnet NS, as shewn in fig. 2, the particles of iron clinging to one another, and forming themselves into lines, which at the very poles N, S, are in the same direction with the axis of the magnet; a little sideways of the poles they begin to bend, and then they form complete arches, reaching from some point in the northern half of the magnet, to some other point in the southern half. In this experiment the filings may be sprinkled on a piece of paste-board which is placed on a magnetic bar.

10. TO

10. TO IMPROVE NATURAL MAGNETS.

This may be done by the same methods which are used to communicate the virtue to steel-bars or to iron-ores; but the natural magnets being generally very short, we can seldom do more than place them between two strong magnetic bars; however, when they are of sufficient length, they must be rubbed with other bars besides those between which they are put; using the same precautions as in making artificial magnets. When subjected to this operation, it will always be proper to remove the armature from them.

11. TO ARM NATURAL OR ARTIFICIAL MAGNETS.

Find out the poles of the magnet; then shape it in the form of a parallelepipedon; care must be taken to let the poles fall about the middle of two opposite surfaces; in this direction the magnet ought to have the greatest length possible: for a natural magnet is weakened much more by having a part cut off from its length than its breadth. This done, provide two plates of soft iron, equal in breadth to those surfaces where the poles stand, and projecting a little on one side of the stone, as shewn by fig. 20. The projections marked DD must be much narrower than the breadth of the plates: from a quarter to half an inch being sufficient for the larger magnets, and about one-tenth of an inch for small ones, for the purpose of applying to them the surface of the iron F. The thickness of the plates CD, CD, must be proportioned to the strength of the magnet AB; and this proportion cannot easily be determined without an actual experiment. The best method, therefore, is to make them somewhat thick at first, and then keep filing them down as long as the power of the magnet increases; after which the filing is to be discontinued. The armature may be kept on, either by tying or by a box; which last is preferable. The armature of spherical magnets must be adapted to their shape, and each large enough to cover a quarter of it. In like manner may artificial magnets be armed, and thus a compound magnet may be produced much more-powerful than any single one. Thus Dr. Knight constructed two very powerful artificial magnets, or magazines of magnetic bars, which are now in the repository of the Royal Society. Each of these consists of 240 bars disposed in four lengths, so as to form a parallelepipedon, each length containing sixty bars. They are all kept together by iron-braces, and the whole suspended on pivots, with a wooden pedestal or carriage, by which they may be easily placed in any required position. If the artificial magnets be made in the shape of a horse-shoe, or a semi-circle, they have no occasion for armature, it being sufficient to join them either by rivetting or by means of a box; and indeed even when straight bars are used, a compound magnet may be made without armature; but then as the poles cannot act in the same plain, it is necessary to have two magazines in order to give magnetism the more conveniently to other bodies. The power of a magnet is rather augmented by being armed, for the same reason that it is increased by a piece of iron affixed to it. E is a brass-ring, by which it may be suspended with the iron adhering to it, which is the best method for preserving its virtue.

12. OF THE TIME REQUIRED BY MAGNETISM TO PENETRATE THROUGH IRON.

Having placed a bulky piece of iron, suppose one weighing

forty or fifty pounds so near a magnetic needle as to draw it a little out of its direction, apply one of the poles of a strong magnet to the other extremity of the iron, and it will require some seconds before the needle can be affected by it. The interval is greater or less according to the size of the iron and the strength of the magnet.

13. TO EXPLAIN THE APPEARANCES OF THE DIPPING-NEEDLE.

Take a globular magnet, or, which is more easily procured, an oblong one, like SN, fig. 21; the extremity N of which is the north pole, the other extremity S is the south pole, and A is its middle or equator; place it horizontally upon a table CD: then take another small oblong magnet *n s* (viz. a bit of steel-wire, or a small sewing-needle magnetized) and suspend it by means of a fine thread tied to its middle, so as to remain in an horizontal position, when not disturbed by the vicinity of iron, or other magnet. Now if the same small magnet, being held by the upper part of the thread, be brought just over the middle of the large magnet, within two or three inches of it, the former will turn its south pole *s*, towards the north pole, N, of the large magnet; and its north pole *n*, towards the south pole, S, of the large one. It will be farther observed, that the small magnet, whilst kept just over the middle A, of the large one, will remain parallel to it; for since the poles of the small magnet are equally distant from the contrary poles of the large magnet, they are equally attracted. But if the small magnet be moved a little nearer to one end than to the other of the large magnet, then one of its poles, namely, that which is nearest to the contrary pole of the large magnet, will be inclined downwards, and of course the other pole will be elevated above the horizon. It is evident that this inclination must increase according as the small magnet is placed nearer to one of the poles of the large one, because the attraction of the nearest pole will have more power upon it. If the small magnet be brought just opposite to one of the poles of the large magnet, it will turn the contrary pole towards it, and will place itself in the same straight line with the axis of the large magnet. This simple experiment will enable the reader to comprehend easily the phenomena of the magnetic inclination, or of the dipping-needle, upon the surface of the earth; for it is only necessary to imagine that the earth is a large magnet (as in fact it appears to be), and that any magnet, or magnetic needle, commonly used, is the small magnet employed in the above-mentioned experiment; for, supposing that the north pole of the earth is possessed of a south magnetic polarity, and that the opposite pole is possessed of a north magnetic polarity, it appears evident, and it is confirmed by actual experience, that when a magnet, or magnetic needle, properly shaped and suspended, is kept near the equator of the earth (since neither the magnetic equator, nor the magnetic poles of the earth, coincide with its real equator and poles), it must remain in a horizontal situation; if the magnet is removed nearer to one of the magnetic poles of the earth, it must incline to one of its extremities, namely, that which is possessed of the contrary polarity; and this inclination must increase in proportion as the needle recedes from the magnetic equator of the earth. Lastly, when the needle is brought exactly over one of the magnetic poles of the earth, it must stand perpendicular to the horizon of that place.

MAGNETISM, ANIMAL, a sympathy which was lately believed to subsist between the magnet and the human body; and, in consequence of which, the former was supposed to be capable of curing almost every disease. This fanciful system was originally invented by Father Hehl, of Vienna, though first brought into general notice, in 1776, by M. Messmer, who realized a princely fortune in France, by imposing his doctrines on the fanatical and credulous: his pretended mysteries were at length completely developed by a committee of learned and ingenious men, who were appointed to investigate his pretensions. Although this

successful juggler refused to explain the principles of his art, yet from the account of one of his most eminent pupils, it appears, 1. That animal magnetism is an universal fluid, pervading the whole creation, and forming a medium of mutual influence between the planets; and also between the earth and animal bodies. 2. It is the most subtle fluid in nature, being capable of flux and reflux; and of receiving, propagating, and continuing, all kinds of motion. 3. That the animal body is subject to the influence of this fluid by means of the nerves which are immediately affected by it. 4. It operates at a distance, without the intervention of any person. 5. That

5. That, notwithstanding, its universality, there are certain animal bodies, which are not equally susceptible of this fluid, and the presence of which even destroys the effects of animal magnetism. Lastly, it cures all nervous disorders immediately, and others mediately: in short, its virtues extend to the universal cure and preservation of mankind! Such are some of the principles of this wild and incoherent system, which we should not have noticed but to expose its absurdity, and to guard our readers against the like impositions, which are not unfrequently practised.

MAGNIFYING, in optics, the making of objects appear larger than their natural size; whence convex lenses, which do this, are called magnifying glasses. See **OPTICS**.

MAGNITUDE, whatever is made up of parts locally extended, or that hath several dimensions; as a line, surface, solid. The apparent magnitude of a body is that measured by the visual angle, formed by rays drawn from its extremes to the centre of the eye; so that whatever things are seen under the same or equal angles, appear equal; and vice versa. See **GEOMETRY**, and **OPTICS**.

MAGNOLIA, the **LAUREL-LEAVED TULIP-TREE**: in botany, a genus of the polygynia order, and polyandria class of plants; natural order, Coadnatae. Calyx three-leaved; petals nine; capsule one-celled, two-valved; seeds berried, pendulous. There are seven species.

M. GLAUCA, the **SMALL MAGNOLIA**, is a native of North America. It rises from seven or eight to fifteen or sixteen feet high, with a slender stem. The wood is white and spongy, the bark smooth, and of a greenish-white colour; the branches garnished, with thick smooth leaves, of an oval shape, smooth on their edges, and white underneath. The flowers are white, and produced at the extremities of the branches. The seeds are discharged from their cells, and hang by a slender thread. This species generally grows in a poor swampy soil, or on wet meadows. The scent of its blossoms are exquisite, and can be perceived at the distance of three quarters of an English mile, provided the wind be not against it. It is extremely agreeable to travel in the woods about the time of its flowering. The berries likewise look very fine, having a rich red colour, and hanging in bunches on slender stalks. The cough and other pectoral diseases are cured by putting the berries into rum or brandy, and taking a draught of this tincture every morning. The virtues of this remedy are greatly extolled for their salutary effects in consumptions. The bark put into brandy, or boiled in any liquor, is said to ease pectoral diseases and to be of service against all internal pains and heat: and it was thought that a decoction of it could stop the dysentery.

M. GRANDIFLORA, the **GREAT MAGNOLIA**, is a native of Florida and South Carolina. It rises to eighty feet or more, with a straight trunk above two feet in diameter, and a regular head. The leaves resemble those of the laurel, but are larger, and continue green throughout the year. The flowers are produced at the ends of the branches, and are of a purplish-white colour.

MAGNUS, ALBERTUS, a Dominican Friar, afterwards Bishop of Ratisbon, was one of the most learned men and most famous doctors of the thirteenth century. He is said to have acted as a man-midwife. A book entitled "*De Natura Rerum*," of which he was reputed the author, gave rise to this report. In this treatise there are several instructions for midwives, and so much skill shown in their art, that the author could not have arrived at it without having himself practised; but the advocates for Albert say he was not the writer thereof, nor of another piece entitled "*Alberti Magni De Secretis Mulierum*," in which there are many expressions unavoidable on such a subject, which raised a great clamour against the supposed author. It must be confessed, that there are in his Comment upon the Master of Sentences, some questions concerning conjugal duty, in which he has used some words rather too gross for chaste ears: but he used to say in his vindication, that he came to the knowledge of so many monstrous things at confession, that it was impossible to avoid touching upon such questions. Albertus Magnus was certainly a man of a most inquisitive turn of mind, which gave rise to other accusations; such as, that he laboured to find out the philosopher's stone; that he was a magician; and that he made a machine in the shape of a man, which was an oracle to him, and explained all the difficulties he proposed. He had great knowledge in the mathematics, and by his skill in that science might probably have formed a head

with springs capable of articulate sounds. See **AUTOMATON**. John Mattheus de Luna, in his treatise "*De Rerum Inventoribus*," has attributed the invention of fire-arms to Albert; but in this he is confuted by Naude, in his "*Apologie des Grands Hommes*." Many fables are told of him by Bayle and others: such as that the Virgin Mary appeared to him, and offered him his choice of excelling in philosophy or divinity, &c. He died at Cologne, Nov. 15, 1280. His works were printed at Lyons, in 1651, in twenty-one volumes in folio.

MAGNUS CAMPUS, in ancient geography, a tract lying towards Scythopolis, or Bethshan, in Galilee, beyond which it extends into Samaria.

MAGNUS PORTUS, in ancient geography, a port of the Belgæ, in Britain, on the Channel; now thought to be Portsmouth.

MAGO, in ancient geography, a citadel and town of Balearis Minor or Minorca; now Mahon. Lon. 4. 6. E. Lat. 39. 5. N.

MAGOPHONIA, [from *magus*, magician, and *phonia*, slaughter,] a festival among the ancient Persians, held in memory of the expulsion and massacre of the Magians. See **MAGI**.

MAGPIE. See **CORVUS**.

MAGRA, or **MAGORA**, a river of Italy, which rises in the Appennines, near Modena, and falls into the Mediterranean, in Liguria.

MAHALEU, a considerable town of Egypt, capital of Garbia. Lon. 30. 31. E. Lat. 31. 50. N.

MAHERNIA, in botany, a genus of the pentagynia order, and pentandria class of plants. Calyx five-toothed; petals five; nectaria five, obcordate, placed under the filaments; capsule five-celled. It has three species, found at the Cape of Good Hope.

MAHE, the name given by the inhabitants of Otaheite, to a kind of sour paste, made of the bread-fruit, which, in consequence of having undergone a fermentation, will keep a considerable time, and supply them with food when no ripe fruit is to be had. See **ARTOCARPUS**.

MAHOGANY, or **SWIETENIA**, an exotic tree growing wild in South America, and likewise in the islands of Cuba, Jamaica, Hispaniola, and in those of Bahama. It was formerly very common in Jamaica; whence it was first imported to London in the year 1724; since which period it has been very generally employed for household furniture. Lately, however, it has become more scarce and expensive; because the low-lands in that island have been gradually thinned of those valuable trees which could be readily carried to market, or transported on ship-board. The mahogany-tree grows very tall and straight, frequently among bare rocks, and attains a size of four feet in diameter: its wood is hard, admits of a fine polish, and is excellently calculated for chairs, tables, desks, and similar articles. It also affords strong and durable timber, and is usefully employed in the West Indies for beams, joists, planks, boards, and shingles. Ships built of this wood are said to be almost impermeable to cannon-balls, which lodge in the wood, or, if they pass through the planks, occasion no splinters. See **SWIETENIA**.

MAHOMET. See **MOHAMMED**.

MAIDEN, or **MAYDEN**, an instrument anciently used in Britain for beheading criminals, similar to the Guillotine.

MAIDEN, is also a name of a machine first used in Yorkshire, and since introduced into other places, for washing linen; consisting of a tub nineteen inches high, and twenty-seven in diameter at the top, in which the linen is put, with hot water and soap, to which is adapted a cover, fitting it very closely, and fastened to the tub by two wedges; through a hole in the middle of the cover passes an upright piece of wood, kept at a proper height by a peg above, and furnished with two handles, by which it is turned backward and forward: to the lower end of this upright piece is fastened a round piece of wood, in which are fixed several pieces, like cogs of a wheel. The operation of this machine makes the linen pass and repass quick through the water.

MAIDEN RENTS, in old English writers, a noble paid by the tenants of some manors on their marriage.

MAIDENHAIR. See **ADIANTUM**.

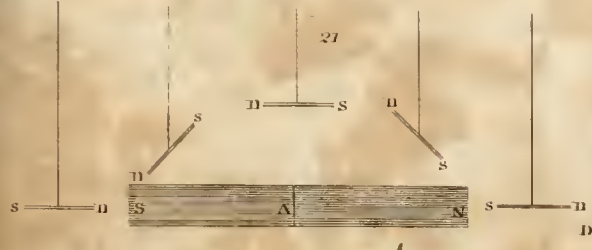
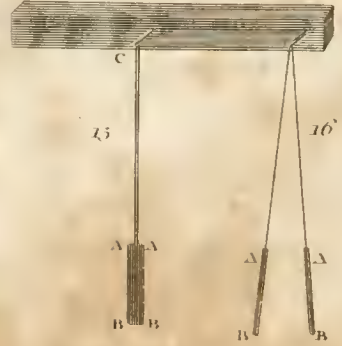
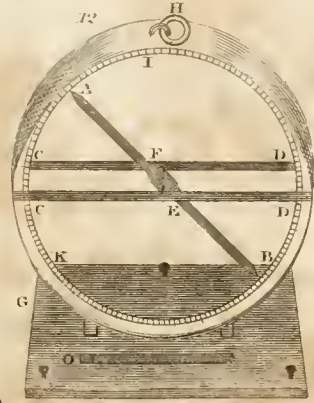
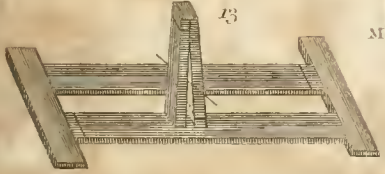
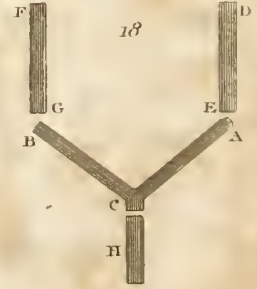
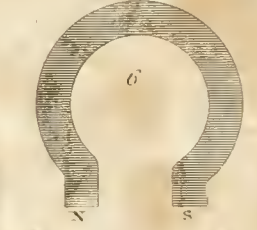
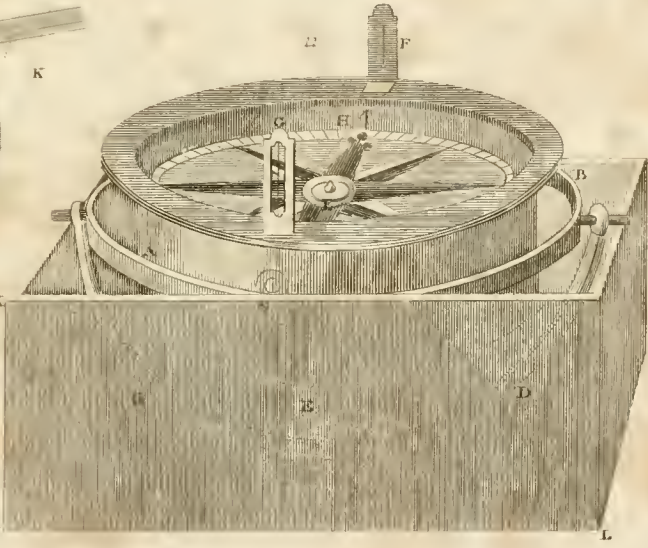
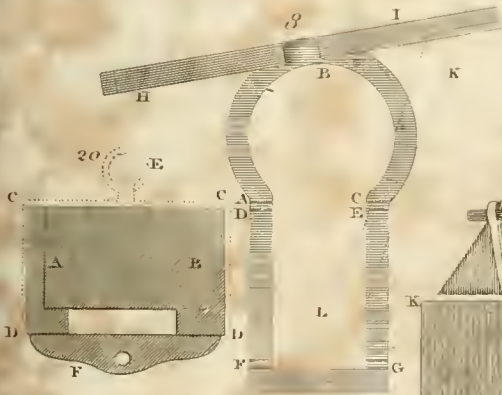
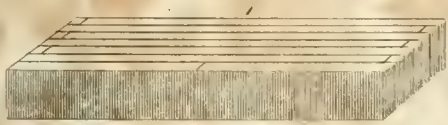
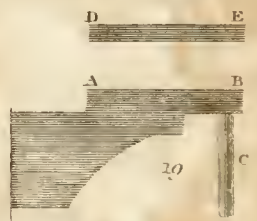
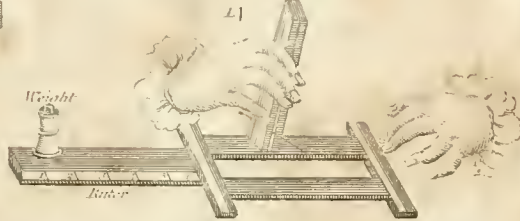
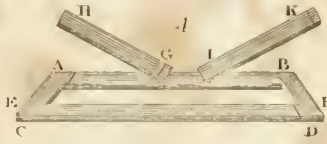
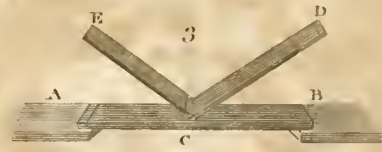
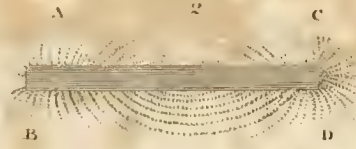
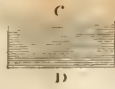
MAIDENHEAD, a town of Berks, twenty-six miles W. by N. from London.

MAIDSTONE, a town of Kent, twenty miles W. of Canterbury, and thirty-five S. E. by E. of London. Lon. 0. 38. E. Lat. 51. 16. N.

MAJESTY,



1





MAJESTY, [from *majior*, Lat. greater, and *status*, state,] a title given to emperors and kings, as a term of distinction.

MAIL, or **MAILL**, on ship-board, a square machine composed of a number of rings interwoven net-wise, and used for rubbing off the loose hemp which remains on lines or white cordage after it is made.

MAIL, or **MAILLE**, in old English writers, a small kind of money. Silver-halfpence were likewise termed mailles, 9 Hen. V. By indenture in the mint, a pound weight of old sterling silver was to be coined into 360 sterlings or pennies, or 720 mails or halfpennies, or 1440 farthings. Hence the word mail was derived, which is still used in Scots law for an annual rent.

MAIL, or **MALL**, also signifies a round ring of iron; whence the play of pall-mall, from *pallus*, a ball, and *maille*, the round ring through which it is to pass.

MAIL-COACHES. See **COACH**.

MAILLEZAIS, a town of France, in the department of the Vendee, twenty-two miles N. E. of Rochelle. Lon. 0. 40. W. Lat. 46. 27. N.

MAIM, **MAIHEM**, or **MAYHEM**, in law, a wound by which a person loses the use of a member that might have been a defence to him; as when a bone is broken, a foot, hand, or other member, cut off, or an eye put out; though the cutting off an ear or nose, or breaking the hinder-teeth, was formerly held to be no maim. A maim by castration was anciently punished with death, and other pains with loss of member for member; but afterwards they were only punished by fine and imprisonment. It is now enacted by the statute 22 and 23 Car. II. that if any person, from malice aforethought, shall disable any limb or member of any of the king's subjects, with an intent to disfigure him, the offender, with his aiders and abettors, shall be guilty of felony without benefit of clergy, but shall not corrupt the blood, or occasion forfeiture of lands, &c.

MAIMONIDES, **MOSES**, **MOSES THE SON OF MAIMON**, a celebrated rabbi, called by the Jews the eagle of the doctors, was born of an illustrious family at Cordova in Spain, in 1131. He is also called *Moses Egyptian*, because he settled in Egypt, where he spent his life as physician to the sultan. He also opened a school, which was soon filled with pupils from Alexandria, Damascus, &c. who spread his fame all over the world. He was no less eminent in philosophy, mathematics, and divinity, than in medicine. Casaubon says of him, that "he was the first of his tribe who ceased to be a trifler." It would be tedious to enumerate all his works; some were written originally in Arabic, but are now extant only in Hebrew translations. "Those (says Collier) who desire to learn the doctrine and the canon law contained in the Talmud, may read Maimonides's compendium of it in his book entitled *Jad*; wherein they will find great part of the fables in the Talmud discarded. But the *More Nevochim* is the most valued of all his works; designed to explain the obscure words, phrases, metaphors, &c. in Scripture." He died in Egypt, aged seventy, and was buried in Upper Galilee.

MAIN, a term usually applied by sailors to whatever is principal, as opposed to whatever is secondary. Thus the main land is used in contradistinction to an island or peninsula; and the main-mast, the main-wale, the main-keel, and the main-hatchway, are distinguished from the fore and mizen-masts, the channel-wales, the false-keel, the fore and after-hatchways, &c.

MAINA, a country of European Turkey, in the Morea.

MAINA, the capital of the above territory.

MAINE, or **MAIN**, one of the seventeen United States of North America; bounded on the N. by mountains which separate it from Lower Canada; E. by the river St. Croix, and New Brunswick; S. E. and S. by the Atlantic Ocean; and W. by the Piscataqua, and New Hampshire. It lies between 68° and 72° Lon. W. and Lat. from 43° to 48° N.

MAINE, a late province of France, now forming the department of Maine. It was divided into Upper and Lower Maine. Mans was the capital.

MAINE, or **MAYENNE**, a department of France, which includes the above province; so named from the river. It is bounded on the N. by the departments of the Channel and Orne; E. by that of the Sarthe; S. by that of Maine and Loire; and W. by that of Ille and Vilaine. It is forty-five miles long from N. to S. and thirty broad.

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MAINE, **MAIENNE**, or **MAYENNE**, the capital of the above department. Lon. 0. 35. W. Lat. 48. 18. N.

MAINE, or **MAYENNE**, a river of France, which rises near Linières, in the department of Charente.

MAINE, a river of Germany, which rises in the circle of Franconia, runs by Bamberg, Wurtzburg, Aschaffenburg, Hauna, and Frankfort, and falls into the Rhine at Mentz.

MAINE and **LOIRE**, a department of France on the N. of Maine.

MAINLAND, or **POMONA**, the largest of the Orkney Islands, twenty-four miles long, and nine broad. Kirkwall is the capital.

MAIN-LAND, the largest of the Shetland, or Zetland Islands. It is about sixty miles long from N. to S. and in some places twenty broad, but in others not much above two.

MAINPERNOR, surety. It differs from bail, in that a man's bail may imprison, or surrender him up before the appointed day of appearance; mainpernors can do neither, but are barely sureties for his appearance at the day: bail means only sureties, that the parties be answerable for the special matter for which they stipulate; mainpernors are bound to produce him to answer all charges whatever.

MAINPRISE, or **MAINPRIZE**. The writ of mainprize, *manucapio*, is a writ directed to the sheriff (either generally, when any man is imprisoned for a bailable offence, and bail hath been refused; or specially, when the offence or cause of comment is not properly bailable below), commanding him to take sureties for the prisoner's appearance, usually called mainpernors, and to set him at large.

MAINTENANCE, in law, bears a near relation to *baratry*; being an officious intermeddling in a suit that does not belong to one, by maintaining or assisting either party with money or otherwise, to prosecute or defend it: a practice greatly encouraged by the first introduction of uses. This is an offence against public justice, as it keeps alive strife and contention, and perverts the remedial process of the law into an engine of oppression. By the Roman law, it was a species of the *crimen falsi*, to enter into any confederacy, or do any act to support another's law-suit, by money, witnesses, or patronage. A man may lawfully, however, maintain the suit of his near kinsman, servant, or poor neighbour, out of charity and compassion. Otherwise the punishment by common law is fine and imprisonment; and by stat. 32 Hen. VIII. c. 9, a forfeiture of 10*l*. See **BARATRY**.

MAINTENON, a town of France, in the department of Eure and Loire, nine miles N. of Chartres.

MAJOR, in law, a person who is of age to manage his own affairs. By the civil law a man is not a major till the age of twenty-five years; in England he is a major at twenty-one; in Normandy at twenty, &c.

MAJOR, in logic, is understood of the first proposition of a regular syllogism. It is called major, because it has a more extensive sense than the minor proposition, as containing the principal term. See **LOGIC**.

MAJOR and **MINOR**, in music, are applied to concords which differ from each other by a semi tone. Major-tone is the difference between the fifth and fourth; and major semi-tone the difference between the major fourth and the third. The major-tone surpasses the minor by a comma.

MAJOR, in the art of war, is the title of several officers of very different ranks and functions: as,

MAJOR, **AID**, an officer on sundry occasions appointed to act as major, who has a pre-eminence above others of the same denomination. Our horse and foot-guards have their guidons, or second and third majors.

MAJOR, **DRUM**, the person who instructs the drummers in their different beats; is daily at orders with the serjeants, to know the number of drummers for duty; and marches at their head when they beat in a body.

MAJOR, **FIFE**, he that plays best on the fife. He has the same authority over the fifers as the drum-major has over the drummers. He teaches them their duty, appoints them for guards, &c.

MAJOR, **TOWN**, the third officer in order in a garrison, and next to the deputy-governor. He should understand fortification, and has a particular charge of the guards, rounds, patrols, and centinels.

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MAJOR-

MAJOR-GENERAL, the next officer to the lieutenant-general. His chief business is to receive orders from the general, or in his absence from the lieutenant-general of the day; which he is to distribute to the brigade-majors, with whom he is to regulate the guards, convoys, detachments, &c. On him rests the whole fatigue and detail of duty of the army-roll. He is charged with the encampment of the army; places himself at the head of it when they march; marks out the ground of the camp to the quarter-master-general; and places the new guards for the safety of the camp. When the army is to march, he dictates to the field-officers the order of the march, which he has received from the general, and on other days gives them the parole. In a fixed camp he is charged with the foraging, with reconnoitring the ground for it, and posting the escorts. In sieges, if there be two separate attacks, the second belongs to him; but if there be but one, he takes, either from the right or left of the attack, that which the lieutenant-general has not chosen. When the army is under arms, he assists the lieutenant-general, whose orders he executes. If the army marches to an engagement, his post is at the head of the guards of the army, until they are near enough to the enemy to rejoin their different corps; after which he retires to his own proper post: for the major-generals are disposed in the order of battle as the lieutenant-generals are; to whom, however, they are subordinate, for the command of their divisions. The major-general has one aid-de-camp paid for executing his orders.

MAJOR OF A REGIMENT OF FOOT, the next officer to the lieutenant-colonel, generally promoted from the eldest captain. He is to take care that the regiment be well exercised, to see it march in good order, and to rally it in case of being broke in action: he is the only officer among the infantry that is allowed to be on horseback in time of action, that he may the more readily execute the colonel's orders.

MAJOR OF A REGIMENT OF HORSE, as well as foot, ought to be a man of honour, integrity, understanding, courage, activity, experience, and address.

MAJOR OF ARTILLERY, is the next officer to the lieutenant-colonel. His post is very laborious, as the whole detail of the corps rests with him; and therefore all the non-commissioned officers are subordinate to him, as his title of serjeant-major imports; in this quality they must render him an exact account of every thing which comes to their knowledge, either regarding the duty or wants of the artillery and soldiers.

MAJOR OF BRIGADE, is appointed only in camp: he goes every day to head-quarters to receive orders from the adjutant-general: there he writes exactly what is dictated to him; thence he goes to give the orders, at the place appointed, to the different majors or adjutants of the regiments, which compose the brigade, and regulates with them the number of officers and men which each are to furnish for the duty of the army; taking care to keep an exact roster, that one may not give more than another; and that each march in their tour.

MAJOR OF ENGINEERS, commonly called **SUB-DIRECTOR**, should be well skilled in military architecture, fortification, gunnery, and mining. He should know how to fortify in the field, to attack and defend all sorts of posts, and to conduct the works in a siege, &c. See **ENGINEER**.

MAJORCA, an island of the Mediterranean, lying between Yvica on the W. and Minorca on the E. These three islands were anciently called Baleares. See **BALEARES**.

MAJORCA, a town in the S. W. part of the above island. Lon. 2. 55. E. Lat. 39. 36. N.

MAJORITY, the greater number of persons. Several things are determined by a majority. Thus our laws are enacted by a majority of members of parliament, and the members themselves are chosen by a majority of electors: also the act of the major part of every corporation, is accounted the act of the corporation; for where the majority is, there the law adjudges to be the whole.

MAISTRE, **LEWIS ISAAC LE**, called also **SACY**, was born at Paris in 1613. His genius appeared very early, and he completed an excellent course of study; but being accused of Jansenism, he was, in 1666, committed to the Bastille. During his confinement, he is said to have composed the book *Figures de la Bible*; in which allusions are made to the sufferings endured by the Jansenists. But it is more probable, that it was composed by Nicolas Fontaine his fellow-prisoner. To Le Maistre's confinement

the public are indebted for a French translation of the Bible, finished in 1668, the evening before the feast of All Saints; when he recovered his liberty, after an imprisonment of two years and a half. He was presented to the king and the minister; and all the favour he asked from them was, that they would send several times a year to examine the state of the prisoners in the Bastille. He continued at Paris till 1675, when he retired to Port Royal, which he was obliged to leave in 1679. He then settled at Pampone, where he died Jan. 4, 1684, aged 71. His works are, 1. *La Traduction de la Bible*, with explanations of the spiritual and literal meaning from the fathers; which were chiefly done by Du Fosse, Hure, and Tournoux. This is the best French translation which has yet appeared, and the best edition is that of Paris in 32 vols. 8vo. 1684, &c. 2. *Une Traduction des Pseaumes selon l'Hebreu et la Vulgate*, in 12mo. 3. *Une Version des Homelies de St. Chrysostome sur St. Matthieu*; 3 vols. 8vo. 4. *La Traduction de l'Imitation de Jesus Christ* (sous le nom de Beuil, prieur de St. Val), Paris 1663, 8vo. 5. *Celle de Phedre*, 12mo. (sous le nom de St. Aubin. 6. *De trois Comedies de Terence*, in 12mo. 7. *Des Lettres de Bongars* (sous le nom de Brianville). 8. *Du Poeme de St. Prosper sur les ingrates*, in 12mo. en verse et en prose. 9. *Les Enluminures de l'Almanach des Jesuites*, 1654, 12mo. and 1733. 10. *Heures de Port-Royal*, in 12mo. 11. *Lettres de Piété*, Paris, 1699, 2 vols. 8vo.

MAITLAND, JOHN, Lord Thirlstane, and Lord High Chancellor of Scotland, was born in 1537, educated in Scotland, and afterwards sent to France to study the law. On his return, he commenced advocate; in which profession his abilities became conspicuous. In 1567, his father resigned the privy-seal in his favour. This office he kept till 1570; when, for his loyalty to the queen, he lost the seal, which was given to George Buchanan. He was made a lord of session in 1581; secretary of state in 1584; and lord-chancellor in 1586. His power and influence created him many enemies among the Scottish nobility, who made several attempts to destroy him, but without success. In 1589 he attended King James on his voyage to Norway, where his bride, the Princess of Denmark, was detained by contrary winds. The marriage was immediately consummated; and they returned with the queen to Copenhagen, where they spent the winter. During their residence in Denmark, the chancellor became intimately acquainted with the celebrated Tycho Brahe. In 1590 he was created Lord Maitland of Thirlstane. He died in 1595, much regretted by the king. He bears a high character both for talents and integrity. Melville, who writes the memoirs, (says Mr. Pinkerton,) was his personal enemy, so must not receive much credit in his censures of him. Besides his Scottish poetry in the Maitland Collection, he wrote several Latin epigrams, &c. to be found in the *Deliciae Poetarum Scotorum*, vol. ii.

MAITTAIRE, MICHAEL, A. M. an eminently learned writer, born in 1668. Dr. South canon of Christ Church, made him a student of that house, where he took the degree of M. A. March 23, 1696. From 1695 till 1699 he was second master of Westminster School. In 1706, he published *Græcæ Linguae Dialecti*, in *Usum Scholæ Westmonasteriensis*, 1706, 8vo.; reprinted at the Hague in 1738; and 1712, "English Grammar, Applied to, and Exemplified in, the English Tongue," 8vo. In 1711, he published "Remarks on Mr. Whiston's Account of the Convocation's Proceedings with Relation to Himself," 8vo.; and "An Essay against Arianism, and some other Heresies; or, A Reply to Mr. W. Whiston's Historical Preface," &c. 8vo. In 1709 he gave the first specimen of his great skill in typographical antiquities, by publishing *Stephanorum Historia, Vitas Ipsorum ac Libros Complectens*, 8vo. This was followed in 1717, by *Historia Typographorum aliquot Parisiensium, Vitas et Libros complectens*, 8vo. In 1719, *Annales Typographici, ab Artis inventæ Origine, ad Annum MD. 4to.* The second vol. continued to 1536, was published at the Hague in 1720; with an introductory letter of John Toland de prima Typographiæ inventionē: as was also the third continued to 1557, and, by an appendix, to 1664, in 1725. In 1733 was published at Amsterdam, the fourth volume, continued to 1664. In 1741 the work was completed at London, by the publication of the fifth and last volume, with an index to the whole. These four last volumes were in two parts each. In the intermediate years he was employed on various useful works. In 1713 he published by subscription *Opera et Fragmenta Veterum Poetarum*; in 2 vols.

vols. folio. In 1714, he published a Greek Testament, in 2 vols. The Classics, which he published separately, with indexes, came out in the following order: In 1713, Christus Patiens, Justin; Lucretius, Phadrus, Sallust, Terence. In 1715, Catullus, Tibullus, Propertius, C. Nepos, Florus, Horace, Juvenal, Ovid, Virgil. In 1717, Cæsar, Martial, Q. Curtius. In 1718 and 1725, Velleius Paterculus. In 1719, Lucan. In 1720, Bonifoni Carmina. In 1721, Batrachomyomachia Græcæ ad Veterum Exemplarium Fidem recusa: Glossa Græca; var. lect. vers. Lat. &c. illustrata, 8vo. In 1722, Miscellanea Græcorum aliquot Scriptorum Carmina, cum vers. Lat. et Notis, 4to. In 1725 and 1741, Anacreon, in 4to. In 1724 he compiled, at the request of Dr. Friend, an Index to the splendid folio edition of Aretæus, in 1723. In 1726, he published Petri Petiti Medici Parisiensis in tres priores Aretæi Cappadociæ Libros Commentarii; nunc primum editi, 4to; a work found among the papers of Grævius. From 1728 to 1733, he published Marmorum Arundelianorum, Seldenianorum, aliorumque Acad. Oxon. donatarum, unâ cum Commentariis et Indice, editio 2da, fol. with an Appendix. His Epistola ad D. P. Des Maizeaux, in qua Indicis in Annales Typographicus Scriptodius explicatur, &c. is printed in The Present State of the Republic of Letters, Aug. 1733, p. 142. His life of R. Stephens in Latin, with a complete list of his works, is prefixed to the improved edition of R. Stephens's Thesaurus; 4 vols. fol. in 1734. In 1736 appeared Antiquæ Inscriptiones duæ, folio; being a commentary on two large copper-tables discovered near Hieraclea, in the Bay of Tarentum. In 1739, he addressed to Anne, Empress of Russia, a small Latin poem, entitled Carmen Epitaphium Augustissimæ Russorum Imperatrici sacrum. In 1741, he published anonymously Plutarch's Apophthegmata, 4to. His last publication was Senilia, sive Poetica aliquot in Argumentis varii Generis Tentamina: in 4to. 1742. He died in 1747, aged 79. His valuable library, which had been fifty years collecting, was sold by auction in 1747 and 1748, taking up in all forty-four nights. He was patronised by the first and second earls of Oxford; and was also Latin tutor to Mr. Stanhope, Chesterfield's favourite son.

MAIXANT, or MAIXENT, Sr. an ancient town of France, in the department of the Two Sevrès, and late province of Poitou, twenty-six miles S. W. of Poitou.

MAKING UP, among distillers, the reducing spirits to a certain standard of strength, usually called proof, by the admixture of water.

MALABAR, the name given to a great part of the west coast of Hindostan, from the kingdom of Baglala, or from the north extremity of that of Canara, to Cape Comorin. It is bounded on the east by the mountains of Ballagat; on the south and west by the Indian sea; and on the north by the Decan.

MALACA, in ancient geography, a maritime town of Hispania Batica, surnamed *Federatorum* by Pliny; now called Malaga.

MALACCA, the most southerly part of the great peninsula beyond the Ganges, is about 600 miles long, and from 60 to 150 broad. It is bounded by the kingdom of Siam on the north, by the bay of Siam and the Indian ocean on the east, and by the straits of Malacca, which separate it from the island of Sumatra, on the south-west. It lies more to the south than any other country in the East Indies; and comprehends the towns and kingdoms of Patan, Pahan, Igohor, Pera, Queda, Borkelon, Ligor; and on the north the town and kingdom of Tanassery, where the Portuguese formerly carried on a great trade.

MALACCA, a kingdom of the above country. The people are in general subject to the Dutch, who possess all the strong places on the coast, and compel them to trade on their own terms, excluding all other nations of Europe from having any commerce with them. The Malays are governed by feudal laws. The country is very fertile. It abounds with odoriferous woods, such as aloes, sandal, and cassia. The ground is covered with flowers of the greatest fragrance, of which there is a perpetual succession throughout the year. There are many mines of the most precious metals, said to be richer than those of Brazil or Peru, and in some places are mines of diamonds. The sea abounds with excellent fish, ambergris, pearls, &c. and the rocks with those delicate bird's nests so much in request in China, which are of such an exquisite flavour, that the Chinese for a long time purchased them for their weight in gold.

MALACCA, the capital of the above kingdom, is situated in a flat country close to the sea. Lon. 102. 9. E. Lat. 2. 12. N.

MALACCA, STRAITS OF, a narrow sea between Malacca and the Island of Sumatra.

MALACHI, [מלאכי, Heb. *i. e.* my messenger,] the last of the twelve lesser prophets. He prophesied about 300 years before Christ, reproving the Jews for their wickedness after their return from Babylon, and condemning the priests for being careless in their ministry: at the same time encouraging the few who maintained their integrity. He distinctly points at the Messiah, as well as his forerunner John the Baptist, who should come in the spirit and power of Elijah.

MALACHITE, a mineral, the green carbonate of copper, found frequently crystallized in long slender needles; colour green, and the specific gravity about 3.6. It effervesces with nitric acid, and gives a blue colour to ammonia. It decrepitates and blackens before the blow-pipe. There are two varieties, the fibrous and the compact. the constituent parts are,

Copper.....	58.0
Carbonic acid.....	18.0
Oxygen.....	12.5
Water.....	11.5
	100.0

MALACOPTERYGEOUS, among ichthyologists, an appellation given to such fishes as have the rays of their fins bony, but not pointed or sharp at the extremities, like those of *ancanthopterygeous* fishes.

MALACOSTOMOUS, a term applied to fishes destitute of teeth in the jaws, called also leather-mouthed, as the tench, carp, bream, &c.

MALACHODENDRUM, in botany, a genus of the monadelphia polyandria class and order; natural order, Columniferae. Calyx simple; germ pear-shaped, pentagonal; styles five; capsule five, one-seeded. There are two species, *M. ovatum*, and *M. corchoroides*.

MALACHRA, in botany, a genus of the polyandria order, and monadelphia class of plants. Calyx common, three-leaved, many-flowered; anils five, one-seeded. It has five species, natives of America.

MALAGA, an ancient town of Spain, in Grenada. Lon. 4. 36. E. Lat. 36. 44. N.

MALACOLITE, a mineral which occurs in the silver-mines of Sweden and Norway, massive, and crystallized in six-sided prisms. Specific gravity about 3.25. Its constituents are,

Silica.....	53
Lime.....	20
Magnesia.....	19
Alumina.....	3
Oxide of iron, &c.....	4
	99
Loss.....	1

100

MALAGUETTA, the *GRAIN-COAST*, or the *PEPPER-COAST*, a country of Guinea, bounded by Sierra Leona on the W. and the Ivory Coast on the S. E. extending about 300 miles along the Atlantic. It abounds with lemons, oranges, dates, palm-wine, and a peculiarly delicious kind of nuts; but its chief article of commerce is pepper. The people are governed by a king, whom they hold in great veneration; but they are fond of the Europeans.

MALLANDERS, [from *mal andare*, Ital. to go ill,] a disease incident to horses, proceeding from corrupt blood, hard labour, or being over-ridden, and sometimes for want of clean keeping and rubbing. See *FARRIERY*.

MALATES, in chemistry, salts formed by the union of the malic acid with different bases. The malates of lime, barytes, and magnesia, are very insoluble. The malates of potass, soda, and ammonia, are deliquescent. The malates of potass, soda, ammonia, lime, and barytes, may be formed by dissolving these alkalies in malic acid, and evaporating the solutions.

MALAXIS, in botany, a genus of the gynandria diandria class and order; natural order, Orchideæ. Nectary one-leaved, concave, cordate, acuminate backwards, bifid in front, cherishing the genitals in the middle. It has two species, *M. spicata*, and *M. umbelliflora*, natives of Jamaica.

MALDEN,

MALDEN, or **MALDON**, a town of Essex, thirty-seven miles N. E. of London. Lon. 0. 41. E. Lat. 51. 46. N.

MALDIVE, or **MALDIVIA ISLANDS**, a cluster of small islands in the Indian Ocean, 500 miles S. W. of Ceylon. They are about 1000 in number, and extend from Lat. 2° S. to 7° N. They are generally black low lands, surrounded by rocks and sands. The natives are of the same complexion with the Arabians, profess the Mohammedan religion, and are subject to one sovereign.

MALÉ, by zoologists, is defined that sex of animals which has the parts of generation situated externally.

MALE is also, from some resemblance, often applied to inanimate things; as a male-flower, a male-screw, &c. See **BOTANY**, and **SCREW**.

MALE, in geography, the principal of the Maldive Islands. It is four miles and a half in circumference, and has a town, where the king resides.

MALEBRANCHE, **NICHOLAS**, an eminent French metaphysician, the son of Nicholas Malebranche, secretary to the French king, was born in 1638, and admitted into the congregation of the oratory in 1660, and died in 1715. He wrote several books, the principal of which is the "Search after Truth," printed at Paris in 1674. His object in this work is to shew, that the only way of discovering truth is to observe every thing in God; or, in other words, to abstract the mind from all objects but in reference to the Fountain of Existence. Mr. Locke, in his examination of Malebranche's opinion of seeing all things in God, styles him an "accurate and ingenious author;" and tells us, that there are "many very fine thoughts, judicious reasonings, and uncommon reflections, in his Recherche;" yet he refutes the chief principles of his system. Malebranche wrote many other pieces, to confirm his doctrine, and to clear it from objections.

MALIC ACID, in chemistry, an acid abounding in unripe fruits, especially in apples. It was discovered by Scheele about the year 1785. It is thus obtained: saturate the juice of apples with potass, and add to the solution acetate of lead till no more precipitation ensues. Wash the precipitate carefully with a sufficient quantity of water; then pour upon it diluted sulphuric acid till the mixture has a perfectly acid taste, without any of that sweetness which is perceptible as long as any lead remains dissolved in it; then separate the sulphate of lead, which has precipitated, by filtration, and there remains behind pure malic acid. The French chemists have ascertained that it may be obtained in the largest quantities from the juice of the *sempervivum tectorum*, where it exists abundantly combined in lime. Malic acid is very soluble in water, and decomposes spontaneously, by undergoing a kind of fermentation. It is composed of oxygen, hydrogen, and carbon. It combines with alkalies, earths, and metallic oxides, and forms **MALATES**, which see. This acid greatly resembles the citric acid.

MALICE, in ethics and law, is a formed design of doing mischief to another; it differs from hatred. In murder, it is malice makes the crime; and if a man, having a malicious intent to kill another, in the execution of his malice kills a person not intended, the malice shall be connected to his person, and he shall be adjudged a murderer. The words *ex malitiâ præcogitatâ* are necessary to an indictment of murder, &c. And this *malitiâ præcogitata*, or malice prepense, may be either express or implied. Express malice is, when one, with a sedate, deliberate mind, and formed design, kills another; which formed design is evidenced by external circumstances discovering that intention; as lying in wait, antecedent menaces, former grudges, and concerted schemes to do him some bodily harm. Besides, where no malice is expressed, the law will imply it; as where a man wilfully poisons another, in such a deliberate act the law presumes malice, though no particular enmity can be proved. And if a man kills another suddenly, without any, or without a considerable provocation, the law implies malice; for no person, unless of an abandoned heart, would be guilty of such an act upon a slight or no cause.

MALIGNANT, among physicians, applied to diseases of a very dangerous nature, and generally infectious; such are the dysentery, jaundice, &c. in their worst stages.

MALIGNITY, among physicians, signifies much the same with contagion. See **CONTAGION**.

MALINES. See **MECHLIN**.

MALIN-HEAD, a cape of Ireland, and the most northern point of the island, 23 miles N. of Londonderry.

MALL, or **SEA-MALL**. See **LARUS**.

MALLEABILITY, the quality of enduring the hammer; and of spreading under the hammer.

MALLEABLE, a property of metals, whereby they are capable of being extended under the hammer.

MALLEOLI, or **PYROCOLLI**, in the ancient art of war, were bundles of combustible materials, set on fire to give light in the night, or to annoy the enemy.

MALLEOTI, in anatomy, the ancle-bone. See **ANATOMY**.

MALLET, a kind of large wooden hammer, used by artificers who work with a chisel, as sculptors, masons, and stone-cutters, whose mallets are commonly round, and by joiners, carpenters, &c. who work with square-headed mallets.

MALLEUS, in anatomy, a bone of the ear, so called from its resemblance to a mallet, and in which is observed the head, the neck, and handle, which is joined to the membrane of the tympanum. See **ANATOMY**.

MALLICOLLO, one of the New Hebrides, and the most considerable of them next to *Espiritu Santo*. It is 16 leagues long from S. E. to N. W. its greatest breadth, which is at the S. E. end, 24 miles. Sandwich harbour, in which Capt. Cook's ship anchored, lies about the middle of this island on the N. E. side; in Lon. 167° 57' 53" E. Lat. 16° 25' 20" S.

MALLOW, a town of Ireland, in Cork, 14 miles N. of Cork.

MALLOW, in botany. See **MALVA**.

MALMEDY, a town of France, in the department of Ourte, and late bishopric of Liege, 9 miles S. of Limburg. Lon. 6. 2. E. Lat. 50. 18. N.

MALMSBURY, a town of Wiltshire, 95 miles W. from London.

MALO, **ST.** a sea-port town of France, in the department of Ille and Vilaine, and late province of Brittany, 17 miles N. W. of Dol, and 205 W. of Paris. Lon. 1. 57. W. Lat. 48. 39. N.

MALOPE, **BASTARD MALLOW**; in botany, a genus of the polyandria order, and monadelphia class of plants; natural order, Columnifera. Calyx double, outer three-leaved; anils globose, one-seeded. There are two species, herbs of Tuscany.

MALPAS, a town of Cheshire, 166 miles N. W. from London.

MALPIGHI, **MARCELLUS**, an eminent Italian physician and anatomist in the 17th century. He studied under Massari and Mariano. The duke of Tuscany invited him to Pisa, to be professor of physic there. In this city he contracted an intimate acquaintance with Borelli, to whom he ascribed all the discoveries he had made. He went back to Bologna, the air of Pisa not agreeing with him. Cardinal Antony Pignatelli, who had known him while he was legate at Bologna, being chosen pope in 1691, under the name of Innocent XII. immediately sent for him to Rome, and appointed him his physician. He died in 1694; and his works, with his life, written by himself, prefixed, were first collected and printed at London, in fol. in 1697.

MALPIGHIA, **BARBADOES CHERRY**; a genus of the trigynia order, and decandria class of plants: natural order, Tribilata. Calyx pentaphyllous, with melliferous pores on the outside at the base; petals five, roundish, anguiculated; berry unilocular, trispermous. There are eighteen species, shrubby evergreens of the warm parts of America, rising with branchy stems from eight or ten, to fifteen or twenty feet high, ornamented with oval and lanceolate entire leaves, and large pentapetalous flowers, succeeded by red cherry-shaped, eatable berries, of an acid and palatable flavour.

MALT, [*mealt*, Saxon; *mout*, Dutch,] denotes barley prepared for brewing, so as to produce, by fermentation, a potable liquor, known under the different names of beer, ale, and porter. See **BREWING**. The operation of malting is performed by steeping any quantity of good barley, newly threshed, in a leaden cistern containing river-water, for the space of three or four days, or till the fluid acquires a bright red colour: but a more eligible method is that of changing the water every day, till the grain is sufficiently macerated, so as to slip out of the husk, when compressed between the fingers. It is then removed from the cistern

and laid in heaps to drain for two or three hours, at the end of which it is stirred, and formed into a new heap. In this state, the grain is suffered to lie for more or less than forty hours, till the malt is properly come; during which interval, it will be necessary to examine the barley at the expiration of fifteen or sixteen hours, because the grains generally begin to sprout about that time. Within an hour after the roots appear, the heap must be carefully stirred, so that the whole may equally germinate. The malt is now to be spread out, and repeatedly turned over, for the space of two or three days, in order that it may properly cool; in consequence of which process it becomes mellow, dissolves easily in brewing, and readily parts with the husk. To complete the process of malting, the barley is thrown up into a high heap, where, in the course of thirty hours, it becomes as hot as the hand can bear it, by which both its sweetness and mellowness are improved. Lastly, the malt is dried in a kiln, heated with coke, charcoal, or straw; the intensity of the fire varies according to the colour required; but, where wood or other vegetable fuel is employed, such materials ought to be perfectly dry; as otherwise the smoke arising from damp combustibles would greatly injure the grain. In order to determine the quality of malt, a handful of it should be thrown into cold water, where those grains that are imperfectly germinated, will swim with one end upwards (Dr. Darwin supposes with the root-end); and such as are properly malted float on their side; whereas sound, ungerminated barley, uniformly sinks in water. Another criterion of good malt is, its agreeable saccharine taste; and, likewise, if the whole contents of the grain easily crumble into powder, and dissolve in the mouth. In short, it ought to be pure, dry, and to emit a strong, though agreeable, odour. Several acts of parliament have been passed, with a view to prevent frauds in the making of malt, which is subject to a duty of sixpence per bushel; and, by the 34 Geo. III. c. 30, § 15, every kind of malt is prohibited to be imported on pain of forfeiting both the vessel and cargo, though it may be admitted into British ports provisionally, as his Majesty shall think proper.

MALTA, a celebrated island of the Mediterranean, situated between Lon. 15° and 16° E. and between Lat. 33° and 36° N. It is about nineteen or twenty leagues in length, nine or ten in breadth, and sixty in circumference. This island was anciently called Melita; and is supposed by Cluverius, from its situation and other particulars, to be either Ogygia, or Hyperia, mentioned by Homer, which last is most probable, as the poet places the mountain Melita in that island. See *HYPERIA*. The most ancient professors of Malta, of whom we have any certain account, were the Carthaginians; from whom it was taken by the Romans: and yet during the whole time that it continued under the power of these nations, it was almost entirely barren. The soil was partly sandy and partly rocky, having scarcely any depth of earth; and withal so stony, that it was hardly capable of producing corn or any other grain except cummin, and some similar seeds. Its chief products were figs, melons, honey, cotton, and some few other fruits and commodities which the inhabitants exchanged for corn; and in this barren state it seems to have continued till it came into the possession of the Maltese knights. It laboured also under great scarcity of water and fuel: upon all which accounts it was till that time but thinly inhabited, there being only about thirty or forty scattered villages, and no city except the capital, called also Malta, and the town and fort of St. Angelo, which defended the harbour: so that the whole number of its inhabitants, did not exceed 12,000, the greatest part of whom were very indigent. The knights of Rhodes, afterwards of Malta, originated from a religious military order, called Hospitalers of St. John of Jerusalem. These knights, so famous for defending Christendom, had their rise as follows: Some time before the Journey of Godfrey of Bouillon into the Holy Land, some Neapolitan merchants, who traded in the Levant, obtained leave of the caliph of Egypt, to build a house for those of their nation who came thither on pilgrimage, upon paying an annual tribute. Afterwards they built two churches, and received the pilgrims with great zeal and charity. This example being followed by others, they founded a church in honour of St. John, and an hospital for the sick; whence they took the name of Hospitalers. A little after Godfrey had taken Jerusalem, in 1099, they began to be distinguished by black habits and a cross with eight points; and, besides the ordinary vows, they took another, to defend the pilgrims against the insults of the

infidels. This foundation was completed in 1104, in the reign of Baldwin; and so their order became military. Many persons of quality entered into it, and changed the name of hospitalers into that of knights. When Jerusalem was taken, and the Christians lost their power in the East, the knights retired to Acre or Ptolemais, which they defended valiantly in 1290. Then they followed the king of Cyprus, who gave them Limassol in his dominions, where they staid till 1310. That same year they took Rhodes, under the grand master Foulques de Villaret, a Frenchman; and next year defended it against an army of Saracens: since which the grand masters have used these four letters, F. E. R. T. i. e. Fortitudo ejus Rhodum tenuit; and the order was thence called knights of Rhodes. In 1522, Soliman II. having taken Rhodes, the knights retired into Candia, and thence into Sicily. In 1530, Charles V. gave them the island of Malta; which in 1566, was besieged by Soliman, but gallantly defended by the grand master John de Valette Parisot, and the Turks obliged to quit it with great loss. "The approach of the island (says Dr. Brydon) is very fine, although the shore is rather low and rocky. It is everywhere made inaccessible to an enemy by a vast number of fortifications. The rock, in many places, has been sloped into the form of a glacis, with strong parapets and intrenchments running behind it. The fortifications are indeed a most stupendous work. All the boasted catacombs of Rome and Naples are a trifle to the immense excavations that have been made in this island. The ditches, of a vast size, are all cut out of solid rock. These extend many miles, and raise our astonishment to think that so small a state has ever been able to make them. One side of the island is so completely fortified by nature, that there was nothing left for art. The rock is of a great height, and absolutely perpendicular from the sea for several miles. On this side there are still vestiges of several ancient roads, with the tracks of carriages worn deep in rocks. These roads are now terminated by the precipice, with the sea beneath; and shew, that this island has formerly been of a much larger size than it is at present. It has been often observed, notwithstanding the very great distance of mount Ætna, that this island has generally been more or less affected by its eruptions; and it is probable, that on some of these occasions a great part of it may have been shaken into the sea. One-half of mount Ætna is clearly discovered from Malta. They reckon the distance near 200 Italian miles: and the people of Malta affirm, that, in great eruptions of the mountain, their whole island is illuminated, and from the reflection in the water there appears a great track of fire all the way from Malta to Sicily. The thundering of the mountain is likewise distinctly heard. The people of Malta manufacture their cotton into a great variety of stuffs. Their stockings are exceedingly fine, and have sometimes been sold for ten sequins a pair. Their coverlets and blankets are esteemed all over Europe. Of these the principal manufactures are established in the island of Gozzo. The aspect of the country is far from being pleasing; the whole island is a great rock of very white free-stone; and the soil that covers this rock is, in most places, not above five or six inches deep; yet, the crop, in general, is exceedingly abundant, from the copious dews that fall during spring and summer. The whole island produces corn only sufficient to supply its inhabitants for about five months; but the crop they most depend upon is the cotton. They begin to sow it about the middle of May, and continue till the middle of June; and the time of reaping is in the month of October and beginning of November. They pretend that the cotton produced from this plant, which is sown and reaped in four months, is of a much superior quality to that of the cotton-tree: but Dr. Brydon, upon comparison, found, that though this indeed is the finest, that of the cotton-tree is by much the strongest texture. The plant rises a foot and an half; and is covered with a number of pods full of cotton: these, when ripe, they cut off every morning before sunrise, for the heat of the sun immediately turns the cotton yellow. The Maltese oranges are reckoned the finest in the world. The season continues for above seven months, from November till the middle of June; during which time those beautiful trees are always covered with abundance of delicious fruit. There is not an inch of ground lost in any part of the island; and where there was not soil enough, they have brought over ship-loads of it from Sicily. The whole island is full of inclosures of free-stone, which give the country a very uncouth and barren aspect; and in sum-

mer reflects such a light and heat, that it is exceedingly offensive to the eyes. The inclosures are small and irregular, according to the inclination of the ground; which they are obliged to observe, otherwise the floods would soon carry off their soil.

MALTA, the capital of the above island, is now called Valletta. Lat. $35^{\circ} 53' 50''$ N. Lon. from Greenwich $14^{\circ} 28' 30''$ E.

MALT-BRUISER, or **BRUISING-MILL**. It has been found by repeated experiments, that bruising malt is a more advantageous method than the old one of grinding and flouring. By bruising, there is not only less waste, but the malt is also better fitted for giving out all its virtues. It has lately, therefore, become a practice to squeeze malt between rollers, by means of a proper apparatus, of which various constructions have been invented. As the best contrivance of this sort is said to be the bruising-mill of Mr. Winlaw, we have given a figure of it on Plate CIII. fig. 9, where AAAA is the frame; B, the large cylinder or roller; C, the small one; D, the hopper; E, the shoe; F, the frame that supports the hopper; G, a fly-wheel; H, the windlass. To use this engine, it is directed to screw the large roller up to the small one, and not to feed too fast from the shoe, which is regulated by pins that have strings fixed to them. It is evident, that when two smooth surfaces are opposed to each other at a distance which can be regulated at pleasure, neither grain nor any other similar substance can pass between them without being bruised. This being the principle on which the bruising-mill acts, the mealy substance, which is the essential part of malt, is entirely removed from the skin or husk which contains it, and all the virtues of the malt are with ease extracted by the water, in a manner superior to what is effected when the grain is only cut by grinding. The operation is at the same time so expeditiously performed, that two men can with ease bruise a bushel of malt in a minute. By the same engine may also be bruised oats and beans for horses. A great part of the corn given these animals, it is well known, is swallowed whole, and often passes through them in the same state; in which case, they cannot receive any nourishment from the grains that are unbroken: but when bruised in this engine, it eases mastication; and every grain being prepared for nutrition, a much less quantity will of course be found to be sufficient. For bruising beans, the two regulating screws must be unscrewed a little; and the fly-wheel requires to be then set in motion with the hand, on account that the rollers are then a little space apart, and will not turn each other before the beans come between them.

MALTHA, in chemistry, called also sea-wax, is a solid substance found on the Lake Baikal in Siberia. It is white, melts when heated, and on cooling assumes the consistence of white cerate. It readily dissolves in alcohol, and in other respects it possesses the characters of a solid volatile oil.

MALVA, the **MALLOW**; a genus of the polyandria order, and monadelphia class of plants; natural order, Columnifera. Calyx double, outer three-leaved; capsules many, united in a depressed whorl, one-celled, one-seeded. There are thirty-four species, chiefly perennial herbaceous plants.

M. COMMUNIS, the **COMMON MALLOW**. The leaves of this plant are reckoned the first of the four emollient herbs; they were formerly in some esteem as food, for loosening the belly; at present, decoctions of them are sometimes employed in dysenteries, heat, and sharpness of urine; and, in general, for obtunding acrimonious humours: their principal use is in emollient glysters, cataplasms, and fomentations. The leaves enter the official decoction for glysters, and a conserve is prepared from the flowers.

MALVERN, GREAT, a town of Worcestershire, 8 miles W. by S. of Worcester.

MALVERN HILLS, lofty mountains in the S. W. part of Worcestershire, rising like stairs, one above another, for about seven miles, and dividing that county from Herefordshire. On these hills are two medicinal springs, called holy wells, one good for the eyes, and the other good for cancers. They run from N. to S. the highest point 1313 feet above the surface of the Severn at Hanley, and appear to be of lime-stone and quartz. On the summit of these hills is a camp with a treble ditch, supposed to be Roman, and situated on the Herefordshire side of the hills.

MALVERN, LITTLE, a town of Worcestershire, seated in a cavity of the above hills, 3 miles from Great Malvern.

MALUS, in botany. See **PYRUS**.

MALWA, an extensive province of Hindoostan, belonging to the Mahrattas; bounded on the N. by Agimere and Agra; E. by Allahabad; S. by Candesh; and W. by Guzerat.

MAMALUKES, the name of a dynasty that reigned in Egypt. The Mamalukes were originally Turkish and Circassian slaves, bought of the Tartars by Melicsaleh, to the number of a thousand, whom he bred up to arms, and raised some to the principal offices of the empire. They killed Sultan Moadam, whom they succeeded. Others say, that the Mamalukes were ordinarily chosen from among the Christian slaves, and that they were the same thing in a great measure with the Janissaries among the Turks. They never married; they first are said to have been brought from Circassia, and some have supposed that they began to reign about the year of Christ 869.

MAMARS, a town of France, in the department of Sarle, 16 miles S. E. of Alençon.

MAMMÆ, in anatomy, the breast. See **ANATOMY**.

MAMMALIA, in natural history, the first class of animals in the Linnæan system: the animals in this class have lungs that respire alternately; jaws incumbent, covered; teeth usually within; teats lactiferous; organs of sense, tongue, nostrils, eyes, ears, and papilla of the skin; covering, hair, which is scanty in warm climates, and scarcely any on aquatics. There are seven orders, the characters of which are taken from the number, situation, and structure, of the teeth. The names of the orders are

Bellua,	Gires,
Bruta,	Pecora,
Cete,	Primates.
Fera.	

See these articles, and **ZOOLOGY**.

MAMMARY GLANDS, in anatomy, is a glandular substance situated in the breast, and secreting the milk. This gland, surrounded by cellular and adipous substance, and covered by the common integuments, constitutes the breast. It lies on the anterior surface of the pectoralis major muscle. See **ANATOMY**.

MAMMEA, or the **MAMMEE-TREE**, a genus of the monogynia order, and polyandria class of plants. Corolla tetrapetalous; calyx diphyllous; berry very large and tetraspermous. There are two species; both large evergreen trees of the hot parts of America and Asia, and both adorned with large, oval, oblong, stiff leaves, and large quadripetalous flowers, succeeded by large round eatable fruit of the most exquisitely rich flavour.

MAMMIFORM, [*mamma* and *forma*, Lat.] in anatomy, a name given to apophyses of the bone in the back part of the skull, so called from their resembling a breast.

MAMMILLARY, or **MAMMILLARIS**, in anatomy, an epithet given to two little protuberances, somewhat resembling the nipples of the breast, found under the four ventricles of the brain, and supposed to be the organs of smelling. These are called apophyses mammillares. There is also a muscle called mammillaris, or mastoides, serving to stoop the head. See **ANATOMY**.

MAMMON, the god of riches, according to some authors; though others deny that the word stands for such a deity. Our Saviour says, We cannot serve God and mammon; that is, be religious and worldly-minded at the same time. Milton, by poetic licence, makes Mammon one of the fallen angels.

MAMMOTII, or **MAMMUTH**, **AMERICAN ELEPHANT**, a huge animal now unknown, if not extinct, to which have belonged those tusks, bones, and skeletons of vast magnitude, which have been often found in different parts of Siberia, Russia, Germany, and North-America. Many specimens of them may be seen in the Imperial Cabinet at Petersburg; in the British, and Dr. Hunter's Museum, and in that of the Royal Society.

MAN, the chief of the animated world, is distinguished from all living creatures by his superior faculties; being possessed of reflection, thought, a power of invention, and an ability of carrying his conceptions or designs into effect. Formed for society, he seldom lives in solitude: and as an emanation of divine light appears to direct all the good actions of mankind, we excel every created being, while we enjoy the exclusive faculty of communicating our ideas, by speech as well as by letters. Men are divided into classes, chiefly by their colour, that varies according to the

the situation of the country in which they reside. See **COMPLEXION**. Their bodies are erect, and seldom exceed six feet in height; they are almost naked, excepting a few hairs; and, though Nature has refused a general covering of the skin, man still remains her master-piece; as, conformably to sacred history, he is the last work that proceeded from the hands of the Creator. The form of his body; the powers of his mind, supported by that innate spirit which governs (or at least ought to guide) his actions, and to which the faint appellation of reason has been given; together with his discernment of good and evil; all evince his superiority over the whole animal kingdom. For a description of the curious structure of the human body, see **ANATOMY** and **PHYSIOLOGY**. For the varieties arising from climate, &c. see **HOMO**. "Man," says Haller in his *Physiology*, "has no right to complain of the shortness of life. Throughout the whole of living beings, there are few who unite in a greater degree all the internal causes which tend to prolong its different periods. The term of gestation is very considerable; the rudiments of the teeth are very late in unfolding; his growth is slow, and is not completed before about 20 years have elapsed. The age of puberty, also, is much later in man than in any other animal. In short, the parts of his body being composed of a softer and more flexible substance, are not so soon hardened as those of inferior animals. Man, therefore, seems to receive at his birth the seeds of a long life: if he reach not the distant period which nature seemed to promise him, it must be owing to accidental causes foreign to himself. Instead of saying that he has finished his life, we ought rather to say that he has not completed it. The natural and total duration of life is in some measure proportioned to the period of growth. A tree or an animal which soon acquires its full size, decays much sooner than another which continues to grow for a longer time. If it be true that the life of animals is eight times longer than the period of their growth, we might conclude that the boundaries of human life may be extended to a century and a half. It does not appear that the life of man becomes shorter in proportion to the length of time the world has existed. In the days of the Psalmist, the ordinary limits of human life did not exceed 70 or 80 years. No king of Judah lived beyond that period. When the Romans, however, were numbered by Vespasian, there were found in the empire, in that age of effeminacy, ten men aged 120 and upwards. Among the princes of modern times, the late Frederic the Great of Prussia lived to the age of 74. George II. of Britain lived to that of 77. Louis XIV. lived to the same age. Stanislaus king of Poland and duke of Lorraine exceeded that age. Pope Clement XII. lived to the age of 80. George I. of Britain attained the age of 68. And there are divers instances of persons who have lived above a century. See **LONGEVITY**. In the looks of no animal are the expressions of passion painted with such energy and rapidity, and with such gentle gradations and shades, as in those of man. In certain emotions of the mind, the blood rises to the face, and produces blushing; and in some others, the countenance turns pale. These two symptoms, the appearance of which depends on the structure and the transparency of the reticulum, especially redness, constitute a peculiar beauty. In our climates, the natural colour of the face of a man in good health is white, with a lively red suffused upon the cheeks. Paleness of the countenance is always a symptom of deficient health. Notwithstanding the general similitude of countenance in nations and families, there is a wonderful diversity of features. No one, however, is at a loss to recollect the person to whom he intends to speak, provided he has once fully seen him. One man has liveliness and gaiety painted in his countenance, and announces before-hand, by the cheerfulness of his appearance, the character which he is to support in society. The tears which bedew the cheeks of another man would excite compassion in the most unfeeling heart. Thus the face of man is the rendezvous of the symptoms both of his moral and physical affections: tranquillity, anger, threatening, joy, smiles, laughter, malice, love, envy, jealousy, pride, contempt, disdain, indignation, irony, arrogance, tears, terror, astonishment, horror, fear, shame or humiliation, sorrow and affliction, compassion, meditation, particular convulsions, sleep, death, &c. &c. The difference of these characters, and the various impressions made by them, form the principles of the science of **PHYSIOGNOMY**. (See that article.) When the mind is at ease, all the features of the face are in a state of profound tranquillity. Their proportion,

harmony, and union, point out the serenity of the thoughts. But when the soul is agitated, the human face becomes a living canvas, whereon the passions are represented with equal delicacy and energy, where every emotion of the soul is expressed by some feature, and every action by some mark; the lively impression of which anticipates the will, and reveals by pathetic signs our secret agitation, and those intentions which we are anxious to conceal. It is particularly in the eyes that the soul is painted in the strongest colours and with the most delicate shades. The different colours of the eyes are, dark hazel, light hazel, green, blue, gray, and whitish gray. The most common of these colours are hazel and blue, both of which are often found in the same eye. Eyes which are commonly called black, are only dark hazel; they appear black in consequence of being contrasted with the white of the eye. Wherever there is a tint of blue, however slight, it becomes the prevailing colour, and outshines the hazel, with which it is intermixed, to such a degree, that the mixture cannot be perceived without a very narrow examination. The most beautiful eyes are those which appear black or blue. In the former, there is more expression and vivacity; in the latter, more sweetness and perhaps delicacy. Next to the eyes, the parts of the face by which the physiognomy is most strongly marked, are the eye-brows. Being of a different nature from the other parts, their effect is increased by contrast. They are like a shade in a picture, which gives relief to the other colours and forms. The forehead is one of the largest parts of the face, and contributes most to its beauty. Every body knows of how great importance the hair is in the physiognomy, and that baldness is a very great defect. When old age begins to make its approaches, the hair which first falls off is that which covers the crown of the head and the parts above the temples. The hair of the lower part of the temples, or of the back of the head, seldom completely falls off. Baldness is peculiar to men; women do not naturally lose their hair, though it becomes white as well as that of men at the approach of old age. The nose is the most prominent feature of the face. But it has very little motion, and that only in the most violent passions, it contributes less to the expression than to the beauty of the countenance. The nose is seldom perpendicular to the middle of the face, but for the most part is turned to one side or the other. The cause of this irregularity, which, according to the painters, is perfectly consistent with beauty, and of which even the want would be a deformity, appears to be frequent pressure on one side of the cartilage of the child's nose against the breast of the mother when it receives suck. At this early period of life, the cartilages and bones have acquired very little solidity, and are easily bent, as may be observed in the legs and thighs of some individuals, who have been injured by the bandages of the swaddling clothes. Next to the eyes, the mouth and lips have the greatest motion and expression. These motions are under the influence of the passions. The mouth, which is set off by the vermilion of the lips and the enamel of the teeth, marks, by the various forms which it assumes, their different characters. The organ of the voice likewise gives animation to this feature, and communicates to it more life and expression than is possessed by any of the rest. The cheeks are uniform features, and have no motion or expression excepting from that involuntary redness or paleness with which they are covered in different passions, such as shame, anger, pride, and joy, on the one hand; and fear, terror, and sorrow, on the other. In different passions, the whole head assumes different positions, and is affected with different motions. It hangs forward during shame, humility, and sorrow; it hangs to one side in languor and compassion; it is elevated in pride, erect and fixed in obstinacy and self-conceit; in astonishment it is thrown backwards; and it moves from side to side in contempt, ridicule, anger, and indignation. The particular effects of the different passions on the features have been already quoted from M. Le Brun's accurate description of them. See **DRAWING**. The arms, hands, and every part of the body, contribute to the expression of the passions. In joy, for instance, all the members of the body are agitated with quick and various motions. In languor and sorrow, the arms hang down, and the whole body remains fixed and immovable. In admiration and surprise, this total suspension of motion is likewise observed. In love, desire, and hope, the head and eyes are raised to heaven, and seem to solicit the wished-for good; the body leans forward as if to approach it; the arms are stretched out, and seem to seize before-

before, and the beloved object. On the contrary, in fear, hatred, and horror, the arms seem to push backward and repel the object of our aversion; we turn away our head and eyes as if to avoid the sight of it; we recoil in order to shun it.

MAN, or the **ISLE OF MAN**, an island in the Irish sea, lying about 21 miles N. of Anglesey, as far W. of Lancashire, nearly equidistant from Galloway on the S. E. and 27 miles E. of Ireland. Its form is long and narrow, stretching from the N. E. of *Ayr Point* to the *Calf of Man* on the S. E. at least 30 miles. Its breadth in some places is more than nine miles, in most places eight, but in some not above five, containing about 160 square miles. This island, from its situation in the mouth of the channel, is very beneficial to Britain, by lessening the force of the tides, which would otherwise break with far greater violence than they do at present. It is frequently exposed to very high winds; and at other times to mists, which, however, are not at all unwholesome. The air is sharp and cold in winter; the frosts short; and the snow, especially on the coast, seldom lies long on the ground. There is a ridge of mountains runs almost the length of the island, which afford good water from the rivulets and springs; the highest rises about 580 yards. There are quarries of good stone, and red free-stone, with some mines of lead, copper, and iron. The soil towards the N. is dry and sandy, of consequence unfertile, but not unimprovable; the mountains, which may include near two-thirds of the island, are bleak and barren; yet afford excellent peat, and contain several kinds of metals. In the valleys there is as good pasture, hay, and corn, as in any of the northern counties; and the S. part of the island is as fine soil as can be wished. They have marl and lime-stone sufficient to render even their poorest lands fertile; excellent slate, rag-stone, black marble, and some other kinds for building. They have vegetables of all sorts, and in the utmost perfection; potatoes in immense quantities, and tolerable fruit. They have also hemp, flax, large crops of oats and barley, and some wheat.

MAN, an island in the South Pacific Ocean. Lon. 151. 25. E. Lat. 4. 0. S.

MAN OF WAR. See **SHIP**, and **SHIP-BUILDING**.

MANACIA, a town and fort of Turkey, in *Natolia*, anciently called *Magnesia*. Lon. 27. 49. E. Lat. 38. 45. N.

MANASSEH, [מנשה, Heb. *i. e.* not forgotten,] the eldest son of Joseph, and grand-son of the patriarch Jacob, (Gen. xli. 50, 51,) was born A. M. 2290.

MANASSEH, the 15th king of Judah, the son and successor of Hezekiah. His acts are recorded in 2 Kings xx. xxi. and 2 Chr. xxxiii.

MANASSEH, THE TRIBE OF, the descendants of the patriarch. They came out of Egypt, in number 32,200 men, fit for battle, upwards of 20 years old, under the conduct of Gamaliel son of Pedahzur. Numb. ii. 20, 21. This tribe was divided at their entrance into the land of Canaan. One half had its portion beyond the Jordan, and the other half on this side of it. The half-tribe of Manasseh which settled beyond the river possessed the country of Bashan, from the river Jabbok to mount Libanus, (Numb. xxii. 33, 34, &c.) and the other half-tribe of Manasseh on this side Jordan, obtained for its inheritance the country between the tribe of Ephraim on the S. and the tribe of Issachar on the N. having the river Jordan on the E. and the Mediterranean sea on the W. Josh. xvi. xvii.

MAN-BOTE, in the Anglo-Saxon laws, compensation for killing a man. In King Ina's laws rates are fixed for the expiation of this crime, according to the quality of the person slain.

MANCA, in English antiquity, was a square piece of gold-coin, commonly valued at 30 pence.

MANCHA, a mountainous province of Spain, in New Castile, between the Guadiana and Andalusia.

MANCHESTER, a large, populous, and flourishing town of Lancashire, famous for the fustian manufactory, called Manchester cottons. It lies 67 miles W. S. W. of York, and 182 N. N. W. of London. Lon. 2. 42. W. Lat. 53. 27. N.

MANCHINEEL-TREE, in botany. See **HIPPOMANE**.

MANCIPATIO, a term used in the ancient Roman law, which may be thus explained: every father had such a regal authority over his son, that before the son could be released from his subjection and made free, he must be three times over sold and bought, his natural father being the vender. The vendee was

called *pater fiduciarius*. After this fictitious bargain, the *pater fiduciarius* sold him again to the natural father, who could then, but not till then, manumit or make him free. The imaginary sale was called *mancipatio*; and the act of giving liberty or setting him free after this was called *emancipatio*.

MANCIPATIO also signifies the selling or alienating of certain lands by the balance, or money paid by weight, and five witnesses. This mode of alienation took place only among Roman citizens, and that only in respect to certain estates situated in Italy, which were called *mancia*.

MANCIPLE, [*manceps*, Lat.] the steward of a community; the purveyor: it is particularly used of the purveyor of a college.

MANCIPLE, means also a clerk of the kitchen. An officer in the inner temple was anciently so called, of whom Chaucer, the ancient English poet, some time a student of that house, thus writes:

A manciple there was within the temple,
Of which all caterers might take ensample.

MANCUNIUM, in ancient geography, a town of the Brigantes in Britain; now called Manchester.

MANCUS, [from *manu cusus*, Lat.] in antiquity, an Anglo-Saxon gold-coin, equal in value to $2\frac{1}{2}$ solidi, or 30 pence; and in weight to 35 Troy grains. The first account of this coin, that occurs in the English history, is about the close of the 8th century, in an embassy of Kenwulf king of Mercia to Leo III. requesting the restoration of the jurisdiction of the see of Canterbury: this embassy was enforced by a present of 120 mancuses.

MANDAMUS, [Lat.] a writ granted by the king, so called from the initial word. A *mandamus* issues out of the court of king's bench, and is sent to a corporation, commanding them to admit or restore a person to his office. This writ also lies where justices of the peace refuse to admit a person to take the oaths, to qualify himself for any post or office; or where a bishop or arch-deacon refuses to grant a probate of a will, to admit an executor to prove it, or to swear a churchwarden, &c.

MANDANES, an Indian prince and philosopher, who for the renown of his wisdom was invited by the ambassadors of Alexander the Great to the banquet of the son of Jupiter. A reward was promised him if he obeyed, but he was threatened with punishment in case of a refusal. Equally unmoved by both, the philosopher dismissed them with observing, that though Alexander ruled over a great part of the universe, he was not the son of Jupiter; and that he gave himself no trouble about the presents of a man who possessed not wherewithal to content himself. "I despise his threats (added he); if I live, India is sufficient for my subsistence; and to me death has no terrors, for it will only be an exchange of old age and infirmity for the happiness of a better life."

MANDARINS, a name given to the magistrates and governors of provinces in China, who are chosen out of the most learned men, and whose government is always at a great distance from the place of their birth.

MANDARIN TONGUE, the learned language of the Chinese. Besides the language peculiar to every province, this is common to all the learned in the empire, and is in China the language of the court.

MANDATE, in law, is a judicial commandment to do something. See **MANDAMUS**.

MANDATE, in the canon law, a rescript of the pope commanding an ordinary collator to put the person therein named in possession of the first vacant benefice in his collation.

MANDATS, or **MANDATS TERRITORIAUX**, a species of paper-currency issued by the French government, to supply the place of the assignats, in March 1796, when they had lost credit and suffered an enormous depreciation. To prevent jobbing, they were ordered to be taken at par with specie; and instead of resting their credit on the whole national property, as the assignats had been, they were bottomed upon so much of it, as was equivalent in value to the amount of the mandates issued.

MANDATUM, in Roman antiquity, was a fee or retainer given the *procuratores* and *advocati*. It was a necessary condition, without which they had not the liberty of pleading.

MANDERSCHIEIT, a county of Germany, in the late circle of the Lower Rhine. It is now included in the department of the Rhine and Moselle.

MANDERSCHIEIT, a town of France, in the department of the Rhine

Rhine and Moselle, and late electorate of Triers; capital of the above county. Lon. 6. 32. E. Lat. 50. 20. N.

MANDEVILLE, BERNARD DE, M. D. an eminent writer of the 18th century, born in Holland, where he studied physic, and took his degree. He afterwards came over into England, and in 1714 published a poem, entitled, "The Grumbling Hive; or, Knaves turned Honest;" upon which he afterwards wrote remarks, and published the whole at London, 1723, in 8vo. under the title of, "The Fable of the Bees, or private Vices made public Benefits; with an Essay on Charity and Charity Schools, and a Search into the Nature of Society." This book was presented by the jury of Middlesex in July the same year, and severely animadverted upon in, A Letter to the Rt. Hon. Lord C. printed in the London Journal of Saturday, July 27, 1723. Our author published a Vindication. His book was attacked by several writers. He published other pieces, and died in 1723.

MANDEVILLE, Sir JOHN, an English physician, famous for his travels, born at St. Alban's, about the beginning of the 14th century. He had a liberal education, and studied physic; but being seized with an invincible desire of seeing distant parts of the globe, he left England in 1332, and did not return till 1364. His friends, who had long supposed him dead, did not know him when he appeared. He had travelled through almost all the east, and made himself master of a great variety of languages. He particularly visited Scythia, Armenia the Greater and Less, Egypt, Arabia, Syria, Media, Mesopotamia, Persia, Chaldea, Greece, Dalmatia, &c. His rambling disposition did not suffer him to rest; for he left his own country a second time, and died at Liege in the Netherlands in 1372. He wrote An Itinerary, or an Account of his Travels, in English, French, and Latin.

MANDINGO, an inland and populous Kingdom of Africa, about 200 miles from the coast of the Atlantic, near the Gambia.

MANDRAGORTIS, a surname of Venus.

MANDRAKE, in botany. See *ATROPA*.

MANDREL, a kind of wooden pulley, and member of the turner's lathe. Of these there are several kinds; as Flat Mandrels, which have three or more little pegs or points near the verge, and are used for turning flat boards on. Pin Mandrels, which have a long wooden shank to fit stiff into a round hole made in the work to be turned. Hollow Mandrels, which are hollow of themselves, and used for turning hollow work. Screw Mandrels, for turning screws, &c.

MANDUBII, a people of Gaul, who inhabited the country afterwards called Burgundy. Many of them served in Caesar's army. Cæs. de Bell. Gall. 5, c. 20.

MANEGE, or **MENAGE**, the exercise of riding the great horse; or the ground set apart for that purpose; which is sometimes covered, for continuing the exercise in bad weather; and sometimes open, to give more freedom both to the horseman and horse. See *HORSEMANSHIP*. The word is borrowed from the Italian *maneggio*; *a manu agerdo*, i. e. acting with the hand.

MANERBIO, a town and territory of Italy, in the department of Mella, and late province of Bresciano, on the Mella.

MANES, or **MANICHÆUS**, one of the Persian Magi, who having embraced Christianity, mingled his own philosophical opinions with its doctrines, and thus became the founder of the Manichæan system. See *MANICHEES*. Manes flourished about A. D. 277. St. Epiphanius says, his original name was Cubricus, and that he changed it for Manes, which, in the Persian or Babylonish language, signifies vessel. A rich widow, whose servant he had been, dying without issue, left him a great deal of wealth; after which he assumed the title of the apostle or envoy of Jesus Christ. He next assumed that of the Paraclete, whom Christ had promised to send; which Augustine explains by saying, that Manes endeavoured to persuade men, that the Holy Ghost did personally dwell in him with full authority. He left several disciples, and among others Addas, Thomas, and Hermas. These he sent in his life-time into several provinces to preach his doctrine. Manes, having undertaken to cure the son of Sapor king of Persia, and not succeeding, was put in prison upon the young prince's death, whence he made his escape; but was apprehended soon after, and flayed alive. However, the oriental writers, cited by D'Herbelot and Hyde, tell us, that Manes, after having been protected in a singular manner by K. Hormisdas, who succeeded Sapor, but who was not able to defend him against the united perse-

cutions of the Christians the Magi, the Jews, and the Pagans, was shut up in a strong castle to preserve him from his enemies. They add, that after the death of Hormisdas, Varanes I. his successor, first protected Manes, but afterwards gave him up to the fury of the Magi, whose resentment against him was owing to his having adopted the Sadducean principles, as some say; while others attribute it to his having mingled the tenets of the Magi with the doctrines of Christianity. However, it is certain that the Manichæans celebrated the day of their master's death.

MANES, is a poetical term, signifying the shades or souls of the deceased. The heathens used a variety of ceremonies and sacrifices to appease the manes of those who were deprived of burial. See *LEMURES* and *LEMURIA*.

MANES DI were the same with *INFERI*, or the infernal gods, who tormented men; and to these the heathens offered sacrifices to assuage their indignation.

MANETHO, an ancient Egyptian historian, who pretended to take all his accounts from the sacred inscriptions on the pillars of Hermes Trismegistus. He was high priest of Heliopolis under Ptolemy Philadelphus, at whose request he wrote his history in Greek; beginning from their gods, and continued it down to near the time of Darius Codomanus. His history of Egypt is a celebrated work, often quoted by Josephus and other ancient authors. Julius Africanus gave an abridgement of it in his Chronology. Manetho's works is however lost; and there only remain some fragments extracted from Julius Africanus, which are to be found in Eusebius's Chronica.

MANETTIA, in botany, a genus of the tetrandria monogynia class and order; natural order Contortæ. Calyx eight-leaved; corolla four-cleft; capsule inferior, two-valved, one-celled; seeds imbricate, orbicular, with a central seedlet. There are three species.

MANFREDONIA, a port-town of Naples, on the Gulph of Venice, built on the ruins of the ancient Sipontum. It is 93 miles N. E. of Naples, and 150 S. E. of Ancona. Lon. 16. 12. E. Lat. 41. 36. N.

MANGALORE, a town of Hindostan, in Canara, on the coast of Malabar, 124 miles W. N. W. of Seringapatam. Lon. 74. 57. E. Lat. 12. 50. N.

MANGANESE, or **MAGNESIA NIGRA**, in chemistry, a dark-coloured native mineral, found in a more or less impure state, both in iron-mines, and in the lead-mines of Mendip-hills, in the county of Somerset. Common manganese is very heavy, moderately hard, and of a deep dusky grey, approaching to black, but sometimes of an iron-brown cast. It emits sparks with great difficulty, when stricken against steel; nor does it effervesce with acids, though the latter make a partial solution of it when calcined. Considerable quantities of manganese are employed in glass-works for purifying glass; as it destroys the effects of colouring substances, and renders vitrified matters perfectly clear; from which property it has received the appellation of soap of glass. Farther, it imparts to a large quantity of glass, in a state of fusion, a purplish or reddish tinge, that disappears if continued in the fire: these colours may, according to Cronstedt, be easily effaced by the calces of arsenic or tin. Manganese likewise communicates various tints to warm water, such as green, purple, red, blue, &c. which change on agitating that fluid. When distilled with the muriatic acid, or spirit of salt, this mineral yields the oxygenated muriatic acid, or bleaching liquor of Berthollet. It is also employed for glazing earthen-ware, which thus acquires a black colour. Bergman and Scheele first gave an accurate description of the nature and properties of this mineral. It is generally found in the state of an oxide, either white, or black, or red. The white contains the smallest proportion of iron and of oxygen. This ore soon tarnishes in the air by absorbing oxygen. The red contains more iron than the white, and is crystallized. The black or the brown ore is frequently crystallized like the red. Manganese is procured in the metallic state, by reducing the oxide to powder, and forming it into a paste with water. It is then exposed to a strong heat, not less than 160° of Wedgwood, with charcoal, and the metal, after a time, is found at the bottom of the crucible, or in the midst of the scoræ in small globules, which amount to nearly one-third of the manganese employed. Manganese, in the metallic state, is of a greyish white colour, with considerable brilliancy, and of a granular texture. The specific gravity is 6.85.

It is hard as iron; is one of the most brittle and most infusible of the metals. When exposed to the air it is quickly tarnished, and at length falls into powder, which is found to have acquired considerable addition to its weight. But when heated in the open air it passes more rapidly through the different changes of colour in proportion as it combines with oxygen, to the absorption of which these changes are owing; hence manganese, like some other metals, combines with different portions of oxygen, forming with it different oxides. The different coloured oxides are combined of manganese and oxygen in the following proportions:

	White Oxide.	Brown or Red Oxide.	Black Oxide.
Manganese.....	80.....	74.....	60.....
Oxygen.....	20.....	26.....	40.....
	100.....	100.....	100.....

From the black, the chemists usually obtain the oxygen they use in their experiments. The black is evidently the metal at the maximum of oxydizement, the white is the one at the minimum. Manganese does not enter into combination with azote, hydrogen, or carbon. By means of charcoal the oxide is reduced, by being deprived of its oxygen. Phosphorus combines very readily with manganese, forming a phosphuret. It may likewise be made to combine with sulphur, forming a sulphuret. It enters into combination with the acids, and forms salts with them. These salts may be decomposed by the alkalies, which throw down precipitates of a yellow or reddish colour. None of them are decomposed by any of the other metals, which shews the strong affinity of manganese to oxygen. The pure alkalies favour the oxidation of manganese, and the decomposition of water, because they combine readily with this oxide. When the black oxide is exposed to heat, with twice its weight of dry soda or potash, a compound is formed of a dark-green colour, which is soluble in water. During the solution, this substance exhibits rapid changes of colour, and on that account has been denominated the "mineral camelion." There is no action between manganese and any of the earths; but its oxide combines with them, and forms vitreous matters, which are of different colours, according to the degree of oxidation of the manganese, and its mixture with iron. For the affinities, &c. of manganese, see **CHEMISTRY**.

MANGE. See **FARRIERY**.

MANGEEA, or **MANGYA**, a populous island in the South Sea, discovered by Capt. Cook, in 1777. Lon. 158. 3. W. Lat. 21. 57. S.

MANGEL-WURZEL, or the **ROOT OF SCARCITY**, a root much celebrated as food for both men and cattle. It is a species of Beta. See **BETA**.

MANGENOT, **LEWIS**, a canon of the temple at Paris, where he was born A. D. 1694, and died 1768, aged 74. He was a social poet, and an amiable man. But though lively and agreeable in his conversation, his character leaned somewhat towards cynical misanthropy. His poems were published at Amsterdam, in 1776, and contain two eclogues, natural, simple, and elegant; fables, some of which are well composed; tales, which are by far too licentious; moral reflections, sentences, madrigals, &c. &c.

MANGER, a raised trough under the rack in a stall, for receiving the grain that a horse eats.

MANGER, in a ship of war, is a small apartment, extended athwart the lower deck immediately within the hause-boles, and fenced on the after-part by a partition, which separates it from the other part of the deck behind it. This partition serves as a fence against the water, which occasionally gushes in at the hause-boles, or falls from the wet cable whilst it is heaved in by the capstern. The water, thus prevented from running aft, is immediately returned into the sea by several small channels, called scuppers, cut through the ship's side within the manger. The manger is therefore particularly useful in giving a contrary direction to the water that enters at the hause-boles, which would otherwise run aft in great streams upon the lower deck, and render it extremely wet and uncomfortable, particularly in tempestuous weather, to the men who mess and sleep in different parts thereof.

MANGET, **JOHN JAMES**, an eminent physician, born at Geneva, in 1652. The elector of Brandenburg made him his first

physician in 1699; in which post he continued till he died, at Geneva in 1742. He wrote many works; the most known of which are, 1. A Collection of several Pharmacopœias, in folio. 2. Bibliotheca Pharmaceutico-medica. 3. Bibliotheca Anatomica. 4. Bibliotheca Chemica. 5. Bibliotheca Chirurgica. 6. A Bibliotheca of all the Authors who have written on Medicine in four vols. folio. All these works are in Latin. Daniel le Clerc, the author of a History of Physic, assisted him in writing them.

MANGIFERA, the **MANGO-TREE**; in botany, a genus of the monogynia order, and pentandria class of plants. Corolla five-petaled; plum kidney-shaped. There are three species, natives of the East Indies, and the warm parts of America.

MANHEIM, a beautiful city of Germany, on the E. bank of the Rhine. It lies six miles N. E. of Spire. Lon. 8. 33. E. Lat. 49. 25. N.

MANIA, or **MADNESS**. See **MEDICINE**.

MANICHI, **MANICHEANS**, or **MANICHEES**, a sect of ancient heretics, who asserted two principles; so called from their author Manes or Manichæus. See **MANES**. This heresy had its first rise about A. D. 277, and spread principally in Arabia, Egypt, and Africa. St. Epiphanius treats of it at great length. It was a motley mixture of the tenets of Christianity with the ancient philosophy of the Persians, in which Manes had been instructed during his youth. He combined these two systems, and applied and accommodated to Jesus Christ the characters and actions which the Persians attributed to the God Mithras. He established two principles, a good and an evil one: the first a most pure and subtle matter, which he called light, did nothing but good; and the second a gross and corrupt substance, which he called darkness, nothing but evil. This philosophy is very ancient; and Plutarch treats of it at large in his Isis and Osiris. Our souls, according to Manes, were made by the good principle, and our bodies by the evil one; these two principles being, according to him, coeternal, and independent of each other. Each of these is subject to the dominion of a superintendent being, whose existence is from all eternity. The being who presides over the light is called God; he that rules the land of darkness bears the title of hyle or demon. The ruler of the light is supremely happy, and in consequence thereof benevolent and good; the prince of darkness is unhappy in himself, and desirous of rendering others partakers of his misery, and is evil and malignant. These two beings have produced an immense number of creatures, resembling themselves, and distributed them through their respective provinces. After a contest between the ruler of light and the prince of darkness, in which the latter was defeated, this prince of darkness produced the first parents of the human race. The beings engendered from this original stock, consist of a body formed out of the corrupt matter of the kingdom of darkness, and of two souls; one of which is sensitive and lustful, and owes its existence to the evil principle; the other rational and immortal, a particle of that divine light which had been carried away in the contest by the army of darkness, and immersed into the mass of malignant matter. The earth was created by God out of this corrupt mass of matter, in order to be a dwelling for the human race, that their captive souls might by degrees be delivered from their corporeal prisons, and the celestial elements extended from the gross substance in which they were involved. With this view God produced two beings from his own substance, viz. Christ and the Holy Ghost; for the Manicheans held a consubstantial Trinity. Christ, or the glorious intelligence, called by the Persians Mithras, subsisting in and by himself, and residing in the sun, appeared in due time among the Jews, clothed with the shadowy form of a human body, to disengage the rational soul from the corrupt body, and to conquer the violence of malignant matter. The Jews, incited by the prince of darkness, put him to an ignominious death, which he suffered not in reality, but only in appearance, and according to the opinion of men. When the purposes of Christ were accomplished, he returned to his throne in the sun, appointing apostles to propagate his religion, and leaving his followers the promise of the Paraclete or Comforter, who is Manes the Persian. Those souls who believe Jesus Christ to be the Son of God, renounce the worship of the god of the Jews, who is the prince of darkness, and obey the laws delivered by Christ, and illustrated by Manes the comforter, are gradually purified from the contagion of matter; and their purification being completed, after having passed through two states

states of trial, by water and fire, first in the moon and then in the sun, their bodies return to the original mass (for the Manicheans decided the resurrection of bodies,) and their souls ascend to the regions of light. But the souls of those who have neglected the salutary work of purification, pass after death into the bodies of other animals or natures, where they remain till they have accomplished their probation. Some, however, more perverse and obstinate, are consigned to a severer course of trial, being delivered over for a time to the power of malignant aerial spirits, who torment them in various ways. After this, a fire shall break forth and consume the frame of the world; and the prince and powers of darkness shall return to their primitive seats of anguish and misery, in which they shall dwell for ever. These mansions shall be surrounded by an invincible guard, to prevent their ever renewing a war in the regions of light. Manes borrowed many things from the ancient Gnostics; on which account many authors consider the Manicheans as a branch of the Gnostics, and the Manichean doctrine was a system of philosophy rather than of religion. They made use of amulets, in imitation of the Basilidians; and are said to have made profession of astronomy and astrology. They denied that Jesus Christ, who was only God, assumed a true human body; and maintained that it was only imaginary: and therefore they denied his incarnation, death, &c. They pretended that the law of Moses did not come from God, or the good principle, but from the evil one; and that for this reason it was abrogated. They rejected almost all the sacred books in which Christians look for the sublime truths of their holy religion. They affirmed, that the Old Testament was not the work of God, but of the prince of darkness, who was substituted by the Jews in the place of the true God. They abstained entirely from eating the flesh of any animal; they also condemned marriage. The rest of their errors may be seen in St. Epiphanius and St. Augustin; which last, having been of their sect, may be presumed to have been thoroughly acquainted with them. Though the Manichees professed to receive the books of the New Testament, yet in effect they only took so much of them as suited with their own opinions. They first formed to themselves a certain idea or scheme of Christianity; and to this adjusted the writings of the apostles, pretending that whatever was inconsistent with this had been foisted into the New Testament by later writers, who were half Jews. On the other hand, they made fables and apocryphal books pass for apostolical writings; and even are suspected to have forged several others, the better to maintain their errors.

MANICHORD, or **MANICORDON**, a musical instrument in form of a spinet; with 49 or 50 stops, and 70 strings; which, like those of the clavicord, are covered with little pieces of cloth, to deaden as well as to soften their sound, whence it is also called the dumb-spinet. The strings bear on five bridges.

MANIFESTO, a public declaration made by a prince in writing, shewing his intentions to begin a war or other enterprise, with the motives that induce him to it, and the reasons on which he founds his rights and pretensions.

MANILLA, **MANILA**, **LUCONIA**, or **LUZON**, the largest of the Philippine Islands, in the East Indies. It had the name of Luzon from a custom that prevailed among the natives of beating or bruizing their rice in wooden mortars, before they either boiled or baked it; *lucon* in their language signifying a mortar. The middle of this island is in Lat. 15° N. and Lon. 123° E. The shape of it resembles an arm bent; the whole length being about 160 Spanish leagues: the greatest breadth between 30° and 40°, and the circumference about 350°. The days are of an equal length, and the weather never cold. The climate being very hot and moist, is not wholesome; but is worst for young Europeans. The natives, without many precautions, live very commonly to 80 or 100. The soil is so rich, that rice grows even on the tops of the mountains without being watered; and this makes provisions so plentiful, that the Indians value gold so little as not to pick it up, though it lies almost every where under their feet. There are several burning mountains, but the face of the island is far from being disfigured by their explosions. Here are 40 different sorts of palm-trees, the most excellent coccos, wild cinnamon, wild nutmegs, and some say wild cloves also; ebony; foetal wood; the best cassia, and in such plenty, that they feed their hogs with its fruit; all kinds of cattle, and prodigious quantities of gold, amber, and ambergris. This island is divided into several provinces,

containing divers towns; the chief of which are Manilla, Caceres, New Segovia, Bondo, Passaco, Ibalen, Bulaw, Serfocon, or Bagatoo, Lampon, Ferdinandia, Bolinao, Playahonda, Cavite, Mindora, Caleleya, and Balayan.

MANILLA, the capital of the island, lies on the S. E. side of it.

MANILLE, in commerce, a large brass-ring in the form of a bracelet, either plain or engraved, flat or round. Manilles are the principal commodities which the Europeans carry to the coast of Africa, and exchange with the natives for slaves.

MANINGOABO, a kingdom and town of Sumatra.

MANINGTREE, a town of Essex, sixty miles N. E. of London.

MANIPULE, or **MANIPULUS**, among the Romans, was a small body of infantry, which in the time of Romulus consisted of 100 men; and in the time of the consuls, and first Caesars, of 200. The word properly signifies a handful; and according to some was first given to the handful of hay which they bore at the end of their pole, to distinguish themselves, before the custom was introduced of bearing an eagle for their ensign; and hence also the phrase, a handful of men. But Vegetius, Modestus, and Varro, gave other etymologies of the word; the last derives it from *manus*, a little body of men following the same standard. According to the former, this corps was called manipulus, because they fought hand in hand, or all together.

MANIPULUS, in ecclesiastical affairs, an ornament worn by the priests, deacons, and subdeacons, in the Latin church. It consists of a little fillet in form of a stole, three or four inches broad, and made of the same stuff with the chasuble; representing a handkerchief, which the priests in the primitive church were accustomed to wear on the arm, to wipe off the tears for the sins of the people.

MANIPULUS, among physicians, is used to signify a handful of herbs or leaves, or so much as a man can grasp in his hand at once; and is often denoted by the abbreviation, *M*, or *m*.

MANIS, the **SCALY LIZARD**, in zoology, a genus of mammalia of the order bruta. The generic character is, teeth none; tongue cylindric and extensile; mouth narrowed into a snout; body covered with scales. The genus *manis* presents an appearance not less extraordinary than that of *dasyus* or armadillo; being covered on every part, except on the belly, with extremely strong and large horny scales, constituting a suit of armour capable of defending the animals, when rolled up, from the assaults of the most ferocious enemies. This external covering, together with the uncommon length of the body and tail, gives an aspect much resembling that of a lizard, and these creatures are commonly known by the title of scaly lizards: they may be allowed, however, in a general view of the animal kingdom, to form a kind of shade or link of approximation between the proper viviparous quadrupeds and the lizards. They are animals of a harmless nature, and feed in the same manner as the ant-eaters, by thrusting out their very long tongue into the nests of ants and other insects, and swallowing their prey by suddenly retracting it in. They have no teeth, and differ from the ant-eaters in scarcely any other circumstance than that of their scaly integument. There are three species, found in India and the Indian islands.

M. TETRADACTYLA, **LONG-TAILED MANIS**, known in India by the name of the phatagen, is of a very long and slender form: the head is small; the snout narrow: the whole body, except beneath, covered with broad, but sharp-pointed, scales, which are striated throughout their whole length: the tail is more than twice the length of the body, and tapers gradually to the tip. It grows to the length of five feet, measuring from the tip of the nose to the extremity of the tail. See Plate C.

M. PENTADACTYLA, **SHORT-TAILED MANIS**, differs from the former, in being of a much thicker and shorter form; the tail, in particular, differs greatly in proportion from that of the preceding, being not so long as the body, very thick at the base, and thence gradually tapering, but terminating very obtusely. They are sometimes found six feet long. See Plate C.

MANISURIS, in botany, a genus of the polygamia monœcia class and order; natural order, Gramina, or grasses. Hemaphrodite calyx; glume two-valved, one-flowered, outer valve emarginate at the top and sides; corolla less than the calyx; stamens three; style bind. Male as in the hermaphrodites; but with the flowers in the lower side of the same spike, standing out more.

The two species, *M. myurus*, and *M. granularis*, are natives of the East and West Indies.

MANKIND. See **HOMO**, and **MAN**.

MANLEY, Mrs. the celebrated writer of the *Atalantis*, was the daughter of Sir Roger Manley, the reputed author of the first volume of the *Turkish Spy*. She lost her parents when very young; and having been deluded into a false marriage by means of her guardian, who was her cousin, and afterwards deserted her, she was patronized by the duchess of Cleveland, mistress of Charles II. But the duchess, being a woman of a very fickle temper, grew tired of Mrs. Manley in six months; and discharged her upon a suspicion, that she intrigued with her son. After this she wrote her first tragedy, called *Royal Mischief*, which was acted with great applause in 1696; and her apartment being frequented by men of wit and gaiety, she soon engaged in amours, and was taken into keeping. She now became as licentious in her writings as in her morals; for, she wrote four vols. entitled *Memoirs of the New Atalantis*; in which she was not only very free in her wanton tales of love adventures, but satirized the characters of many distinguished personages, who had had a principal concern in the Revolution. A prosecution was commenced against her for this work; but those in power being ashamed to bring a woman to trial for a few amorous trifles, she was discharged; and, a total change of ministry ensuing, Mrs. Manley lived in high reputation and gaiety, amusing herself with the conversation of wits, and writing plays, poems, and letters. After this she wrote *Lucius King of Britain*, a tragedy; Letters, and other works. She died in 1724.

MANLIUS TORQUATUS, **TITUS**, a celebrated consul and Roman general: he had great wit, but a difficulty in expressing himself, which induced Manlius Imperiosus, his father, to keep him almost by force in the country. Pompey, tribune of the people, enraged at this instance of severity, formed a design of accusing Manlius the father before the judges; but young Manlius being informed of it, went to that tribune, and, with a poniard in his hand, made him swear that he would not proceed in that accusation against him to whom he owed his life. At length Manlius was made military tribune, and killed a soldier of the Gauls in single combat, from whose neck he took a gold-chain, whence it was surnamed *Torquatus*. He was consul in the war against the Latins; when he barbarously ordered his own son to be beheaded, for fighting contrary to his orders, though he had gained the victory. He conquered the enemies of the republic, and was several times made consul; but at last refused the consulship, saying, That it was no more possible for him to bear with the vices of the people, than it was for the people to bear with his severity.

MANNA, in sacred history, a miraculous kind of food which fell from heaven for the support of the Israelites in their passage through the wilderness, being in form of coriander-seeds, its colour like that of bdellium, and its taste like honey. Asaph styles it, the bread of heaven, and the food of angels, *Psal. lxxviii. 25*, whether to insinuate that the angels sent and prepared this food, or that angels themselves, if they had need of any food, could not have any more agreeable than manna. The author of the *Book of Wisdom* says, *xvii. 20, 21*, that manna so accommodated itself to every one's taste, that every one found it pleasing to him; and that it included every thing that was agreeable to the palate and fit for good nourishment; which expression some have taken in the internal sense, though others understand them figuratively. Critics are divided about the original of the word manna. Some think that man is put instead of the Hebrew word mah, which signifies "What is this?" and that the Hebrews, when first seeing that new food which had been sent them, cried to one another, מהו man-hu, instead of mah-hu, What is this? Mr. Saumaise and others maintain, that the Hebrews very well knew what manna was; and that, seeing it in great abundance about their camp, they said one to another, Man-hu, This is manna. They imagine that the manna which God sent the Israelites was nothing else but that fat and thick dew which still falls in Arabia, which presently condensed, and served for food to the people; that this is the same thing as the wild honey, mentioned *Matth. iii. 4*, wherewith John Baptist was fed; and that the miracle did not consist in the production of any new substance, but in the exact and uniform manner in which the manna was dispensed for the maintenance of such a

great multitude. But the Hebrews and Orientals believe, that the fall of the manna was wholly miraculous; which is certainly true; because, 1. It fell but six days in the week. 2. It fell in such a prodigious quantity, as sustained nearly three millions of souls. 3. There fell a double quantity every Friday, to serve them the next day, being sabbath. 4. What was gathered on the first five days stunk and bred worms if kept above one day: but that which was gathered on Friday kept sweet for two days. And, lastly, It continued falling while the Israelites abode in the wilderness, but ceased as soon as they came out of it, and had got corn to eat in the land of Canaan.

MANNA, in the materia medica, the juice of certain trees, of the ash-kind, either naturally concreted on the plants, or exsiccated and purified by art. There are several sorts of manna in the shops. The larger pieces, called flake-manna, are usually preferred; though the smaller grains are equally good, provided they are white, or of a pale yellow colour; very light, of a sweet, not unpleasant taste, and free from any visible impurities.

MANNA-TREE, a species of the ash, and a native of Calabria. See **FRAXINUS**. The shoots of this tree are much shorter, and the joints closer together, than those of the common ash; the small leaves are shorter, deeper sawed on their edges, and of a lighter green.

MANNER, in painting, a habitude that a man acquires in the three principal parts of painting, the management of colours, lights, and shadows; which is either good or bad according as the painter has practised more or less after the truth, with judgement and study. But the best painter is he who has no manner at all. The good or bad choice he makes is called *goute*.

MANNERS, or **GOOD MANNERS**, according to Swift, is the art of making those people easy with whom we converse. "Whoever makes the fewest persons uneasy, is the best bred person in the company. As the best law is founded upon reason, so are the best manners. And as some lawyers have introduced unreasonable things into common law; so likewise many teachers have introduced absurd things into good manners. One principal point of this art is to suit our behaviour to the three several degrees of men; our superiors, our equals, and inferiors. For instance, to press either of the two former to eat or drink is a breach of manners; but inferiors must be thus treated, else it will be difficult to persuade them that they are welcome. Pride, ill-nature, and want of sense, are the three great sources of ill manners; without some one of these defects, no man will behave himself ill for want of experience; or for what, in the language of fools, is called knowing the world." "I defy (proceeds our author) any one to assign an incident, wherein reason will not direct us what we are to say or to do in company, if we are not misled by pride or ill-nature. Therefore, I insist that good sense is the principal foundation of good manners; but because the former is a gift which very few among mankind are possessed of, therefore all the civilized nations of the world have agreed upon fixing some rules for common behaviour, best suited to their general customs, or fancies, as a kind of artificial good sense to supply the defects of reason."

MANŒUVRE, in a military sense, consists solely in distributing equal motion to every part of a body of troops, to enable the whole to form, or change their position, in the most expeditious and best method, to answer the purposes required of a battalion, brigade, or line, of cavalry, artillery, or infantry. It has always been lamented, that men have been brought on service without being informed of the uses of the different manœuvres they have been practising; and, having no ideas of any thing but the uniformity of the parade, instantly fall into disorder and confusion when they lose the step, or see a deviation from the straight lines they have been accustomed to at exercise. It is a pity to see so much attention given to show, and so little to instruct the troops in what may be of use to them in real service. No manœuvre should be executed in presence of the enemy, unless protected by some division of the troops.

MANOMETER, or **MANOSCOPE**, [from *μανος*, rare or thin, and *μετροω*, to measure,] an instrument to shew or measure the alterations in the rarity or density of the air. The manometer differs from the barometer in this, That the latter only serves to measure the weight of the atmosphere, or of the column of air over it

it; but the former, the density of the air in which it is found; which density depends not only on the weight of the atmosphere, but also on the action of heat and cold, &c. Authors, however, generally confound the two together; and Mr. Boyle himself gives a very good manometer, under the name of a statical barometer. See *BAROMETER*. Another kind of manometers were made use of by Col. Roy, in his attempts to correct the errors of the barometer, and are described in the *Philos. Trans.* Vol. LXVII, p. 689. "They were (says he) of various lengths, from four to upwards of eight feet: they consisted of straight tubes, whose bores were commonly from one-15th to one-25th of an inch diameter. The capacity of the tube was carefully measured, by making a column of quicksilver, about three or four inches long, move along it from one end to the other. These spaces were severally marked, with a fine-edged file, on the tubes; and transferred from them to long slips of pasteboard, for the subsequent construction of the scales respectively belonging to each. The bulb, attached to one end of the manometer at the glass-house, was of the form of a pear, whose point being occasionally opened, dry or moist air could be readily admitted, and the bulb sealed again, without any sensible alteration in its capacity. The air was confined by a column of quicksilver, long or short, and with the bulb downward or upwards, according to the nature of the proposed experiment. Here it must be observed, that, from the adhesion of the quicksilver to the tube, the instrument will not act truly, except it be in a vertical position; and even then it is necessary to give it a small degree of motion, to bring the quick into its true place; where it will remain in equilibrio, between the exterior pressure of the atmosphere on one side, and the interior elastic force of the confined air on the other. Pounded ice and water were used to fix a freezing point on the tube; and by means of salt and ice, the air was farther condensed, generally four, and sometimes five or six degrees below zero. The thermometer and manometer were then placed in a tin-vessel among water, which was brought into violent ebullition; where having remained a sufficient time, and motion being given to the manometer, a boiling point was marked thereon. After this the fire was removed, and the gradual descents of the piece of quicksilver, corresponding to every 20 degrees of temperature in the thermometer, were successively marked on a deal-rod applied to the manometer. It is to be observed, that both instruments, while in the water, were in circumstances perfectly similar; that is, the ball and bulb were at the bottom of the vessel. In order to be certain that no air had escaped by the side of the quicksilver during the operation, the manometer was frequently placed a second time in melting ice. If the barometer had not altered between the beginning and end of the experiment, the quicksilver always became stationary at or near the first mark. If any sudden change had taken place in the weight of the atmosphere during that interval, the same was noted, and allowance made for it in afterwards proportioning the spaces. Long tubes, with bores truly cylindrical, or of any uniform figure, are scarcely ever met with. Such however as were used in these experiments, generally tapered in a pretty regular manner from one end to the other. When the bulb was downwards, and the tube narrowed that way, the column of quicksilver confining the air lengthened in the lower half of the scale, and augmented the pressure above the mean. In the upper half, the column being shortened, the pressure was diminished below the mean. In this case, the observed spaces both ways from the centre were diminished in the inverse ratio of the heights of the barometer at each space, compared with its mean height. If the bore widened towards the bulb when downwards, the observed spaces, each way from the centre, were augmented in the same inverse ratio; but in the experiments on air less dense than the atmosphere, the bulb being upwards, the same equation was applied with contrary signs: and if any extraordinary irregularity took place in the tube, the corresponding spaces were proportioned both ways from that point, whether high or low, that answered to the mean. The observed and equated manometrical spaces being thus laid down on the pasteboard containing the measures of the tube; the 212° of the thermometer, in exact proportion to the sections of the bore, were constructed along-side of them: hence the coincidences with each other were easily seen; and the number of thermometrical degrees answering to each manometrical space readily transferred into a table prepared for the purpose."

MANOR, [from *maneo*, to stay, as being the usual residence

of the owner,] seems to have been a district of ground held by lords or great personages; who kept in their own hands so much land as was necessary for the use of their families. These lands were called *terra dominicales*, or *demesne lands*; being occupied by the lord, or *dominus manerii*, and his servants. The other, or *tenemental lands*, they distributed among their tenants; which, from the different modes of tenure, were called and distinguished by two different names. First *book-land*, or *charter-land*, which was held by deed under certain rents and free services, and in effect differed nothing from free soccage lands: and hence have arisen most of the free-hold tenants who hold of particular manors, and owe suit and service to the same. The other species was called *folk-lands*, which was held by no assurance in writing, but distributed among the common folk at the pleasure of the lord, and resumed at his discretion; being indeed land held in villenage. See *VILLENAGE*. The residue of the manor, being uncultivated, was termed the lord's waste, and served for public roads, and for common of pasture to the lord and his tenants. Manors were formerly called *Baronies*, as they still are lordships; and each lord or baron was empowered to hold a domestic court, called the court baron, for redressing misdemeanors and nuisances within the manor and for settling disputes of property among the tenants. This court is an inseparable ingredient of every manor: and if the number of suitors should so fail, as not to leave sufficient to make a jury or homage, that is, two tenants at the least, the manor itself is lost. In early times, the king's greater barons, who had a large extent of territory held under the crown, granted out frequently smaller manors to inferior persons to be held of themselves; which therefore now continue to be held under a superior lord, who is called in such cases the lord paramount over all these manors; and his seignory is frequently termed an honour, 'not a manor; especially if it hath belonged to an ancient feudal baron, or hath been at any time in the hands of the crown. In imitation whereof, these inferior lords began to carve out and grant to others still more minute estates, to be held as of themselves, and were so proceeding downwards in infinitum, till the superior lords observed, that, by this method of subinfeudation, they lost all their feudal profits of wardships, marriages, and escheats, which fell into the hands of these mesne or middle lords, who were the immediate superiors of the *terre tenant*, or him who occupied the land; and also that the mesne lords themselves were so impoverished thereby, that they were disabled from performing their services to their own superiors. This occasioned, first, that provision in the 32d chapter of *magna charta*, 9 Hen. III. that no man should either give or sell his land without reserving sufficient to answer the demands of his lord: and, afterwards, the statute of Westm. 3, or *quia emptores*, 18 Edw. I. c. 1, which directs, that, upon all sales, or feoffments of land, the feoffee should hold the same, not of his immediate feoffer, but of the chief lord of the fee, of whom such feoffer himself held it. But these provisions not extending to the king's own tenants in capite, the like law concerning them is declared by the statutes of *prærogativa regis*, 17 Edw. II. c. 6, and of 34 Edw. III. c. 15, by which last all subinfeudations, previous to the reign of Edward I. were confirmed; but all subsequent to that period were left open to the king's prerogative. Hence it is clear, that all manors existing at this day, must have existed as early as Edward I. for it is essential to a manor, that there be tenants who hold of the lord; and, by the operation of these statutes, no tenant in capite since the accession of that prince, and no tenant of a common lord since the statute of *quia emptores*, could create any new tenants to hold of himself. See *VILLENAGE*.

MANOSQUE, a populous town of France, in the department of the Lower Alps, and late province of Provence, 15 miles W. of Apt, and 350 S. by E. of Paris.

MANRESA, or **MANXES**, a town of Spain, in Catalonia, 20 miles N. W. of Barcelona. Lon. 1. 56. E. Lat. 41. 36. N.

MANS, or **LE MANS**, an ancient and rich town of France, capital of the department of the Sarthe, 20 miles S. of Alençon, and 75 W. by N. of Orleans. Lon. 0. 18. E. Lat. 47. 58. N.

MANSAROAR, a large lake of Asia, in Thibet, from which the southernmost head of the Ganges issues. It is 115 miles in circumference. Lon. 79. 0. E. Lat. 33. 15. N.

MANSE, **MANSUS**, **MANSA**, or **MANSUM**; in ancient law-books, denotes an house or habitation, either with or without land. See *HOUSE*, *MANOR*, and *MANSION*.

MANSE, CAPITAL, MANSUM CAPITALE, the MANOR-HOUSE, or LORD'S COURT. See **MANOR**.

MANSFELD, a city of Germany, and capital of a county of the same name, in Upper Saxony. Lon. 12. 55. E. Lat. 41. 35. N.

MANSILLA, a town of Spain in Leon, 15 miles S. W. of Leon.

MANSIO, a term often mentioned in itineraries, denoting inns on the public roads to lodge in, at the distance of 18 miles from each other.

MANSIO, or **MANSUS**, was sometimes also used in the same sense with **hide**; that is, for as much land as one plough could till in a year. See **HIDE**.

MANSION, [*munsio*, Latin,] the lord's house in a manor, called the capital messuage, or manse, or chief manor-place. See **MANOR**.

MANSION is also used for a dwelling house in the country.

MANSLAUGHTER, in law, the act of killing a man not wholly without fault, though without malice; punished by forfeiture. It may be either voluntarily, upon a sudden heat; or involuntarily, but in the commission of some unlawful act. See **HOMICIDE**. As to the punishment of this degree of homicide: The crime of manslaughter amounts to felony, but within the benefit of clergy; and the offender shall be burnt in the hand, and forfeit all his goods and chattels. But there is one species of manslaughter, which is punished as murder, the benefit of clergy being taken away from it by statute; namely, the offence of mortally stabbing another, though done upon sudden provocation.

MANSUS PRESBYTERI, is a parsonage or vicarage house for the incumbent to reside in.

MANTE, or **MANTES**, a considerable town of France, in the department of Seine and Oise; and late province of the Isle of France, 31 miles N. W. of Paris.

MANTEL, or **MANTLE-TREE**, in architecture, the lower part of a chimney, or that piece of timber which is laid across the jambs, and sustains the compartments of the chimney-piece.

MANTELET, [*mantelet*, French,] in the art of war, a kind of moveable parapets, made of planks about three inches thick, nailed one over another, to the height of almost six feet, generally cased with tin, and set upon little wheels, so that in a siege they may be driven before the pioneers, and serve as blinds to shelter them from the enemy's small shot.

MAN-TIGER. See **SIMIA**.

MANTINEA, in ancient geography, a town situated in the S. of Arcadia, on the confines of Laconia, called afterwards Antigonea.

MANTIS, in zoology; a genus of insects of the order hemiptera. The generic character is, head unsteady, armed with jaws, and furnished with palpi or feelers; antennæ setaceous: thorax linear; wings four, membranaceous, convoluted, the lower pair plaited; fore-legs, in most species, compressed, serrated beneath, and armed with a single claw and a setaceous, lateral, jointed foot; hind-legs smooth, formed for walking. There are about sixty species.

M. ORATORIA, or **CAMEL CRICKET**, as it is often called, is the chief European kind. This insect, which is a stranger to the British isles, is found in most of the warmer parts of Europe, and is entirely of a beautiful green-colour. It is nearly 3 inches in length, of a slender shape, and in its general sitting posture is observed to hold up the two fore-legs, slightly bent, as if in an attitude of prayer: for this reason the superstition of the vulgar has conferred upon it the reputation of a sacred animal; and a popular notion has often prevailed, that a child or traveller having lost his way would be safely directed by observing the quarter to which the animal pointed when taken into the hand. In its real disposition it is very far from sanctity, preying with great rapacity on any of the smaller insects which fall in its way, and for which it lies in wait with anxious assiduity in the posture at first mentioned, seizing them with a sudden spring when within its reach, and devouring them. It is also of a very pugnacious nature; and when kept with others of its own species in a state of captivity, will attack its neighbour with the utmost violence, till one or the other is destroyed in the contest. See **PLATE LXXXVI**.

MANTLE. See **MANTEL**.

MANTLE, or **MANTLING**, in heraldry, that appearance of folding of cloth, flourishing, or drapery, which in any achievement is drawn about a coat of arms. See **HERALDRY**.

MANTO, in fabulous history, the daughter of Tiresias, and like her father strongly inspired with prophecy.

MANTOUA, or **MANTUA**, in ancient and modern geography, a city of Italy, capital of the department of the Mincio. It was anciently a town of Gallia Transpadana, and situated on the Mincius, a river running from the lake Benacus. It is said to have been founded about 300 years before Rome, by Bianor or Ocnus, the son of Manto; and was the ancient capital of Etruria. When Cremona, which had followed the interest of Brutus, was given to the soldiers of Octavius, Mantua also, which was in the neighbourhood, shared the common calamity, and many of the inhabitants were tyrannically deprived of their possessions. Virgil, who was among them, and a native of the town, applied for redress to Augustus, and obtained it on account of his poetical talents. It lies 22 miles S. W. of Verona; and 70 E. S. E. of Milan. Lon. 10. 47. E. Lat. 45. 10. N.

MANTUA, or the **MANTUAN**, a country and late duchy of Italy, lying along the Po, which divides it into two parts. It was bounded on the N. by the Veronese; on the S. by the duchies of Reggio, Modena, and Mirandola; on the E. by the Ferrarese; and W. by the Cremonese. It is about 50 miles long, and 25 broad; and is fruitful in corn, pastures, flax, fruits, and excellent wine.

MANTUA, LAKE DI, or the **LAKE OF MANTUA**, a lake of Italy, in the department of the Mincio, 20 miles in circumference, and 2 broad.

MANUAL, a service-book used in the church of Rome, containing the rites, directions to the priests, and prayers used in the administration of the sacraments; the form of blessing holy water, and the service used in processions.

MANUAL EXERCISE, in the army, consists in the observance of certain words of command appointed for this purpose. When a regiment is drawn up, or paraded for exercise, the men are placed three deep, either by companies, or divided into platoons, with the grenadiers on the right. When soldiers are drawn up for exercise, the ranks and files should be exactly even. The distances between the files must be equal, and the ranks eight feet distant from each other. Every motion should be performed with life, and the greatest exactness observed in all firings, wheelings, and marching; and therefore a regiment should never be under arms longer than two hours. The following is an abstract of the manual exercise, as altered and abridged by his Majesty's command, April 20th, 1792; and published at London, in 1795, by Adj. Gen. Fawcett, with a few alterations made since.

POSITION OF THE SOLDIER UNDER ARMS.—The equal squareness of the shoulders, and body, to the front, is the first, and great principle of the position of the soldier:—The heels must be in a line, and closed:—The knees straight without stiffness:—The toes turned out, so that the feet may form an angle of about 60 degrees: The arms hang near the body, but not stiff; the flat of the hand, and little finger, touching the thigh, and the thumbs as far back as the seams of the breeches:—The elbows and shoulders are to be kept back:—The belly rather drawn in; and the breast advanced, but without constraint:—The body to be upright, but inclining rather forwards, so that the weight of it may bear chiefly on the fore-part of the feet:—The head to be erect; and neither turned to the right nor to the left; the eyes alone will be glanced to the right. The body of the soldier being in this position, the firelock is to be placed in his left hand, against the shoulder; his wrist to be a little turned out, the thumb alone to appear in front; the four fingers to be under the butt; and the left elbow to be rather bent inwards, so as not to be separated from the body, or to be more backward or forward than the right one:—The firelock must rest on the hand, not on the end of the fingers; and be carried in such a manner as not to raise, advance, or keep back one shoulder more than the other; the butt must therefore be forward, and as low as can be permitted without constraint; the fore-part a very little before the front of the thigh; and the hind-part of it pressed by the wrist against the thigh:—It must be kept steady, and firm before the hollow of the shoulder; should it be drawn back or carried too high, the one shoulder would be advanced, the other kept

kept back, and the upper part of the body would be distorted, and not square with respect to the limbs.

WORDS OF COMMAND. I. *Order arms.* Bring the firelock to the trial in two motions as usual, seizing it at the first, at the lower loop, just above the swell; at the second, bring it down to the right side, the butt within two inches of the ground; at the third, drop the butt on the ground, placing the muzzle against the hollow of the right shoulder, and the hand flat upon the sling.

II. *Fix Bayonets.* At the word *Fix*, place the thumb of the right hand, as quick as possible, behind the barrel, taking a gripe of the firelock; as soon as the word of command is fully out, push the firelock a little forward, at the same time drawing out the bayonet with the left-hand, and fixing it with the utmost celerity: The instant this is done, return, as quick as possible, to the order, as above described, and stand perfectly steady.

III. *Shoulder Arms.* As soon as the word *shoulder* is given, take a gripe of the firelock with the right-hand, as in fixing bayonets, and at the last word *arms*, the firelock must be thrown with the right hand in one motion, and with as little appearance of effort as possible, into its proper position on the left shoulder;—the hand is brought to the centre of the body in so doing, but must instantly be withdrawn.

IV. *Present Arms.* 1st, Seize the firelock with the right-hand, under the guard, turning the lock to the front, but without moving it from the shoulder. 2d, Bring it to the poize, seizing it with the left-hand, the fingers extended along the sling, the wrist upon the guard, and the point of the left thumb of equal height with the eyes. 3d, Bring down the firelock with a quick motion, as low as the right hand will admit without constraint, drawing back the right foot at the same instant, so that the hollow of it may touch the left heel.—The firelock in this position is to be totally supported in the left-hand;—the body to rest entirely on the left foot; both knees to be straight.

V. *Shoulder Arms.* 1st, By a turn of the right wrist, bring the firelock to its proper position on the shoulder as described above, the left hand grasping the butt:—

2d, Quit the right hand, bringing it briskly down to its place by the side.

VI. *Charge Bayonets.* At one motion throw the firelock from the shoulder across the body, to a low diagonal recover.

VII. *Port Arms.* 1. Turn the lock to the front, and at the height of the breast; the muzzle slanting upwards, so that the barrel may cross opposite the point of the left shoulder, with the butt proportionally depressed: the right hand grasps the small of the butt, and the left holds the piece at the swell, close to the lower pipe, the thumbs of both hands pointing towards the muzzle.

2d, Make a half-face to the right, and bring down the firelock to nearly a horizontal position, with the muzzle inclining an inch upwards, and the right wrist resting against the hollow of the thigh, just below the hip. N. B. The first motion of the charge is the position which the soldier will, either from the shoulder, or after firing, take, in order to advance on an enemy, whom it is intended to attack with fixed bayonets: and the word of command for that purpose is, *prepare to charge.* 2d, The position of the charge is that which the front-rank takes, when arrived at a few yards distance only from the body to be attacked. The first motion of the charge is also that which sentries are to take, when challenging any persons who approach their posts.

VIII. *Shoulder Arms:* 1. Face to the front, and throw up the piece into its position on the shoulder, by a turn of the right wrist, instantly grasping the butt, as above described, with the left hand; but particular care must be taken, that the shoulder does not fall to the rear. 2. Quit the firelock briskly with the right hand, bringing it to its proper place by the side. The men must be taught likewise to support arms at three motions, throwing the first and second nearly into one: at the first motion, they seize the small of the butt under the lock with the right hand, bringing the butt in front of the groin, and keeping the lock somewhat turned out: at the second they bring the left arm under the cock: at the third they quit the right hand. In carrying arms from the support, the motions are exactly reversed. The motions in the manual exercise will, in future, be performed slower than heretofore, leaving three seconds between each motion, except that of fixed bayonets, in which a longer time must be given. The manual is not to be executed by one word, or signal, but each separate word of command is to be given by the officer who commands the body performing it. In regard to the motions of securing, grounding, and trailing, as well as those of piling, &c. it will be sufficient for the soldiers to be taught to

perform them in the most convenient, and quickest method. Returning bayonets is to be done from the order, in the same manner as fixing them. The manual and platoon exercise will no longer make a regular part of a review, but will only be gone through, when particularly called for by the reviewing General. (See *PLATOON.*) Sentries posted with shouldered arms, are permitted afterwards to support, but not to slope them. On the approach of an officer, they immediately carry their arms; and put themselves into their proper position, which is not to be done at the instant he passes, but by the time he is within 20 yards of their post, so that they may be perfectly steady before he comes up. Corporals marching with reliefs, or commanding detachments, or divisions, will carry their arms advanced; for which purpose a soldier, when promoted to that rank, must be taught the position of advanced arms.—There are some peculiar words of command at the manual exercise of the grenadiers, when apart from the battalion; and also for the cavalry and artillery.

MANUDUCTOR, [from *manus*, Lat. hand, and *duco*, I lead,] an ancient officer in the Latin church, who, from the middle of the choir, gave the signal for the choirists to sing, and marked the measure, beat time, and regulated the music.

MANUFACTURE, [*manus*, and *facio*, Lat.] signifies a commodity, or piece of workman-ship, produced from raw materials, whether by hand, or by the aid of machinery. The extensive utility of manufactures to a commercial nation, is generally acknowledged; and it is a circumstance worthy of remark, that the greatest improvements have, in general, proceeded from persons of no liberal education. Manufactures, it is true, furnish employ for numerous families, but at the same time they greatly contribute to that depravity of manners for which the labouring classes are, at present, but too conspicuous. Indeed, it is a melancholy fact, that so long as agriculture is but partially attended to, and in a manner neglected, for the more speedy acquisition of wealth, the progress of luxury necessarily tends to change the most virtuous habits, and to vitiate the morals of a mercantile nation. By the 23 Geo. II. c. 13, it is enacted, that if any person export the tools or utensils used either in the silk, linen, or woollen manufactures, he incurs a forfeiture, and the sum of 200*l.*; and, if the captain of the ship be acquainted with such illegal proceeding, he is liable to pay a fine of 100*l.* The forfeiture of the articles, and of 200*l.* is farther imposed on all persons collecting them for the purpose of exportation; and, if any captain of a King's ship, or officer of the customs, knowingly suffer such exportation, both (by the 2*d* Geo. III. c. 37), incur a penalty of 200*l.* lose their employment, and are for ever incapacitated from holding any office under government. This act likewise subjects all persons having tools in their possession, or procuring them to be made, with a view to exportation, to the forfeiture of the same, as well as of the sum of 200*l.* and to imprisonment for the term of 12 months. Lastly, the 22 Geo. III. c. 60, declares, that every person exporting such tools, shall forfeit them, together with the sum of 500*l.*

MANUMISSION, [from the Latin, *manus*, hand, and *mittere*, to send; *quia servus mittebatur extra munum seu potestatem domini sui*,] an act by which a lord enfranchises his tenants, who till that time had been his vassals, and in a state of slavery inconsistent with the sanctity of the Christian faith. Among the Romans, the manumission of slaves was performed three ways: 1. When, with his master's consent, a slave had his name entered in the census or public register of the citizens. 2. When the slave was led before the prætor, and that magistrate laid his wand, called *vindicta*, on his head. 3. When the master gave the slave his freedom by his testament.

MANURE, any substance employed for the purpose of fattening or improving land. It is usually divided into four classes, viz. Animal, Vegetable, Fossil, and Fluid. See *HUSBANDRY*.

MANUSCRIPT, a book or paper written with the hand; by which it stands opposed to a printed book or paper. A manuscript is usually denoted by MS. and in the plural by MSS. What makes public libraries valuable is the number of ancient MSS. reposit in them. In examining MSS. that were written before the invention of printing, it is necessary, 1. to know their nature, their essential qualities, and matter; 2. to be able to read them freely, and without error; 3. to judge of their antiquity by those characters mentioned with regard to diplomas; (See *DIPLO-*

MATICS.)

MATICS.) and, 4. to render them of use in the sciences. As there are scarce any of the ancient codes now remaining written on the Egyptian paper, or on wood, ivory, &c. we have only to consider those that are written on parchment or vellum, membranous, and such as are written on our paper, chartaceos. The former are in most esteem. With regard to the character, these codes are written either in square and capital letters, or in half-square, or round and small letters. Those of the first kind are the most ancient. There are no intervals between the words, no letters different from the others at the beginning of any word, no points, nor any other distinction. The codes, which are written in letters that are half-square, resemble those we have in Gothic characters, as well for the age as the form of the letters. Such as are written in round letters are not so ancient as the former, and are not older than the 9th or 10th century. These have spaces between the words, and some punctuation. They are likewise not so well written as the preceding, and are frequently disfigured with comments. The codes are divided, according to the country, into Lombard, Italian, Gaulic, Franco-Gaulic, Saxon, Anglo-Saxon, &c. In the ancient Greek books, they frequently terminated the periods of a discourse, instead of all other divisions, by lines; and these divisions were called, in Latin, *versus*, from *vertendo*: for which reason these lines are still more properly named *versus* than *linear*. At the end of a work, they put down the number of verses of which it consisted, that the copies might be more easily collated; and it is in this sense we are to understand Trebonius, when he says, that the pandects contain 150,000 *pene versusum*. These codes were likewise *vel probe vel deterioris notæ*, more or less perfect, not only with regard to the caligraphy or beauty of the character, but to the correction of the text. In ancient codes, the abbreviations, as they have been used in different centuries. Thus, for example, A. signifies Aulus; C. Caius; D. Decimus; Ap. Appius; Cn. Cneius; Aug. Imp. Augustus Imperator. The characters that are called *notæ*, are such as are not to be found in the alphabet; but which, notwithstanding, signify certain words. All these matters are explained in a copious manner by Vossius, and in the *Chronicon Gotvicense*. Lastly, the learned divide all the ancient codes into *codices minus raros, rariores, editos, et anecdotos*.

MANUTIUS, ALDUS, the first of those celebrated Venetian printers, who were as illustrious for their learning, as for uncommon skill in their profession. He was born at Bassano in Italy about the middle of the 15th century; and hence is sometimes called *Bassianus*, though generally better known by the name of Aldus. He was the first who printed Greek neatly and correctly; and acquired so much reputation by it, that whatever was finely printed was proverbially said to have "come from the press of Aldus." He published a Greek grammar; with Notes upon Homer, Horace, &c. He died at Venice, in 1516.

MANUTIUS, PAUL, the son of the above, was bred a printer, but was more learned than his father; and acquired, by continual reading of Tully, such a purity in writing Latin, that even Scaliger allows a Roman could not exceed. Pope Pius IV. placed him at the head of the apostolical press, and gave him the charge of the Vatican library. His epistles are highly laboured, and very correct; but contain more words than sentiments. He had, however, a very profound knowledge of antiquity; and he published an edition of Cicero's works, with Commentaries, in four vols. folio; Venice, 1523. He also published an original work, *De Legibus Romanorum*; which is reckoned his master-piece. He died in 1574.

MANUTIUS, ALDUS, the younger, the son of Paul, was esteemed one of the greatest geniuses and most learned men of his time. Clement VIII. gave him the direction of the Vatican printing-house: but probably the profits of that place were very small, as Manutius was obliged to accept of a professorship of rhetoric, and to sell the excellent library, which his father, his uncle, and his great uncle, had collected with extraordinary care, and which contained 80,000 volumes. He died at Rome in 1597, without any other recompence than the praises due to his merit. He wrote, 1. Commentaries on Cicero. 2. A Treatise on Orthography. 3. Three Books of Epistles; and other works in Latin and Italian, which are esteemed.

MAP. See **GEOGRAPHY**.

MAPLE. See **ACER**.

MAPPIA, in botany, a genus of the polyandria monogynia class and order. Calyx five-parted; corolla five-petaled; germ superior; berry one-seeded; seeds arilled. The only species is *M. guianensis*, a shrub of Guiana.

MAPPA, in the public games of the Roman circus, was a napkin hung out at the prætor's or other great magistrate's seat, as a signal for the race or other diversions to begin.

MAPPARIUS, in Roman antiquity, the officer who gave the signal to the gladiators to begin fighting, by throwing a handkerchief that he had received from the emperor or other magistrate.

MARACANDA, in ancient geography, the capital of Sogdiana, now thought to be Samarcand. See **SAMARCAND**.

MARACAYBO, a town of South America, and capital of the province of Venezuela, seated near a lake of the same name. Lon. 70. 45. W. Lat. 10. 0. N.

MARACAYBO, a lake in South America, 200 miles long and 100 broad, which discharges itself by a river into the Caribbean Sea.

MARAGNAN, a province of Brazil, in South America, which comprehends a fertile populous island, 112 miles in circumference. The climate is very agreeable and wholesome, and the soil produces plenty of all the necessaries of life. Lon. 54. 35. W. Lat. 2. 0. S.

MARAGNON, a name of the river Amazon.

MARALDI, JAMES PHILIP, a learned mathematician and astronomer, of the Academy of Sciences at Paris, born in the county of Nice, in 1665. He was the son of Francis Maraldi and Angela Catharine Cassini, the sister of the famous astronomer. His uncle Cassini sent him to France in 1687, where he acquired great reputation by his learning and observations. He made a catalogue of the fixed stars, which is more exact and comprehensive than Bayer's; and has given a great number of interesting observations in the Memoirs of the Academy; particularly on bees and petrifications. He also assisted his uncle in constructing the great meridian through France. He died in 1729. He is highly commended for seriousness, integrity, sincerity, a generous spirit, the purest morals, and an interesting simplicity of manners. He was not proud of the rank which he held in the scientific world, and was never more gratified than when he could render service to others, by communicating to them freely the discoveries and improvements which he had made, at the expence of inconceivable labour and application.

MARANATHIA, [*Syrizc*], signifies the Lord comes, or, the Lord is come: it was a form of denouncing or anathematizing among the Jews. St. Paul pronounces, If any love not the Lord Jesus Christ, let him be anathema maranatha, which is as much as to say, May'st thou be devoted to the greatest evils, and to the utmost severity of God's judgements; may the Lord come quickly to take vengeance of thy crimes. See **ANATHEMA**.

MARANHAO, or **MARANNON**, a fertile island of Brazil, at the mouth of three rivers, on the coast of the province.

MARANHAO, **MARANHON**, or **MARANNON**, a province of Brazil, so named from the above island. St. Philip is the capital.

MARANS, a rich town of France, in the department of Lower Charente, and late territory of Aunis. Lon. 0. 55. W. Lat. 46. 20. N.

MARANT, or **AMARANT**, a town of Persia, in Adirbeizan. The natives say that Noah was buried in it.

MARANTA, **INDIAN ARROW-ROOT**; a genus of the monogynia order, and monandria class of plants; natural order, Scitamineæ. Calyx three-leaved; corolla ringent, quinquefid, with two segments alternately patent. There are five species, herbaceous perennial exotics of the Indies, kept here in hot-houses for curiosity: they have thick, knotty, creeping roots, crowned with long, broad, arundinaceous leaves, ending in points, and upright stalks, half a yard high, terminated by bunches of monopetalous, ringent, five-parted flowers. They are propagated by parting the roots in spring, and planting them in pots of light, rich earth, and then plunging them in the bark-bed. The root of *M. galanga* is used by the Indians to extract the virus communicated by their poisoned arrows; from whence it has its name of arrow-root. The *M. arundinacea*, or starch-plant, rises to two feet, has broad-pointed

pointed leaves, small white flowers, and one seed. The root washed, pounded fine, and bleached, makes a powder and starch; it is recommended as a proper food for infants, and is gelatinous like salep. It is a native of South America, and is cultivated in the West Indies; it is found in great plenty near La Vera Cruz. See Plate XCIX.

MARASMUS, [*μαρasmus*, from *μαρσινω*,] an atrophy in its last stage.

MARAT, JOHN PAUL, one of those bloody agents of the French revolution, whose bigotted and ferocious zeal for liberty, led them to destroy its best friends, when their political sentiments did not agree in every punctilio with their own. If any man can merit assassination, this bloody deputy to the National Convention was deservedly assassinated in his own house, while bathing, by Charlotte Cordé, on the evening of the 13th July, 1793. Marat was a most violent enemy to the Brissotines, and on the 12th April 1793, proposed "to exterminate the conspirators." As a man of letters he was the conductor of an inflammatory Journal, which increased the discontents of the people, and contributed much to the bloody scenes that followed.

MARATHON, in ancient geography, one of the demi or hamlets of Attica; about 22 miles N. E. of Athens, towards Bœotia, near the sea. The plain of Marathon, famous for Miltiades's victory over the Persians, by which the liberties of Athens and other cities of Greece were saved, is long and narrow, but consists chiefly of level ground, and therefore admits the operations of cavalry, which formed the main strength of the barbarian army, and with which the Greeks were very poorly provided. Here the Persians, under Datis, pitched their camp, by the advice of Hippias the banished king of Athens, who had solicited the expedition, and had a perfect knowledge of the country. The Persian army consisted of 100,000 infantry, and 10,000 horse. The Athenians were in the utmost consternation. They had, upon the first appearance of the Persian fleet, sent to implore assistance from the other nations of Greece; but some had submitted to Darius, and others trembled at the very name of the Persians. The Lacedæmonians alone promised troops; but various obstacles prevented them from immediately forming a junction with those of Athens. This city, therefore, could only rely on its own strength, but it possessed three brave generals, viz. Miltiades, Aristides, and Themistocles, who, by their patriotic exertions, kindled the flame of the noblest heroism in the minds of the Athenians. Levies were immediately made. Each of the ten tribes furnished 1000 foot-soldiers with a commander. No sooner were the troops assembled than they marched into the plain of Marathon, where the inhabitants of Plataea in Bœotia sent them a reinforcement of 1000 infantry. Scarcely were the two armies in sight of each other, when Miltiades proposed to attack the enemy. Aristides and several others warmly supported this measure. But the rest, terrified at the excessive disproportion of the armies, were for waiting for the succours from Lacedæmon. Opinions being divided, they had recourse to that of the polemarch, or chief of the militia, to decide the matter. Miltiades addressed him, with the ardour of a man deeply impressed with the importance of the existing circumstances: "Athens (said he) is on the point of experiencing the greatest of vicissitudes. Ready to become the first power of Greece, or subjected to the tyranny and fury of Hippias. From you alone, Callimachus, she now awaits her destiny. If we suffer the ardour of the troops to cool, they will shamefully bow beneath the Persian yoke; but if we lead them on to battle, the gods and victory will favour us. A word from your mouth must now precipitate your country into slavery, or preserve her liberty." Callimachus gave his suffrage, and the battle was resolved on. To ensure success, Aristides, and the other generals after his example, yielded to Miltiades the honour of the command which belonged to them in rotation. Miltiades drew up his troops at the foot of a mountain, on a spot of ground scattered over with trees to impede the Persian cavalry. The Plataeans were placed on the left wing; Callimachus commanded the right; Aristides and Themistocles were in the centre, and Miltiades every where. An interval of nearly a mile separated the Grecian army from that of the Persians. At the first signal the Greeks advanced over this space running. The Persians, astonished at a mode of attack so new, for a moment remained motionless; but to the impetuous fury of the enemy they soon op-

posed a more sedate and not less formidable fury. After an obstinate conflict of some hours, victory began to declare for the Grecian army. The right wing dispersed the enemy in the plain, while the left drove them back on a morass that had the appearance of a meadow, in which they stuck fast and were lost. Both these bodies of troops now flew to the succour of Aristides and Themistocles, ready to give way before the flower of the Persian troops in the centre. From this moment the rout became general. The Persians, repulsed on all sides, found their only asylum in the fleet. The conquerors pursued them with fire and sword, and took, burnt, or sunk, the greater part of their vessels: the rest escaped by dint of rowing. The Persians lost about 6400 men; the Athenians only 192. Miltiades was wounded; Hippias was left dead on the field, as were Stesileus and Callimachus, two of the Athenian generals. Scarcely was the battle over, when a soldier, worn out with fatigue, resolved to carry the first news of the victory to the magistrates of Athens, and without quitting his arms, he runs, flies, arrives, announces the victory, and falls dead at their feet. This battle was fought on the 6th of Boedromion, in the 3d year of the 72d Olympiad, or 29th Sept. B. C. 490. The next day 2000 Spartans arrived, who, in three days and nights, had marched 1200 stadia. The Athenians neglected nothing to eternize the memory of those who fell in the battle. It had been usual to inter the citizens who perished in war at the public expence, in the Ceramicus, without the city; but these were deemed uncommonly meritorious. They were buried, and a barrow was erected on the spot where their bravery had been manifested. Their names were engraven on half-columns erected on the plain of Marathon. In the intervals between them were erected trophies bearing the arms of the Persians. An artist of eminence painted all the circumstances of the battle in one of the most frequented porticoes of the city: Miltiades was there represented at the head of the generals, exhorting the troops to fight for their country. Pausanias examined the field of battle about 600 years after this event: and found, on the barrow of the Athenians, pillars containing the names of the dead under those of the tribes to which they belonged; another for the Plataeans and slaves; and a distinct monument of Miltiades, who survived the battle. The Marathonians worshipped those who were slain in the battle. Many centuries have elapsed since the age of Pausanias; but the principal barrow still towers above the level of the plain. It is of light fine earth, and has a bush or two growing on it. Dr Chandler informs us, that he enjoyed a pleasing and satisfactory view from the summit; and looked, but in vain, for the pillars on which the names were recorded, lamenting that such memorials should ever be removed. At a small distance northward is a square basement of white marble, perhaps part of the trophy.

MARATISTS, a name given to those furious and sanguinary political zealots, who, like Marat, during the French Revolution, expected to establish the liberty of France, by extirpating all who differed from them in their political opinions.

MARATTIA, in botany, a genus of the cryptogamia filices or ferns. Capsules oval, gaping longitudinally at top, with several cells on each side. There are three species.

MARAUDERS, in a military-sense, means a party of soldiers, who, without any order, go into the neighbouring houses and villages, when the army is either in camp or garrison, to plunder and destroy, &c. Marauders are a disgrace to the camp, to the military profession, and deserve no better quarter from their officers than they give to the poor peasants, &c.

MARAVEDI, a little Spanish copper-coin, worth somewhat more than a French denier, or half a farthing English. The Spaniards always count by maravedis, both in commerce and in their finances, though the coin itself is no longer current among them. Sixty-three maravedis are equivalent to a rial of silver; so that the piaster, or piece of eight rials, contains 504; and the pistole of four pieces of eight, 2016 maravedis.

MARBELLA, a town of Spain, in Andalusia, 30 miles N. E. of Gibraltar, and 28 S. W. of Malaga. Lon. 5. 25. W. Lat. 36. 25. N.

MARBLE, in natural history, bright and beautiful stones composed of small separate concretions, moderately hard, not giving fire with steel, fermenting with and soluble in acid menstrua, and calcining in a slight fire. The Latin word *marmor*, is derived from the Greek *μαρμαρίζω*, to shine, or glitter. The colours by which

marbles are distinguished are almost innumerable; but the most remarkable are, 1. The black marble of Flanders. 2. Plain Yellow. 3. Yellow with some white veins. 4. Yellow with black dendrites. 5. Yellow with brown figures resembling ruins. 6. Black and yellow. 7. Black and white. 8. Pale yellow, with spots of a blackish grey colour. 9. Yellow, white, and red. 10. Pale yellow. 11. Olive colour, with deeper coloured cross-lines, and dendrites. 12. Brownish red. 13. Flesh-coloured and yellow. 14. Common red marble. 15. Crimson, white, and grey. 16. Reddish brown lumps, on a whitish ground. 17. Bluish grey. 18. Snowy white. Marble is found in considerable quantities, in most of the mountainous parts of Europe. It abounds in Derbyshire. Near Kemlyn Bay, in the island of Anglesea, there is a quarry of beautiful marble, called *Verde di Corsica*, being common to this place, some parts of Italy, and Corsica. Its colours are green, black, white, and dull purple, irregularly disposed. Italy is that part of Europe which produces the most valuable marble, and in which its exportation makes a considerable branch of foreign commerce. The black and the milk-white marble, coming from Carara, a town in the duchy of Massa, are particularly esteemed. When chemically examined, marble consists of calcareous earth united with fixed air; and is, like lime-stone, or chalk, convertible into a strong quick-lime. Black marble derives its colour from a partial admixture of iron.

MARBLE, STAINING OF. The pieces to be coloured should be of the hardest kind; previously well polished; and be divested of every spot or blemish. Such only are calculated for supporting the heat which is always necessary, in order to open their pores, and render them susceptible of the colours. On the other hand, too low or too high a degree of heat are equally injurious: hence a due temperature ought to be preserved; and this, without making the marble red, will cause the liquor to boil on its surface. The principal colours used for staining marble are, red, yellow, and blue: the two first of these tints may be imparted to it, by reducing dragon's blood, or gamboge, to a powder, and grinding them separately with spirit of wine in a glass-mortar. But, in experiments on a small scale, a little of either of those powders should be mixed with spirit of wine in a silver-spoon, and dissolved over a charcoal-fire. Thus, a strong tincture will be extracted; with which, by the aid of a pencil, the finest traces may be drawn on marble, while cold: on heating the latter in an oven, the marks will penetrate deeply, and remain perfectly distinct. A fine blue colour may be communicated to marble, by a watery solution of the drug, known among dyers by the name of *Canary Turnsol*, and tracing the marks designed with a pencil. These will strike deeply into the stone, and the colour may be increased, by drawing the moistened pencil repeatedly over the same lines. The staining liquor must always be laid on, cold; nor should the marble afterwards be heated; yet such blue is apt to spread itself irregularly, unless its outlines be circumscribed by wax, or other adhesive matter. This colour possesses the advantage of being applicable to marble that has already been stained with other drugs: it affords, besides, a very beautiful shade, and is not liable to be easily effaced. In 1778, a patent was granted to Mr. Richter, for his invention of an art or method of inlaying scagliola, or plaster in marble or metals, so as to imitate flowers, fruit, trees, birds, beasts, landscapes, and every kind of ornament. This patent is now expired; but, as it is practicable only by statuary and artists, the inquisitive reader will consult the 10th volume of the *Repertory of Arts and Manufactures*.

MARBLES, ARUNDEL. marbles with a chronicle of the city of Athens, inscribed on them. See **ARUNDELIAN MARBLES**.

MARbled CHINA-WARE. a species of porcelain or china-ware, which seems to be full of cemented flaws. It is called by the Chinese, who are said to be very fond of it, *tou tchi*. It is generally plain white, sometimes blue, and has exactly the appearance of a piece of China, which had been first broken, and then had all the pieces cemented in their place again, and covered with the original varnish.

MARbled PAPER. See **MARBLING**.

MARBLING, the art of preparing and colouring marbled paper. There are several kinds of marbled paper; but the principal difference of them lies in the forms in which the colours are laid on the ground: some being disposed in whirls or circumvolutions; some in jagged lengths; and others only in spots of a

roundish or oval figure. The general manner of managing each kind is, nevertheless, the same; being the dipping the paper in a solution of gum-tragacanth, or, as it is commonly called, gum-dragon; over which the colours, previously prepared with ox-gall and spirit of wine, are first spread. The peculiar apparatus necessary for this purpose, is a trough for containing the gum-tragacanth and the colours; a comb for disposing them in the figure usually chosen; and a burnishing stone for polishing the paper. The trough may be of any kind of wood; and must be somewhat larger than the sheets of paper for the marbling of which it is to be employed; but the sides of it need only rise about two inches above the bottom; for by making it thus shallow, the less quantity of the solution of the gum will serve to fill it. The comb may be also of wood, and five inches long, but should have brass-teeth, which may be about two inches long, and placed at about a quarter of an inch from each other. The burnishing stone may be of jasper or agate; but as those stones are very dear when of sufficient largeness, marble or glass may be used, provided their surface be polished to a great degree of smoothness. The solution of gum-tragacanth must be made, by putting a sufficient proportion of the gum, which should be white and clear from all foulnesses, into clean water, and letting it remain a day or two, frequently breaking the lumps and stirring it till the whole appear dissolved and equally mixed with the water. The consistence of the solution should be nearly that of strong gum-water used in miniature-painting; and if it appear thicker, water must be added; or if thinner, more of the gum. When the solution is thus brought to a due state, it must be passed through a linen cloth; and being then put into the trough, it will be ready to receive the colours. The colours employed for red are carmine, lake, rose-pink, and vermilion; but the two last are too glaring, unless they be mixed with rose-pink or lake, to bring them to a softer cast; and carmine and lake are too dear for common purposes. For yellow, Dutch-pink and yellow ochre may be employed; for blue Prussian-blue, and verditer: for green, verdigrise, a mixture of Dutch-pink and Prussian-blue, or verditer, in different proportions: for orange, the orange-lake, or a mixture of vermilion, or red lead, with Dutch-pink: for purple, rose-pink and Prussian-blue. These colours should be ground with spirit of wine till they be of a proper fineness; and then, at the time of using them, a little fish-gall, or the gall of a beast, should be added, by grinding them over again with it. The proper proportion of the gall must be found by trying them; for there must be just so much as will suffer the spots of colour, when sprinkled on the solution of the gum-tragacanth, to join together, without intermixing or running into each other. The solution of the gum-tragacanth must then be poured into the trough; and the colours, being in a separate pot, with a pencil appropriated to each, must be sprinkled on the surface of the solution, by shaking the pencil, charged with its proper colour, over it; and this must be done with the several kinds of colour desired, till the surface be wholly covered. When the marbling is proposed to be in spots of a simple form, nothing more is necessary: but where the whirls or snail-shell figures are wanted, they must be made by a quill; which must be put among the spots to turn them about, till the effect be produced. The jagged lengths must be made by the comb, which must be passed through the colours from one end of the trough to the other, and will give them that appearance: but if they be desired to be pointed both ways, the comb must be again passed through the trough in a contrary direction; or if some of the whirls or snail-shell-figures be required to be added, they may be yet made by the means before directed. The paper should be previously prepared for receiving the colours, by dipping it overnight in water; and laying the sheets on each other with a weight over them. The whole being thus ready, the paper must be held by two corners, and laid in the most gentle and even manner on the solution covered with the colours: and there softly pressed with the hand, that it may bear every where on the solution. After which it must be raised and taken off with the same care, and then hung to dry across a proper cord, subtended near at hand for that purpose; and in that state it must continue till it be perfectly dry. It then remains only to give the paper a proper polish; in order to which, it is first rubbed with a little soap; and then must be thoroughly smoothed by the glass-polishers, such as are used for linen, and called the *calendar-glasses*. After which it should be again rubbed by a burnisher of jasper or agate; or, of glass highly polished

polished, for on the perfect polish of the paper depends in a great measure its beauty and value. Gold or silver powders may be used, where desired, along with the colours, and require only the same treatment as them, except that they must be first tempered with gum-water.

MARBLING OF BOOKS, or PAPER, is performed thus: Dissolve four ounces of gum-arabic into two quarts of fair water; then provide several colours mixed with water in pots or shells; and, with pencils peculiar to each colour, sprinkle them by way of intermixture upon the gum-water, which must be put into a trough or some broad vessel; then with a stick curl them, or draw them out in streaks, to as much variety as may be done. Having done this, hold the book or books close together, and only dip the edges in, on the top of the water and colours, very lightly; which done, take them off, and the plain impression of the colours in mixture, will be upon the leaves; doing the ends and the front of the book in the same manner.

MARBLING THE COVERS OF BOOKS is performed by forming clouds with aqua-fortis or spirit of vitriol mixed with ink, and afterwards glazing the covers.

MARCA, PETER DE, one of the greatest ornaments of the Gallican church, was born in Bearn, of an ancient family, in 1594. He first studied the law, was made president of the parliament of Bearn, and, going to Paris in 1639, was made a counsellor of state. His literary merits appear from his *History of Bearn*. By the king's order he published a work, *De Concordia Sacerdotii et Imperii, sive de Libertatibus Ecclesiarum Gallicarum*, in refutation of a book that appeared under the title of *Optatus Gallus*; and on this account, when, on the death of his wife, he was nominated bishop of Conserans, the pope refused the bulls in his favour, until by another book he explained away all he had said on behalf of the state, to the limitation of the papal power. He obtained his confirmation, after seven years' suspense, in 1648; was translated to the archbishopric of Toulouse in 1652; and was made minister of state in 1658. He was made archbishop of Paris in 1662; and died there soon after. His posthumous works, with prefaces, notes, &c. were published by M. Baluze. He is censured for accommodating his learning and talents to his views of interest and ambition.

MARCARIA, a town of Italy, in the department of the Minicio, and district of Mantua, on the Oglio; fourteen miles S. W. of Mantua.

MARCASITE, in mineralogy, is a name that has long been given indifferently to all sorts of minerals; to ores, pyrites, and semimetals. Lately, it seems to be confined to pyrites, and Wallerius proposes to confine it to such pyrites as are regularly formed. See **PYRITES**.

MARCELLIANS, a sect of ancient heretics, who flourished about the end of the second century, so called from Marcellus of Ancyra, their leader, who was accused of reviving the errors of Sabellius. Some, however, are of opinion that Marcellus was orthodox, and that his enemies, the Arians, fathered their errors upon him.

MARCELLUS, MARCUS CLAUDIUS, a famous Roman general, who, after the first Punic war, conducted an expedition against the Gauls. Here he obtained the *Spolia Opima*, by killing with his own hand Viridomarus the king of the Gauls. This success rendered him popular, and soon after he was entrusted to oppose Hannibal in Italy. He was the first Roman who obtained some advantage over this celebrated Carthaginian, and shewed his countrymen that Hannibal was not invincible. The troubles which were raised in Sicily by the Carthaginians at the death of Hieronymus, alarmed the Romans; and Marcellus, in his third consulship, was sent with a powerful force against Syracuse. He attacked it by sea and land; but his operations proved long ineffectual, and the invention and industry of Archimedes baffled all the efforts, and destroyed all the stupendous machines and military engines, of the Romans during three successive years. The perseverance of Marcellus at last obtained the victory. After this conquest, Marcellus was called to oppose Hannibal a second time. In this campaign he behaved with greater vigour than before; the greatest part of the towns of the Samnites, which had revolted, were recovered by force of arms, and 3000 of the soldiers of Hannibal made prisoners. Some time after, in an engagement with the Carthaginians, Marcellus had the disadvantage; but on

the next day a more successful skirmish vindicated his military character and the honour of the Roman soldiers. Marcellus, however, was not sufficiently vigilant against the snares of his adversary. He imprudently separated himself from his camp, and was killed in an ambuscade, in the 60th year of his age, in his 5th consulship, A.U.C. 544. His body was honoured with a magnificent funeral by the conqueror, and his ashes were conveyed in a silver urn to his son. Marcellus claims respect for his private as well as public virtues; and his humanity will ever be remembered, when at the surrender of Syracuse, he wept that multitudes were to be exposed to the barbarity and rapacity of an incensed soldiery, which the policy of Rome and the laws of war rendered inevitable.

MARCGRAVIA, in botany, a genus of the polyandria monogynia class and order; natural order, Putamineae. Corolla one-petaled, calyptré-shaped; calyx six-leaved, imbricate; berry many-celled, many-seeded. The only species, is *M. umbellata*, a native of the West Indies.

MARCH, [Martius, Lat.] in chronology, the third month in the year. Among the Romans, March was the first month; and in some ecclesiastical computations, that order is still preserved; particularly in reckoning the number of years from the incarnation of our Saviour, from the 25th of March. Romulus divided the year into months; to the first of which he gave the name of his supposed father Mars. Ovid, however, observes, that the people of Italy had the month of March before Romulus's time; but that they placed it very differently, some making it the third, others the fourth, some the fifth, and others the tenth month of the year. See **CHRONOLOGY**.

MARCHAND, JOHN LEWIS, a native of Lyons, who shares with the celebrated D'Aquin the glory of having carried the art of playing on the organ to the highest perfection. When very young he went to Paris; and happening to be in the chapel of the college of Lewis XIV. when they were waiting for the organist, he offered to supply his place. His playing gave so great satisfaction, that the Jesuits kept him in the college, and supplied him with every necessary to perfect his talents. He continued to play the organ of their chapel; and though many advantageous places were offered him, he refused to accept them. This disinterested conduct was not solely owing to gratitude, but to a whimsical and independent disposition. He died at Paris in 1732, aged 63. He composed two books of Pieces for the Harpsichord, much esteemed by the connoisseurs.

MARCHAND, PROSPER, was brought up at Paris, in the profession of a bookseller, and in the knowledge of books. He corresponded with several learned men, among whom was Bernard the continuator of the "*Nouvelles de la Republique des Lettres*," and furnished him with the literary anecdotes of France. Marchand, having embraced the Protestant religion, went to join Bernard in Holland, where he might be at liberty to profess his opinions. By his knowledge of books, he was so eminently distinguished, that he was consulted from all parts of Europe. He was also one of the principal authors of the "*Journal Littéraire*," and furnished excellent extracts for the other journals. He died at an advanced age, June 14, 1756; and left his fortune to a society instituted at the Hague, for the education of poor people. His library and MSS. were left by his will to the university of Leyden. He wrote, 1. *The History of Printing*, a work full of erudition and critical discussions; Hague, 1740, 4to. Abbé Mercier, of Saint-Leger de Soissons, gave, in 1775, 4to. a supplement to this history, which is equally curious and accurate. 2. *An Historical Dictionary, or Memoirs Critical and Literary*; Hague, 1758, 2 vols. folio. This work abounds with historical singularities and literary anecdotes, but too great minuteness prevails in it. 3. *A new edition of Bayle's Dictionary*; and 4. *Letters on the Cybalum Mundi*, &c.

MARCHANTIA, a genus of the cryptogamia class of plants. Corolla monopetalous, turbinate, shorter than the cup; in the lower cavity of which there are contained several naked seeds, of a roundish but compressed figure. There are seven species, five of them British.

MARCHE, a late province of France, bounded on the N. by Berry, E. by Auvergne, W. by Angoumois, and S. by Limosin; about fifty-five miles long, and twenty-five broad. It now forms the department of Creuse, and part of that of Vienne. It produces

duces corn and wine, but is not fertile, though it feeds great numbers of cattle.

MARCHE, a town of France, in the department of Vosges, 26 miles S. W. of Epinal. Lon. 5. 50. E. Lat. 48. 6. N.

MARCHE, a territory of Switzerland, in the canton of Schveitz, on the S. side of the Lake of Zurich.

MARCHENA, a town of Spain, in Andalusia. Lon. 5. 20. W. Lat. 37. 20. N.

MARCHERS, or LORDS MARCHERS, were noblemen who lived on the marches of Wales or Scotland, and according to Cambden, had their laws, and potestatem vitae, &c. like petty kings, which are abolished by the stat. 27 H. 8. c. 26, and 1 Edw. 6. c. 10. In old records the lords marches of Wales were styled Marchiones de Marchia Wallia. See 1 and 2 P. and M. c. 15.

MARCHES, [*marchia*, from the German *march*, i. e. lines, or from the French *marque*, a sign,] the notorious distinction between two countries or territories.

MARCHET, or MARCHETTA, a pecuniary fine, anciently paid by the tenant to his lord, for the marriage of one of the tenant's daughters. This custom obtained, with some difference, throughout all England and Wales, as also in Scotland; and it still continues to obtain in some places. According to the custom of the manor of Dinover in Caermarthenshire, every tenant at the marriage of his daughter pays 10s. to the lord; which, in the British language, is called gwahrmerehed, i. e. maid's fee. In Scotland, and the north of England, the custom was, for the lord to be the first night with the bride of his tenant; but this abominable usage was abrogated by King Malcolm III. at the instance of his queen; and instead thereof, a mark was paid by the bridegroom to the lord; whence it was called marcheta mulieris.

MARCIONISTE, MARCIONISTS, or MARCIONITES, a very ancient and popular sect of heretics, who in the time of St. Epiphanius, spread over Italy, Egypt, Palestine, Syria, Arabia, Persia, and other countries: so named from their author, Marcion.

MARCITE, or MARCITES, a sect of heretics in the second century, who called themselves the perfecti, and made profession of doing every thing with a great deal of liberty, and without any fear. This doctrine they borrowed from Simon Magus, who, however, was not their chief; for they were called Marcites, from one Marcus, who conferred the priesthood, and the administration of the sacraments, on women.

MARCOMANNI, an ancient people of Germany, who seem to have taken their name from their situation on the marches, east of the Upper Rhine, and north of the Danube.

MARCOSIANS, or COLOBARSIANS, an ancient sect in the church, a branch of the Valentinians. St. Irenaeus speaks at large of the leader of this sect, Marcus, who was reputed a great magician. The Marcosians had a great number of apocryphal books which they held for canonical. Out of these they picked several idle fables touching the infancy of Jesus Christ, which they put off for true histories. Many of these fables are still in use, and credit among the Greek monks.

MARDI, a people of ancient Persia, who inhabited a mountainous country on the confines of Media. They were conquered by Alexander.

MARDICK, or MARDIKE, a town of France, in the department of the North, 4 miles W. of Dunkirk. Lon. 2. 20. E. Lat. 51. 0. N.

MARE. See EQUUS.

MAREOTIS, a lake in Egypt, near Alexandria. Its neighbourhood was famous for wine, though some make the Mareoticum vinum grow in Epirus, or in a certain part of Libya, called also Mareotis, near Egypt.

MARESCHAL. See MARSHAL.

MARETIMO, an island on the west coast of Sicily, 12 miles in circumference, famous for a victory obtained by the Roman fleet over the Carthaginians. It lies 15 miles W. of Trapani.

MARGARET, countess of Richmond and Derby, the learned and pious mother of Henry VII. was born at Betshoe, in Bedfordshire, in 1441, and was the sole heiress of John Beaufort, duke of Somerset, grandson to John of Gaunt. Her mother was the heiress of lord Beauchamp of Powick. While very young, she was solicited by the king for his half-brother, Edmund, earl of Richmond, to whom she gave her hand. Henry VII. was the sole fruit

of this marriage, his father dying when he was but fifteen weeks old. Her second husband was Sir Henry Stafford, knight, second son to the duke of Buckingham, by whom she had no issue. Soon after his death, in 1482, she married a third husband, Thomas Lord Stanley, who was created earl of Derby by her son. He died in 1504, without issue, being then high constable of England. She died at Westminster in June 1509, aged 69, and was buried in Henry VII.'s chapel; on the south side of which was erected to her memory an altar-tomb of black marble, with her statue of brass. Bishop Fisher, her confessor, says, "she possessed almost all things that were commendable in a woman, either in mind or body." She understood the French language perfectly, and had some knowledge of the Latin. She was devout even to austerity, in humility romantic, profuse in the encouragement of learning, and singularly chaste. Her life, from the turbulence of the times, and vicissitude of her son's fortune, must have been subject to infinite disquiet, which, however, she is said to have supported with singular fortitude. She wrote, 1. The Mirroure of Golde for the sinful Soule? translated from the French. Lond. 4to. with cuts on vellum. 2. Translation of the fourth book of Dr. Gerson's Imitation of our Saviour, 1504. 3. A Letter to the King, in Howard's Collection. 4. She also made the Orders for great estates of ladies and noble women, for their precedence, and wearing of barbes at funerals, over the chin and under the same.

MARGARITA, or PEARL ISLAND, in geography, an island of South America, the middle of which is seated in Lon. 64. 2. W. Lat. 11. 30. N. It was discovered by Columbus, and is about thirty-five leagues in compass. The soil is very fertile in maize and fruits, and abounds in pasture and verdant groves; yet is totally destitute of fresh-water, which the inhabitants are obliged to bring from the continent.

MARGARITARIA, or MARGARITES, a genus of the octandria order, and diœcia class of plants. Male calyx four-toothed; corolla four-petaled: female, calyx and corolla as in the male; styles four or five; berry cartilaginous, four or five grained. The only species is *M. nobilis*, a native of Surinam.

MARGARITINI, glass-ornaments, made at Venice, of small glass-tubes of different colours, which are blown at Murano, and which the women of the lower class wear about their arms and necks.

MARGATE, a sea-port town of Kent, on the north side of the isle of Thanet, near the north Foreland. Lon. 1. 30. E. Lat. 51. 24. N.

MARGRAVE, [from *marche*, or *marcke*, a frontier; and *graffe*, a count or governor,] margraves being originally governors of cities on the frontiers of a state. This dignity is analogous to our marquis. See MARQUIS.

MARHAT, or MERHAT, an extensive country of Hindoostan, inhabited by the Marhattas, comprehending the greater part of the Paishwa's dominions in the Deccan. The Marhatta dominions are governed by a number of separate chiefs, all of whom acknowledge the Ram Rajah as their sovereign; and all, except one, own the Paishaw as his vicegerent.

MARHATTAS, MERHATTAHS, MARATTAS or MAH-RATTAS, a people of India, and by far the most considerable of the Hindoo powers. The Marhattas boast of a very high antiquity; they profess the religion of Brama; speak a dialect of the Sanscript language, in which they have introduced all the technical terms of Moghul administration; use a character of their own writing, somewhat different from that of the surrounding tribes; and are divided into four casts or classes, with the various subdivisions, of professional distinction in the rest of Hindoostan, but with this remarkable difference, that among the Marhattas every individual may, as in fact he occasionally does, follow the life of a soldier. They inhabited from time immemorial the country of Marhat, but were completely subjugated, and afterwards for many centuries oppressed, first by the Patans, and then by the Moghul conquerors of Delhi. At length, towards the end of Aiemgeer's reign, they united, rebelled, and under the famous Sewajee, or Seva-jee, a leader of their own tribe, laid the foundations of their present vast empire, which has risen gradually on the ruins of the Mohammedan power. This Seva-jee claimed to be descended from the ancient Hindoo emperors. His father was lord of a small district, for which he paid tribute to the Mohammedan king of Viziapour. This monarch having arrested and put him in

gaol,

aol, he died in confinement; whereupon Seeva-jee took up arms to revenge his father's death, and being joined by great numbers, took several important places, with a large tract of territory; which, after the king's death, were ceded to him by his widow. After this Seeva-jee became so formidable, that many of the Hindoo princes put themselves under his protection, and he at length ventured to make war upon the emperor Aurengzebe. Though at first unsuccessful, in so much that he was taken prisoner, yet having made his escape, he recommenced hostilities with such success, that at last Aurengzebe, now far advanced in life, made peace with him upon very advantageous terms. Seeva-jee was succeeded by his son rajah Sahou, who considerably extended the Marhatta dominions. When rajah Sahou grew old and infirm, and the fatigues of government began to press heavy upon him, he appointed Bissonat Balajee, a Brahman, born at Götum, and leader of about 25,000 horse, to the office of Paishwa or vicegerent. Sahou died without issue, but left nephews by his brother. The courage and wisdom of Balajee had gained him, during the latter years of the old rajah, the affection and esteem of all the nation. But, under an appearance of modesty and self-denial, his prevailing passion was ambition; and the sentiments of gratitude and loyalty were absorbed in the desire to command. He made use of the influence he had acquired under his benefactor to firmly to establish his own power, that he not only retained the office of Paishwa during his life, but transmitted it to his posterity; and the descendants of rajah Sahou's nephews are still respected, though kept in a kind of captivity in the palace at Sattarah. The eldest is styled Ram Rajah, or sovereign; his name is on the seal and coin of the Marhatta state; but his person is entirely unknown, except to those who immediately surround him. He resides in his splendid prison, encompassed with the appendages of eastern grandeur, but debarred of all power, and kept totally ignorant of business. The seat of government was transferred from the ancient royal residence of Sattarah to Poonah; and the usurper, as well as his successors, seem to have acted under the supposed authority of the deposed prince, by their assuming no other title or character, than that of Paishwa or prince minister.

MARIA, or SANCTA MARIA, an island of the Indian Ocean, 5 miles E. of Madagascar. It is about 27 miles long and 5 broad; well watered, and surrounded by rocks.

MARIA, St. a town of South America, in the audience of Panama. Lon. 148. 30. W. Lat. 7. 0. N.

MARIA, St. a town of Spain, in Andalusia, 18 miles N. of Cadiz. Lon. 5. 33. W. Lat. 36. 35. N.

MARIA, St. a town of Naples, in Latoria, 37 miles W. of Naples. There are eight towns of this name in Naples.

MARIANA, JOHN, a learned Spanish historian, born at Talavera, in the diocese of Toledo. He entered among the Jesuits in 1554, at seventeen years of age; and became one of the most learned men of his time. He was a great divine, a good humanist, and profoundly versed in civil and ecclesiastical history. He taught at Rome, in Sicily, at Paris, and in Spain; and died at Toledo in 1624. His principal works are, 1. A History of Spain, in thirty books; which he wrote first in Latin, and afterwards in Spanish. 2. *Scholia*, or short notes on the Bible. 3. A Treatise on the Changes the Specie has undergone in Spain; for which he was imprisoned by the Spanish minister. 4. A Treatise De Rege et Regis Institutione, which made much noise, and was condemned by the parliament of Paris to be burnt by the hangman, for his asserting in it, that it is lawful to murder tyrants. 5. A work on the Faults of the Government of the Society of Jesuits, which has been translated into Spanish, Latin, Italian, French, &c.

MARICA, in botany, a genus of the triandria monogynia class and order; natural order Ensatæ. Corolla six-parted, with three alternate segments, as small again as the others; stigma petal-form, trifid, with the three divisions simple, acute; capsule three-celled, inferior. There is but one species, *M. paludosa*, a native of Guiana.

MARIE, St. AUX MINES, in the department of the Upper Rhine, and late province of Lorraine, near mines of silver and lead, 12 miles N. W. of Colmar. Lon. 7. 24. E. Lat. 48. 16. N.

MARIENBURG, a town of France, in the department of Ardennes, 7 miles S. E. of Philipville. Lon. 4. 28. E. Lat. 50. 2. N.

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MARIENWEDER, a town of East Prussia. Lon. 19. 15. E. Lat. 53. 42. N.

MARIGALANTE, an island of North America, and one of the least of the Caribbees, 12 miles S. of Guadaloupe. The soil, produce, and climate, are much the same as the other Caribbees. Lon. 61. 5. W. Lat. 16. 32. N.

MARIGOLD. See CALENDULA.

MARIGOLD, AFRICAN. See TAGHES.

MARILA, in botany, a genus of the polyandria monogynia class and order. Calyx five-leaved; corolla five-petaled; capsule four-celled, many-seeded; stigma simple. There is but one species, *M. racemosa*, a native of the West Indies.

MARINE, is a general name for the navy of a kingdom or state; the whole œconomy of naval affairs; and whatever respects the building, rigging, arming, equipping, navigating, and fighting-ships. It comprehends also the government of naval armaments, and the state of all the persons employed therein, whether civil or military. The history of the marine affairs of any one state is a very comprehensive subject. Those who wish to be fully informed of the maritime affairs of Great Britain, and the figure it has made at sea in all ages, may find abundance of curious matter in Selden's *Mare Clausum*; and from his time to ours, may trace a series of facts in Lediard's and Burchet's *Naval History*; but above all, in Dr. Campbell's *Lives of the Admirals*.

MARINE ACID. See MURIATIC ACID.

MARINE CHAIR, a machine invented by Mr. Irwin for viewing the satellites of Jupiter at sea, and of course determining the longitude by their eclipses. An account of it is given in the *Journal Estranger* for March 1760. An account of its accuracy was published in 1761 by M. de L'Isle, astronomer in the imperial academy of Petersburg; but notwithstanding the encomiums bestowed upon it by this gentleman, it has never come into general use; and therefore we may conclude, that it is much inferior to the inventions of Mr. Harrison for the same purpose. See LONGITUDE.

MARINE DISCIPLINE, is the training up of soldiers for sea-service, in such exercises as the various positions of the firelock and body, and teaching them every manœuvre that can be performed on board ships of war at sea.

MARINE FORCES, or MARINES, a body of soldiers raised for the sea-service, and trained to fight either in a naval engagement or in an action ashore. The great service of this useful corps was manifested frequently in the course of the German war, particularly at the siege of Belleisle, where they acquired a great character, although lately raised and hardly exercised in military discipline. At sea they are incorporated with the ship's crew, of which they make a part; and many of them learn in a short time to be excellent seamen, to which their officers are ordered by the admiralty to encourage them, although no sea-officer is to order them to go aloft against their inclination. In a sea-fight their small arms are of great advantage in scouring the decks of the enemy; and when they have been long enough at sea to stand firm when the ship rocks, they must be infinitely preferable to seamen if the troops of the enemy attempt to board, by raising a battalion with their fixed bayonets to oppose them. The sole direction of the corps of marines is vested in the lords commissioners of the admiralty; and in the admiralty is a distinct apartment for this purpose.

MARINE SURVEYOR, a machine contrived by Mr. H. de Saumarez for measuring the way of a ship in the sea. This machine is in the form of the letter Y, and is made of iron or any other metal. At each end of the lines which constitute the angle or upper part of that letter, are two pallets, resembling the figure of the log, one of which falls in the same proportion as the other rises. The falling or pendant pallet, meeting a resistance from the water, as the ship moves, has thereby a circular motion under water, which is faster or slower according as the vessel moves. This motion is communicated to a dial within the ship, by a rope fastened to the tail of the Y, and carried to the dial. The motion being thus communicated to the dial, which has a bell in it, it strikes exactly the number of geometrical paces, miles, or leagues, which the ship has run. Thus the ship's distance is attained; and the forces of tides and currents may also be discovered by this instrument; which, however, has been very little used.

MARINER'S COMPASS. See COMPASS, and NAVIGATION.

5 H

MARINO,

MARINO, a town and fort of Italy, in the Campagna; 101 miles S. E. of Rome. Lon. 12. 46. E. Lat. 41. 54. N.

MARINO, *St.* a small country of Italy, consisting only of a mountain, a town, and a few hills, about the bottom of it, about six miles in extent. The number of inhabitants is about 6000. The mountain yields good wine, but they have only rain or snow-water.

MARINO, *St.* the capital of the above, 60 miles S. E. of Bologna. Lon. 12. 33. E. Lat. 43. 54. N.

MARJORAM, in botany. See **ORIGANUM**.

MARITAGIUM, in the feudal customs, as contradistinguished from *matrimonium*, signifies the power which the lord or guardian in chivalry had of disposing of his infant-ward in matrimony.

MARITIME, bounded by the sea. A maritime province or country is one bounded by the sea; and a maritime kingdom is one that makes a considerable figure, or that is very powerful at sea. Hence, by maritime powers among the European states, are understood Great Britain and Holland.

MARITIME ALPS, that part of the Alps which borders on the Gulf of Genoa. See **ALPS**.

MARITIME ALPS, a department of France, formed out of the late county of Nice, and principality of Monaco. Monaco and Nice are the chief towns.

MARIUPOL, a town of Russia, in the province of Ekaterinofslaw, on the coast of the sea of Asoph, west of Kalmius. Lon. 37. 44. E. Lat. 47. 0. N.

MARIUS, **CAIUS**, a famous Roman general, and seven times consul, who sullied his great military reputation by savage barbarities. He was born at Arpinum, of obscure parents. He signalized himself under Scipio, at the siege of Numantia. The Roman general saw his courage and intrepidity, and foretold his future greatness. By his intrigues at Rome, while he exercised the inferior offices of the state, he rendered himself known; and his marriage with Julia, who was of the family of the Cæsars, contributed to raise him to consequence. He went to Africa as lieutenant to the consul Metellus against Jugurtha; and there ingratiated himself with the soldiers, and having raised enemies to his benefactor, he returned to Rome, and canvassed for the consulship. By his extravagant promises to the people, and his malevolent insinuations against Metellus, he proved successful. He was appointed to finish the war against Jugurtha, and shewed his military talents by defeating Jugurtha. The Roman provinces being suddenly invaded by an army of 300,000 barbarians, Marius was elected consul, and sent against the Teutones. The war being prolonged, Marius was a third and fourth time invested with the consulship. At last two engagements were fought, and not less than 200,000 of the forces of the Ambrones and Teutones were slain in the field of battle, and 90,000 made prisoners, in A. U. C. 650. In 651, the Cimbri, another horde of barbarians were defeated; 140,000 of them were slaughtered by the Romans, and 60,000 taken prisoners. After these victories, Marius, with his colleague, Catullus, entered Rome in triumph; and Marius received the appellation of the third founder of Rome. He was elected consul a sixth time; but his restless ambition began to raise seditions, and to oppose the power of Sylla. This was the foundation of a civil war. Sylla refused to deliver up the command of his forces, with which he was empowered to prosecute the Mithridatic war; and considered the demand as arbitrary and improper. He advanced to Rome, and Marius was obliged to fly. Adverse winds prevented him from seeking a retreat in Africa, and he was left on the coast of Campania, where Sylla's emissaries discovered him in a marsh, into which he had plunged himself, leaving only his mouth above the surface for respiration. He was dragged to the neighbouring town of Minturnæ; and the magistrates being in the interest of Sylla, passed sentence of death on their illustrious prisoner. A Gaul was commanded to cut off his head in the dungeon; but the stern countenance of Marius disarmed the courage of the executioner: and when he heard him say, "Tunc, homo, audes occidere Caium Marium?" the dagger dropped from his hand. Such an uncommon adventure moved the compassion of the inhabitants of Minturnæ. They liberated Marius, and favoured his escape to Africa, where he joined his son, who had been arming the princes of that country in his cause. Marius landed near the walls of Carthage; but his retreat was soon

known; and the governor of Africa, to conciliate the favour of Sylla, compelled Marius to fly to a neighbouring island. He soon after learned that Cinna had embraced his cause at Rome, where the Roman senate had stripped him of his consular dignity, and bestowed it upon one of his enemies. Marius set sail to assist his friend at the head of only 1000 men. His army, however, was soon increased, and he entered Rome like a conqueror. His enemies were inhumanly sacrificed to his fury; Rome was filled with blood, and he, who once had been called the father of his country, marched through the city, attended by a number of assassins, who slaughtered all those whose salutations were not answered by their leader. When Marius and Cinna had sufficiently gratified their rage, they made themselves consuls; but Marius already worn out with old age and infirmities, died sixteen days after he had been elected consul the seventh time, A. U. C. 666, and B. C. 86. Brought up in poverty, and among peasants he always retained his native rusticity, and despised in others those polished manners which education had denied him. Being himself illiterate, he hated the conversation of the learned; and his sobriety and temperance were owing to the obscurity in which he had lived at Arpinum. His countenance was stern, his voice firm and imperious, and his disposition untractable. He was in his seventieth year when he died; and Rome rejoiced at the fall of a man whose ambition had proved so fatal to many of her citizens. His only qualifications were those of a great general; and these rendered him the most powerful of the Romans, because he was the only one whose ferocity seemed capable to oppose the barbarians.

MARK, in this country, a money of account, and in some places a coin. The English mark is two-thirds of a pound sterling, or 13s. 4d. and the Scotch mark is of equal value in Scotch money of account. The mark-lubs, or lubec-mark, used at Hamburg, is also a money of account, equal to one-third of the rix dollar, or to the French livre: each mark is divided into sixteen sols-lubs. Mark-lubs is also a Danish coin equal to sixteen sols lubs. Mark is also a copper and silver coin in Sweden. See **MONEY**.

MARK, or **MARC**, denotes also a weight used in several states of Europe, and for several commodities, especially gold and silver. In France, before the revolution, the mark was divided into 16 ounces 64 drachms, 192 deniers or penny-weights, 160 esterlines 300 maills, 640 felins, or 4608 grains. In Holland, the mark weight was also called troy-weight, and is equal to that of France. When gold and silver are sold by the mark, it is divided into 2 carats.

MARK, *St.* the **EVANGELIST**, was descended of the tribe of Levi. He is supposed to have been converted by St. Peter, to whom he was a constant companion in all his travels, supplying the place of an amanuensis and interpreter. He was by him sent into Egypt, fixing his chief residence at Alexandria; where he was so successful in his ministry, that he converted great multitudes. He afterwards removed westward, towards Libya, travelling through Marmarica, Pentapolis, &c. where, notwithstanding his barbarity and idolatry of the inhabitants, he planted the gospel. Upon his return to Alexandria, he ordered the affairs of the church, and there suffered martyrdom. About Easter, when the solemnities of Serapis were celebrated, the idolatrous people broke in upon St. Mark, while he was performing divine service, and binding him with cords, dragged him through the streets, and thrust him into prison, where in the night he had the comfort of divine vision. Next day they used him in the same manner, or worse, till he expired under their hands. Some add, that they burnt his body, and that the Christians interred his bones and ash near the place where he used to preach. This happened A. D. 68. Some say, that his remains were afterwards translated from Alexandria to Venice, where he has a rich and stately church erected to his memory, being the patron of the state. He is author of the gospel that bears his name.

MARK, *St.* **KNIGHTS OF**, an order of knighthood in the late state of Venice, under the protection of St. Mark the Evangelist. The arms of the order were, gules, a lion winged or; with this device, *PAX TIBI, MARCE EVANGELISTA*. This order was never conferred but on those who had done some signal service to the commonwealth.

MARK, *St.* the **EVANGELIST'S DAY**, a festival of the Christian church, observed April 25.

MARK, *St.* in geography, a town of Hispaniola, forty-eight miles S. of Port Paix. Lon. 72. 42. W. Lat. 19. 18. N.

MARKET, [anciently written *mercāt*, of *mercatus*, Lat.] a public place in a city or town, in which live cattle, provisions, or other goods, are set to sale; and also a privilege, either by grant or prescription, by which a town is enabled to keep a market. A market is less than a fair, and is commonly held once or twice a-week. According to Bracton, one market ought to be distant from all others at least six miles and a half and a third of a half; but no market is to be kept within seven miles of the city of London; but all butchers, victuallers, &c. may hire stalls and standings in the flesh-markets there, and sell meat and other provisions, four days in a week. Every person who has a market, is entitled to receive toll for the things sold in it; and, by ancient custom, for things standing in the market, though nothing be sold; but by keeping a market in any other manner than it is granted, or extorting of toll or fees, where none are due, they may be forfeited.

MARKET, COURT OF THE CLERK OF, an officer incident to every fair and market in England, to punish misdemeanors therein. A court of pie-poudre is to determine all disputes relating to private or civil property. The object of this jurisdiction (see stat. 17 Car. II. cap. 19, 22 Car. II. cap. 8, 23 Car. II. cap. 12,) is principally the cognizance of weights and measures, to try whether they be according to the true standard thereof or no; which standard was anciently committed to the custody of the bishop, who appointed some clerk under him to inspect the abuse of them more narrowly; and hence this officer, though now usually a layman, is called the clerk of the market. If they be not according to the standard, then, beside the punishment of the party by fine, the weights and measures themselves ought to be burnt. This is the lowest court of criminal jurisdiction in England.

MARKLAND, JEREMIAH, one of the most learned scholars and penetrating critics of his age, was born in 1692, and educated in Christ's Hospital. He became first publicly known by his *Epistolæ Criticæ*, addressed to Bishop Hare. In this he gave many proofs of his extensive erudition. He afterwards published an edition of Statius, and some plays of Euripides; and assisted Dr. Taylor in his editions of *Lysias* and *Demosthenes*, by notes. He also elucidated some passages in the New Testament, which may be found in Mr. Bowyer's edition of it; and was author of a very valuable volume of remarks on the epistles of Cicero to Brutus, and of an excellent treatise entitled *Quæstio Grammatica*. He died in 1775, at Milton, near Dorking in Surrey; and was equally valued for his learning, goodness, and primitive simplicity of manners.

MARLBOROUGH, an ancient town of Wiltshire, near the source of the Kennet, at the foot of a chalky hill; so named from its chalky soil, formerly called marl. It lies forty-three miles E. of Bristol, and seventy-four W. of London. Lon. 1. 26. W. Lat. 51. 28. N.

MARLBOROUGH, a county of S. Carolina, in Cheraws district.

MARLE, a kind of calcareous earth, which is often, and advantageously, employed as a manure. It is found in various parts of Britain and other countries, and generally lies at the bottom of low bogs. Marle is a mixture of carbonate of lime and clay, in which the carbonate considerably exceeds the other ingredient. It is earthy; opaque, sometimes in powder; specific gravity from 1.6 to 2.877; colour usually grey, often tinged with other colours; effervesces with acids. Some marles crumble into powder when exposed to the air; others retain their hardness for many years. Marles may be divided into two varieties: 1. Those which contain more silica than alumina. 2. Those which contain more alumina than silica. In general, marles are of a soft, unctuous, nature, and dissolve speedily after rain: when dry, they slacken in the same manner as lime, and are at length converted into a very fine powder. Their quality varies according to the soil under which they are deposited: the Norfolk marle is held in the greatest esteem; but the most valuable is that found near the sea, or large rivers. As marle affords so valuable a manure, it will be useful to point out a few characteristics, by which it may be distinguished from different substances that resemble it. For this purpose, a small mass or lump should be exposed to the air: if genuine, it will, in a short time, by the action of the dews, nitre, &c. crumble into small pieces; and there will likewise appear a hoary or whitish congelation on the side accessible to the rays of

the sun. Another method consists in reducing the marle, when dry, to small particles, which are to be thrown into a coal-fire; where, if it be native or pure, it will crackle in a manner similar to salt. But the most certain criterion is, to break a small piece of dry marle into a glass of pure water; in which, if the substance be of the genuine kind, it will speedily dissolve; forming a soft, almost impalpable, paste, and throwing up many bubbles or sparkles to the surface of the water. The experiment may be repeated with vinegar, in which the fluid effervescence will be considerably stronger: in both cases, however, it will be necessary to keep the glass steady; as otherwise, if it be agitated, the intestine motion cannot be distinctly observed. A good artificial marle may be prepared, by mixing equal quantities of pure clay and lime, in alternate layers, so as to form a heap, which should be exposed to the winter-frost: this compound is well calculated for light lands; but, if the soil be strong and heavy, it will be necessary to substitute loam and sand for the clay. Such compositions may be usefully employed, where marle is not easily procured; as they will amply repay the labour bestowed on mixing them, being little inferior to genuine marle.

MARLINS, in artillery, are tarred white skains, or long wreaths or lines of untwisted hemp, dipped in pitch or tar, with which cables and other ropes are wrapped round, to prevent their fretting and rubbing in the blocks or pulleys through which they pass. The same serves in artillery upon ropes used for rigging guns, usually put up in small parcels called skains.

MARLOW, a town of Buckinghamshire, under the Chiltern Hills, in a marly soil. It is seventeen miles S. of Aylesbury, and thirty-one W. of London. Lon. 0. 45. W. Lat. 51. 35. N.

MARMALADE, a confection of plums, apricots, quinces, &c. boiled up to a consistence with sugar. In this country, it is made of Seville oranges and sugar only.

MARMANDE, a town of France, in the department of Lot and Garonne, and late province of Guienne. Lon. 0. 15. E. Lat. 38. 35. N.

MARMARICA, a country of Africa, anciently inhabited by the Libyans. It was bounded on the E. by Egypt, on the W. by Cyrenaica, on the S. by Sahara, and on the N. by the Mediterranean; and was reckoned a part of Egypt.

MARMORA, the name of four islands of Asia, in the sea of the same name. The largest is about thirty miles in circumference; and the soil of them all produces corn, wine, and fruits.

MARMORA, THE SEA OF, a large gulph which communicates both with the Archipelago and the Black Sea by that of Constantinople, being 120 miles long, and 50 broad. All ships must pass through it that sail to Constantinople from the Mediterranean. It was anciently called Propontis.

MARNE, a river of France, which rises in the department of Upper Marne, three miles E. of Langres, and joins the Seine at Charenton.

MARNE, a department of France, comprehending part of the late province of Champagne. It is sixty miles long from E. to W. and forty-five broad from N. to S. Chalons is the capital.

MARNE, UPPER, a department of France, comprehending part of the late province of Champagne. It is seventy miles long from N. E. to S. W. and from twenty-two to thirty-five broad. The chief city is Chaumont.

MARO, a town of Italy, in the principality of Oneglia; eight miles N. W. of Oneglia. Lon. 7. 41. E. Lat. 44. 55. N.

MARONITES, in ecclesiastical history, a sect of eastern Christians, who follow the Syrian rite, and are subject to the pope; their principal habitation being on Mount Libanus. Mosheim says, that the doctrine of the Monothelites, condemned by the council of Constantinople, was adopted by the Mardaites, a people who inhabited Mounts Libanus and Antilibanus, and who, about the conclusion of the seventh century, were called Maronites, after John Maro their first bishop, who was originally a monk in the famous Convent of St. Maro, upon the banks of the Orontes. Tyrius and others, as well as the most authentic records, inform us, that the Maronites retained the opinions of the Monothelites until the twelfth century, when, renouncing the doctrine of one will in Christ, they were re-admitted, in 1182, into the Romish Church.

MAROON, to put one or more sailors ashore upon a desolate island, under pretence of their having committed some great crime.

This detestable expedient has been repeatedly practised by some inhuman commanders of merchant ships, particularly in the West Indies.

MAROTIÉR, a town of France, in the department of the Lower Rhine, and late province of Alsace; eighteen miles N. W. of Strasburg. Lon. 7. 33. E. Lat. 48. 38. N.

MARPURG, or MARBURG, a strong town of Germany, in Hesse-Cassel, fifteen miles S. of Waldeck, and forty-seven S. W. of Cassel. Lon. 8. 53. E. Lat. 50. 42. N.

MARPURG, a town of Germany, in Lower Stiria, on the Drave, twenty-five miles S. W. of Gratz.

MARQUE, or LETTERS OF MARQUE, in military affairs, are letters of reprisal, granting the subjects of one prince or state liberty to make reprisals on those of another. They are so called from the German *marcke*, *i. e.* limit, frontier; as being *jus concessum in alterius principis markas seu limitis transeundi, subique jus faciendi*; as being a right of passing the limits or frontiers of another prince, and doing one's self justice. Letters of marque among us are extraordinary commissions granted by authority for reparation to merchants taken and despoiled by strangers at sea; and reprisals are only the retaking, or taking, of one thing for another. The form in these cases is, the sufferer must first apply to the lord privy-seal, and he shall make out letters of request under the privy-seal; and if, after such request of satisfaction made, the party required do not, within convenient time, make due satisfaction or restitution to the party grieved, the lord-chancellor shall make him out letters of marque under the great seal; and by virtue of these he may attack and seize the property of the aggressor nation, without hazard of being condemned as a robber or pirate.

MARQUESAS ISLANDS, the general name of five islands in the South Sea, distinguished by those of Magdalena, St. Pedro, Dominica, Santa Christina, and Hood Island. All the natives of these islands are supposed to be of the same tribe. Those spots that are fit for culture are very populous; but as every island is very mountainous, and has many inaccessible and barren rocks, it is doubted whether the whole population of this group amounts to 50,000 persons. The Marquesas islands lie between Lon. 138° and 140° W. and between Lat. 8° and 10° S.

MARQUETRY, or INLAID WORK, is a curious work composed of pieces of hard fine wood of different colours, fastened in thin slices on a ground, and sometimes enriched with other matters, as tortoise-shell, ivory, tin, and brass. There is another kind of marquetry made, instead of wood, of glasses of various colours; and a third, where nothing but precious stones and the richest marbles are used: but these are more properly called mosaic work. See MOSAIC. The art of inlaying is very ancient; and is supposed to have passed from the E. to the W. as one of the spoils brought by the Romans from Asia. Indeed it was then very simple, nor did it arrive at any tolerable perfection till the fifteenth century among the Italians: it, however, arrived at its height in the seventeenth century among the French. Till John of Verona, a contemporary with Raphael, the finest works of this kind were only black and white, which are what we now call Marescoes; but he, having a genius for painting, stained his wood with dyes or boiled oils, which penetrated it. He went no farther, however, than representing buildings and perspectives, which require no great variety of colours. Those who succeeded him not only improved his invention of dyeing the wood, by a secret which they found of burning them without consuming, which served exceedingly well for the shadows, but had also the advantage of a number of fine new wood of naturally bright colours, by the discovery of America. With these assistances the art is now capable of imitating any thing; whence some call it the art of painting in wood. The ground on which the pieces are to be ranged and glued, is ordinarily of oak or fir well dried; and to prevent warping, is composed of several pieces glued together. The wood to be used, being reduced into leaves, of the thickness of a line, is either stained with some colour, or made black for shadow; which some effect by putting it in sand extremely heated over the fire, others by steeping it in lime-water and sublimate, and others in oil of sulphur. Thus coloured, the contours of the piece are formed according to the parts of the design they are to represent. The last is the most difficult part of marquetry, and that wherein most patience and attention are required. The two chief instruments used herein are the saw and the vice; the one, to hold the matters to

be formed; the other, to take off redundances from the extremes. The vice is of wood, having one of its chaps fixed; the other moveable, and is opened and shut by the foot, by a cord fastened to a treadle. Its structure is very ingenious, yet simple enough. The leaves to be formed (for there are often three or four of the same kind formed together) are put within the chaps of the vice, after being glued on the outermost part of the design whose profile they are to follow; then the workman pressing the treadle, and thus holding fast the piece, with his saw runs over all the outlines of the design. By thus joining and forming three or four pieces together, they not only gain time, but the matter is likewise the better enabled to sustain the efforts of the saw; which, how delicate soever it may be, and how lightly soever the workman may conduct it, without such a precaution would be apt to raise splinters, to the ruin of the beauty of the work. When the work is to consist of one single kind of wood or of tortoise-shell, on a copper or tin-ground, or vice versa, they only form two leaves on one another, *i. e.* a leaf of metal, and a leaf of wood or shell: this they call sawing in counter-parts; for by filling the vacuities of one of the leaves by the pieces coming out of the other, the metal may serve as a ground to the wood, and the wood to the metal. All the pieces thus formed with the saw, and marked to know them again, and the shadow given in the manner already mentioned; they veneer or fasten each in its place on the common ground, using for that purpose the best English glue. The whole is put in a press to dry, planed over, and polished with the skin of the sea-dog, wax, and shave-grass, as in simple veneering; with this difference, however, that in marquetry the fine branches, and several of the more delicate parts of the figures, are touched up and finished with a graver. Cabinet-makers, joiners, and toymen, work in marquetry; enamellers and stone-cutters deal in mosaic work: the instruments used in the former are mostly the same with those used by the ebonists.

MARQUIS, a title of honour next in dignity to that of a duke. The office of a marquis was to guard the frontiers and limits of the kingdom, which were called the marches, from the Teutonic word *marche*, a limit; as, in particular, were the marches of Wales and Scotland, before their union with England. The persons who had command there, were called lords marches, or marquesses; whose authority was abolished by stat. 27 Hen. VIII. c. 27. though the title had long before been made a mere design of honour, Robert Vere, Earl of Oxford, being created Marquis of Dublin, by Richard II. in the eighth year of his reign. A marquis is created by patent; his mantle is double ermine, three doublings and a half; his title is most honourable; and his coronet has pearls and strawberry-leaves intermixed round, of equal height.

MARRIAGE, [*maritagium*, low Lat. from *maritus*, a husband,] a contract, both civil and religious, between a man and a woman, by which they engage to live together in mutual love and friendship during the remainder of their days. Matrimony was originally of divine appointment, and has been instituted among all enlightened nations, for the wisest purposes; and, as the contract continues in force for life, such partner ought to be chosen with the utmost circumspection. If this circumstance were always duly weighed, there would certainly be fewer of those unnatural marriages, in which blooming youth is united to the aged or decrepid. One of the most important points that merits constant attention, is the healthiness of the parties. Those who are the obvious victims of hereditary disease, ought, in conformity to every principle of justice and of reason, to be suspended from the nuptial rites. Similar limitations should be observed with respect to the union of deformed persons, especially females, for whom a state of celibacy is doubtless more eligible; unless it appears from proper inquiry, that, notwithstanding their external deformity, they are fully competent to discharge the dignified maternal duties. Farther, an equality in point of natural disposition, temporal fortune, and of age, in both parties, should, as far as possible, regulate the choice. In the latter respect, the most proper period in general appears to be (in temperate climates) between the age of eighteen and twenty in the female, and from twenty-two to twenty-four in the male sex. Marriage is considered by the English law wholly as a civil contract, the sanctity of the matrimonial state being left to the ecclesiastical court, which is empowered to punish or annul incestuous or other unscriptural marriages. It ac-

as all as good and valid, provided the parties, at the time of concluding the contract, were not legally disqualified from performing the same, and have executed it in due form of law. The disabilities of contracting marriage are of two kinds, viz. 1. Canonical, that is, those which are void or voidable in the ecclesiastical law, such as consanguinity, or relation by blood, and affinity, or relation by marriage; together with some bodily infirmities. 2. Legal, that is, such as are created or enforced by the municipal laws; for instance, a prior marriage; lunacy; want of consent of parents or guardians; and minority. Thus, in the last mentioned case, if a boy under fourteen, or a girl under twelve years of age, marry, they may, on attaining the age of consent, declare the marriage void, without any divorce in the ecclesiastical court. There are various other regulations, made by different states, with a view to secure the happiness of subjects in this most important state, but our limits will not permit us to detail them. Hence we shall only observe, that several acts impose a penalty of 100*l.* on every clergyman who marries a couple, without banns, or licence. And, if any woman, under the age of sixteen years, be married without her parents' or guardian's consent, the clergyman performing the ceremony is liable to a fine, or five years imprisonment; and the woman's estate is to be enjoyed during her husband's life, by the next heir. Farther, no marriage is valid, unless solemnized in a church, or other place, where the banns are usually published; except if a special licence be obtained for the purpose. By the 26th Geo. II. c. 33, every person knowingly lending and acting to the contrary, is guilty of felony, and liable to be transported for fourteen years; provided the prosecution be commenced within three years after such illegal solemnization of marriage. To make a false entry into a marriage-register; to alter it when made; to forge or counterfeit such entry, or a marriage-licence, or aid and abet such forgery; to utter the same as true, knowing it to be counterfeit; or to destroy, or procure the destruction, of any register in order to vacate any marriage, or subject any person to the penalties of this act; all these offences, knowingly and wilfully committed, subject the party to the guilt of felony without benefit of clergy. But this act doth not extend to the marriages of the royal family; nor to Scotland; nor to any marriages among the Quakers, or among persons professing the Jewish religion, where both the parties are Quakers or Jews respectively; nor to any marriages beyond the seas.

MARRIAGE, SERVICE, or DUTY OF, is a term used in some ancient customs, signifying an obligation on women to marry. Old maids and widows about sixty who held fees in body, or were charged with any personal or military services, were anciently obliged to marry, to render those services to the lord by their husbands, or to indemnify the lord for what they could not do in person. This was called duty, or service of marriage.

MARRIAGE-SETTLEMENT, is a legal act, previous to marriage, whereby a jointure is secured to the wife after the death of the husband. These settlements seem to have been in use among the ancient Germans and Gauls. Of the former Tacitus gives us this account: *Dotem non uxor marito, sed uxori maritus affert: intersunt parentes et propinqui, et munera probant* (De Mor. Germ. c. 18.) And Casar, De Bell. Gall. lib. vi. c. 18, has given us the terms of a marriage-settlement among the Gauls, as nicely calculated as any modern jointure: *Viri, quantas pecunias ab uxoris dotis nomine acceperunt, tantas ex suis bonis, æstimatione facta, cum dotibus communicant. Hujus omnis pecuniæ conjunctim ratio habetur, fructusque servatur. Uter eorum vita superavit, ad eum pars utriusque cum fructibus superiorum temporum pervenit.* The dauphin's commentator supposes that this Gaulish custom was the ground of the new regulations made by Justinian, Nov. 97, with regard to the provision for widows among the Roman; but surely there is as much reason to suppose, says Judge Blackstone, that it gave the hint for our statutory jointures. *Comm. vol. II. p. 138.* See an excellent marriage-settlement by Blackstone in the appendix to the second volume of his commentaries. See **LAW, DIVORCE, POLYGAMY, &c.**

MARKOW, in animal-economy, an oily matter secreted by the arteries of the internal membrane, which covers the bones. See **ANATOMY**.

MARRUBIUM, WHITE HOREHOUND: a genus of the gymnospermia order, and didynamia class of plants; natural order, Verticillatæ. Calyx salver-shaped, rigid, ten-streaked; corolla

upper lip bifid, linear, straight. There are eleven species. These plants are chiefly preserved in botanic gardens for the sake of variety. *M. vulgare* is recommended in asthmatical and phthical complaints, and most other diseases of the breast and lungs.

MARS, in astronomy, one of the six planets, and of the four superior ones; its place being between the earth and Jupiter. See **ASTRONOMY**.

MARS, in mythology, the god of war. He was, according to some, the son of Jupiter and Juno; while others say that he was the son of Juno alone, who, being displeased at Jupiter's having produced Minerva from his brain, without female aid, in revenge conceived without the assistance of the other sex, by touching a flower shewn to her by Flora in the plains of Olenus, and became the mother of this formidable deity. Mars is usually represented in a chariot, drawn by furious horses. He is completely armed, and extends his spear with the one hand, and grasps a sword, imbrued in blood, with the other. He has a fierce and savage aspect. Discord is represented preceding his car; and Clamour, Fear, and Terror, appear in his train. The victims sacrificed to him were the wolf, the horse, the wood-pecker, the vulture, and the cock.

MARS, among alchemists, denotes iron; that metal being supposed to be under the influence of the planet Mars.

MARSAIS, CESAR CHESNEAU DU, was born at Marseilles in 1676. He became a member of the congregation of the oratory, but soon left it; went to Paris, married, became advocate, and, in this new profession, met with great success. Disappointed, however, in his expectations of making a speedy fortune, he abandoned the law also. About this time the peevish humour of his wife, (perhaps of both,) occasioned a separation. He next became tutor in several genteel families; particularly in those of President de Maissons, the famous John Law, and the Marquis of Beaufremont. After this he kept a boarding academy, but fell into such adverse circumstances, that he was at last reduced to extreme indigence. In this situation he was found by the editors of the *Encyclopédie*, and made a partner in conducting that great work; for which he wrote the article Grammar, and several others. The Count of Lauraguais was so much affected with the distresses, and so much convinced of the merit of Du Marsais, that he procured him a pension of 1000 livres. Du Marsais died at Paris, June 11, 1756, in his eightieth year, after he had received the sacrament. As he had professed to be a deist during his lifetime, the sincerity of his conversion on his death-bed has been doubted: but as Mr. Bayle observes, "The faith of a great genius is not totally extinguished: it is like a spark under the ashes. Reflection and the prospect of danger call forth its exertions. There are certain situations in which philosophers are as full of anxiety and remorse as other men." Fontenelle expressed his character in few words, when he said, "that he was the most lively simpleton, and as a man of wit the most simple he ever knew." He was a great enemy to every kind of affectation. His principal works are, 1. *Exposition de la Doctrine de l'Eglise Gallicane par rapport aux prétensions de la Cour de Rome*, 12mo. This did not appear till after his death. 2. *Exposition d'une Méthode raisonnée pour apprendre la Langue Latine*, 12mo. 1722, rare. 3. *Traité des Tropes*, 1730, 8vo.; reprinted in 1771, 12mo. 4. *Les véritables Principes de la Grammaire raisonnée pour apprendre la langue Latine*, 1790, 4to. There was only the preface of this work published, in which he introduced the greatest part of his *Méthode raisonnée*. 5. *Labiege de la Fable du Pere Jouvenci*, arranged after the manner of the original plan, 1731, 12mo. 6. *Logique, ou Reflections sur les Operations de l'Esprit*. It was reprinted at Paris, in two parts, together with the articles which he had written for the *Encyclopédie*, 1762. He also wrote some tracts of less merit, in favour of scepticism.

MARSAL, a town of France, in the department of the Meurthe, and late province of Lorraine. Lon. 6. 43. E. Lat. 48. 46. N.

MARSALA, an ancient and strong town of Sicily, in the valley of Mazara. Lon. 12. 37. E. Lat. 37. 52. N.

MARSAN, or **MONT MARSAN**, a town of France, in the department of Landes, and late province of Gascony. Lon. 0. 23. W. Lat. 43. 54. N.

MARSAQUIVER, or **MARSALQUIVER**, a strong and ancient town of Africa, on the coast of Barbary, in the province of Beni-Arax,

Beni-Arax, and kingdom of Tremesen, with one of the best harbours in Africa. Lon. 0. 10. W. Lat. 35. 40. N.

MARSEILLES, a strong and rich sea-port town of France, in the department of the Mouths of the Rhone, and late province of Provence. It has a good harbour, where the French galleys were formerly stationed; but it will not admit large men of war. Lon. 5. 22. E. Lat. 43. 18. N.

MARSH, signifies a piece of ground flowed with water, yet so that the grass and other vegetables rise above the surface of the water, and, by their decaying, give rise to putrid effluvia, which are very pernicious to health. Such land by draining may be made firm or arable, and thus rendered more wholesome and profitable. See **HUSBANDRY**.

MARSHAL, or **MARESCHAL**, [*marescallus*, Lat.] primarily denotes an officer who has the care of the command of horses. Nicod derives the word from *polemarchus*, i. e. master of the camp; Matthew Paris from Martis senescallus. In the old Gaulish language, march signified horse; whence merchal might signify him who commanded the cavalry. Other derivations have been given by different authors; and the name itself has been applied to officers of very different employments.

MARSHAL OF ENGLAND, EARL, is the eighth great officer of state. This office, until it was made hereditary, always passed by grant from the king, and never was held by tenure or seignior (by any subject) as the offices of lord high steward and lord high constable were sometimes held. The title is personal, the office honorary and officary. They were formerly styled lord-marshal only, until King Richard II. June 20, 1397, granted letters-patent to Thomas Mowbray, Earl of Nottingham, and to the heirs male of his body lawfully begotten, by the name and style of earl-marshal; and further, gave them power to bear in their hand a gold-truncheon, enamelled with black at each end; having at the upper end of it the king's arms engraven thereon, and at the lower end his own arms.

MARSHAL OF FRANCE, was the highest dignity of preferment in the French armies, under the old monarchy. It was for life, though at its first institution it was otherwise.

MARSHAL OF SCOTLAND, EARL. His office was to command the cavalry, whereas the constable commanded the whole army. They seem, however, to have had a sort of joint command, as of old all orders were addressed "to our constable and marischal." The office of earl-marischal has never been out of the noble family of Keith. It was reserved at the union; and when the heritable jurisdictions were bought, it was in the crown, being forfeited by the rebellion of Geo. Keith, Earl Marischal, in 1715.

MARSHAL OF THE EXCHEQUER, an officer mentioned by Fleta, to whom the court commits the custody of the king's debtors, &c.

MARSHAL OF THE KING'S BENCH, an officer who has custody of the prison called the King's Bench, in Southwark.

MARSHAL OF THE KING'S HOUSE, or KNIGHT MARSHAL, an English officer, whose business, according to Fleta, is to execute the commands and decrees of the lord-steward, and to have the custody of prisoners committed by the court of verge.

MARSHALLIA, in botany, a genus of the syngenesia polygamia æqualis class and order. Calyx common, many-leaved, spreading; leaflets linear, lanceolate, blunt, concave, almost equal, permanent; corolla compound, uniform, longer than the calyx; stamen filaments five, capillary; pistil germ ovate; pericarpium none; seeds solitary; receptacle chaffy.

MARSHALLING A COAT, in heraldry, is the disposal of several coats of arms belonging to distinct families in one and the same escutcheon or shield, together with their ornaments, parts, and appurtenances. See **HERALDRY**.

MARSHALSEA, THE COURT OF, and the Palace-Court at Westminster, though two distinct courts, are frequently confounded together. The former was originally holden before the steward and marshal of the king's house, and was instituted to administer justice between the king's domestic servants, that they might not be drawn into other courts, and thereby the king lose their service. This court being ambulatory, and obliged to follow the king in all his progresses, so that by the removal of the household, actions were frequently discontinued, and doubts having arisen as to the extent of its jurisdiction, King Charles I. in the sixth year of his reign, by his letters patent, erected a new court of record, called the curia palatii, or palace-court, to be held before the

steward of the household and knight-marshal, and the steward of the court, or his deputy; with jurisdiction to hold plea of all manner of personal actions whatsoever, which shall arise between parties within twelve miles of his majesty's palace at Whitehall. The court is now held once a week, together with the ancient court of marshalsea, in the borough of Southwark; and a writ of error lies from thence to the court of king's bench. But if the cause is of any considerable consequence, it is usually removed on its first commencement, together with the custody of the defendant, either into the king's bench or common pleas by a writ of habeas corpus cum causa: and the inferior business of the court hath of late years been much reduced, by the new courts of conscience erected in the environs of London; in consideration of which the four counsel belonging to these courts had salaries granted them for their lives by stat. 23 Geo. II. c. 27.

MARSHAM, SIR JOHN, a very learned English writer in the 17th century. He studied the law in the Middle Temple, and was sworn one of the six clerks in the court of chancery in 1638. In the beginning of the civil wars he followed the king to Oxford for which he was deprived of his place by the parliament at Westminster, and plundered. After the declining of the king's affairs he returned to London; compounded among other royalists, for his real estate; and betook himself wholly to his studies and a retired life, the fruits of which were some excellent works. He wrote *Diatriba Chronologica*; *Chronicus Canon*, *Ægyptiacus*, *Ebraicus*, *Græcus*, &c. He died in 1683.

MARSHELDER. See **VIBURNUM**.

MARSHFIELD, a town of Gloucestershire, 12 miles E. from Bristol.

MARSHLAND, a marshy peninsula in Norfolk, and opposite to King's Lynn, almost surrounded with the Ouse and other navigable rivers, and an arm of the sea.

MARSHLAND, an island of Yorkshire, several miles long and broad, formed by the rivers Aire, Dun, Ouse, and Trent.

MARSH-MALLOW. See **ALTHÆA**.

MARSI, an ancient nation of Germany, who afterwards settled in Italy, where they occupied the territory in the environs of the Fucine Lake.

MARSICO NUOVO, or NEW MARSICO, a town of Naples, in Principato Citra. Lon. 15. 49. E. Lat. 40. 42. N.

MARSIGLI, LEWIS FERDINAND, count, an Italian, famous for letters as well as arms, descended from an ancient and noble family, and born at Bologna in 1658. He acquired great knowledge in the art of war and fortification; served under Leopold II. against the Turks, by whom he was taken prisoner in 1683, but redeemed in 1684. In the Spanish succession-war, Marsigli, then marshal, being in the fortress of Brisac, surrendered to the duke of Burgundy in 1703, though deemed capable of holding out much longer; was stripped of all his commissions, and had his sword broke over him; and the commander Arco was beleagued. Marsigli now sought consolation in the sciences; as, amidst all the fatigue of war, he made all the advantages the most philosophic man could do, who had travelled purely in quest of knowledge. He had a rich collection of every thing proper for such studies; instruments astronomical and chemical, plans of fortifications, models of machines, &c. all which he presented to the senate of Bologna, in 1712, forming at the same time out of them what he called the Institute of the Arts and Sciences at Bologna. He also founded a printing-house, and furnished it with the best types for Latin, Greek, Hebrew, and Arabic, which he presented in 1728 to the Dominicans at Bologna, on condition of their printing all the writings of the institute at prime cost: this was called the printing-house of St. Thomas Aquinas. His writings on philosophical subjects are numerous and valuable, in Latin, Italian, and French. He died in 1730.

MARSILEA, a genus of the cryptogamia class of plants. Calyx common, oval; corolla none; antheræ four, placed on an obtusely conic body; fruit roundish, four-celled; seeds roundish. There are three species.

MARSYAS, in fabulous history, a celebrated musician of Cætenæ, in Phrygia, son of Olympus, or of Hyagnis, or Cægrus. He was so skilful in playing on the flute, that he is generally deemed the inventor of it.

MART, a great fair held every year for buying and selling goods. Public marts, with the tolls thereunto belonging, can only be

be set up by virtue of the king's grant, or by long and immemorial usage and prescription, which presupposes such a grant. The limitation of these public resorts, to such time and place as may be most convenient for the neighbourhood, forms a part of economics, or domestic polity; which considering the kingdom as a large family, and the king as the master of it, he has clearly a right to dispose and order as he pleases.

MARTABAN, a province of Asia, in the kingdom of Pegu, on the gulph of Bengal. It produces rice and all kinds of fruits proper to the climate. It has mines of various metals, and carries on a great trade.

MARTABAN, the capital of the above province, with a good harbour. Lon. 97. 50. E. Lat. 15. 35. N.

MARTEL, a town of France, in the department of Lot, 11 miles N. of Cahors. Lon. 1. 44. E. Lat. 44. 55. N.

MARTHA, Sr. a province of South America, on the coast of Terra Firma, bounded on the N. by the North Sea, E. by Rio de la Hache, S. by New Granada, and W. by Carthagea. It is 300 miles long and 200 broad, is a mountainous country, and the land is very high.

MARTHA, Sr. the capital of the Spanish part of the above province. Lon. 74. 11. W. Lat. 11. 20. N.

MARTHA, Sr. or **SIERRA NEVEDA**, a very high mountain in New Spain; said to be 100 miles in circumference at the bottom, and 5 miles in height. Lon. 74. 35. W. Lat. 8. 0. N.

MARTHA'S VINEYARD, an island of North America, near the coast of New England, 80 miles S. of Boston. Lon. 74. 35. W. Lat. 41. 0. N.

MARTIAL, in the old chemical nomenclature, was often used to express preparations of iron.

MARTIAL LAW, is the law of war that depends upon the just but arbitrary will and pleasure of the king, or his lieutenant: for though the king doth not make any laws but by common consent in parliament, yet, in time of war, by reason of the necessity of it to guard against dangers that often arise, he useth absolute power, so that his word is a law. *Smith de Repub. Ang. lib. 2. c. 4.* But the martial law (according to Chief Justice Hale) is in reality not a law, but something indulged rather than allowed as a law; and it relates only to members of the army, being never intended to be executed on others, who ought to be ordered and governed by the laws to which they are subject, though it be a time of war. And the exercise of martial law, whereby any person might lose his life, or member, or liberty, may not be permitted in time of peace, when the king's courts are open for all persons to receive justice.

MARTIALIS, **MARCUS VALERIUS**, a famous Latin poet, born at Bilbilis, (now Bubierra, in Arragon,) was of the order of knights. He went to Rome at the age of twenty-one, and staid there thirty-five years, under Galba and the succeeding emperors, till the reign of Trajan; and having acquired the esteem of Titus and Domitian, he was created tribune. But, finding that he was neglected by Trajan, he returned to Bilbilis, where he married a wife, and lived with her several years. He commends her much, as being alone sufficient to supply the want of every thing he enjoyed at Rome. "*Romam tu mihi sola facis*," says he, in lib. xii. Epig. 21. She appears likewise to have been a lady of a very large fortune; for in lib. xii. Epig. 31, he extols the magnificence of the house and gardens he had received from her, and says that "she had made him a kind of little monarch."

Has Marcella domos, parvaque regna dedit.
There are still extant fourteen books of his epigrams, filled with points, a play upon words, and obscenities. The style is affected. However, some of his epigrams are excellent; many of them are of the middling kind; but the greatest part of them are bad: so that he never spoke a greater truth, than when he said of his own works,

Sunt bona, sunt quædam mediocria, sunt mala plura.
There is also ascribed to him a book on the spectacles of the amphitheatre; but the most learned critics think it was not written by Martial. The best editions of Martial are, those in Usum Delphini, 4to. Paris, 1617, and cum Notis Variorum.

MARTIGUES, a sea-port town of France, in the department of the mouths of the Rhone, and late province of Provence. Lon. 4. 20. E. Lat. 43. 38. N.

MARTIN, **BENJAMIN**, one of the most eminent artists and

mathematicians of his age, was born in 1704. After publishing a variety of ingenious treatises, and particularly a periodical work, entitled "*Martin's General Magazine of Arts and Sciences*," and carrying on for many years a very extensive trade as an optician and globe-maker in Fleet-street, the infirmities of age compelled him to withdraw from the active part of business. Trusting to the integrity of others, he, though previously possessed of a capital more than sufficient to pay all his debts, became a bankrupt. In a fit of despair he attempted to destroy himself, and the wound, though not immediately mortal, hastened his death, which happened February 19, 1782, in his 78th year. He had a valuable collection of fossils and curiosities, which, after his death, were sold by auction, much below their value. His principal publications are, *The Philosophical Grammar*, 1735, 8vo. A new, complete, and universal System of Decimal Arithmetic, 1735, 8vo. *The Young Student's Memorial Book, or Patent Library*, 1735, 8vo. Description and Use of both the Globes, the Armillary Sphere and Orrery, Trigonometry, &c. 1736, 2 vols. 8vo. *System of the Newtonian Philosophy*, 1759, 3 vols. *New Elements of Optics*, 1759. *Natural History of England*, with a Map of each County, 1759, 2 vols. *Philology, and Philosophical Geography*, 1759. *Mathematical Institutions*, 1764, 2 vols. *Lives of Philosophers, with their Inventions*, &c. 1764. *Introduction to the Newtonian Philosophy*, 1765. *Institutions of Astronomical Calculations*, 2 parts, 1765. *Description and Use of the Air-Pump*, 1766. *Description of the Torricellian Barometer*, 1766. *Appendix to the Description and Use of the Globe*, 1766. *Philosophia Britannica*, 1778, 3 vols. *Gentleman and Lady's Philosophy*, 3 vols. *Miscellaneous Correspondence*, 4 vols. *Principles of Pump-Work. Theory of the Hydrometer. Description and Use of a Case of Mathematical Instruments. Ditto of a Universal Sliding-Rule. Micrographia, or the Microscope. Principles of Perspective. Course of Lectures. Optical Essays. Essay on Electricity. Essay on Visual Glasses, or Spectacles. Horologia Nova, or New Art of Dialing. Theory of Comets. Nature and Construction of Solar Eclipses. Venus in the Sun. The Mariner's Mirror. Thermometrum Magnum. Survey of the Solar System. Essay on Island Crystal. Logarithmologia Nova. Lingua Britannia Reformata, &c. &c.*

MARTIN, in ornithology. See **HIRUNDO**.

MARTIN, in zoology. See **MUSTELA**.

MARTIN, Sr. was born at Sabaria in Pannonia, now called Stain in Lower Hungary, in the beginning of the fourth century. His father was a military tribune; and he himself was obliged to carry arms, although peace and solitude were more agreeable to his inclination. He was remarkable for every virtue, in a profession which is too often considered to give a sanction to vice. Soon after being baptized, he renounced the military profession for the monastic. After passing many years in solitude, he returned to Pannonia, and converted his mother, and with great zeal opposed the Arians, who governed the church in Illyria, for which he was publicly whipped. He afterwards retired to the neighbourhood of Poitiers, where he remained, till he was elected bishop of Tours in the year 374. He built the celebrated monastery of Marmoutier, near Tours, between the Loire and a steep rock, where he displayed the most exemplary sanctity. He afterwards became the apostle of all Gaul; diffused the doctrines of Christianity among the heathens, and destroyed their temples. The emperor Valentinian, and the tyrant Maximus, treated him with distinguished honour. He used his influence with the latter to preserve the Priscillianists, who were prosecuted by Ithace and Idace, bishops of Spain. He died at Candes, November 8, 397, or as others say, on the 11th November, 400. He is the first of the saints confessors whom the Latin church idolized by offering public prayers to him. His life is written in elegant Latin by Fortunatus, and Sulpitius Severus one of his disciples.

MARTIN, Sr. an island of America, and one of the Caribbees, lying on the gulph of Mexico, N. W. of St. Bartholomew, and S. W. of Anguilla. It is 42 miles in circumference. Lon. 62. 57. W. Lat. 18. 4. N.

MARTIN, Sr. a town of France, in the isle of Rhee, 15 miles W. of Rochelle. Lon. 1. 17. W. Lat. 46. 10. N.

MARTINGAL, a broad strap made fast to the girths under the belly of a horse, and running between the two legs to fasten the other end, under the nose-band of the bridle.

MARTINICO,

MARTINICO, or **MARTINIQUE**, one of the Caribbee Islands, the middle of which is situated in Lon. 61. 21. W. Lat. 14. 44. N. This island was first settled by M. Desnambuc a Frenchman, in 1635, with only 100 men from St. Christopher's. They completed their first settlement without any opposition from the natives, who, intimidated by their fire-arms, or seduced by promises, gave up the W. and S. parts of the island to them. In a short time, however, perceiving the number of these enterprising strangers daily increasing, they rose to extirpate them, but were repulsed, with the loss of 700 or 800 of their best warriors. After this a reconciliation took place, and peace seemed to be settled. But several of the settlers having been successively murdered in the woods, the rest rose upon the savages, who were all either slain, or driven out of the island, to which they never returned. The island is 16 leagues in length and 45 in circumference, without reckoning the capes, some of which extend two or three leagues into the sea. It is very uneven, and intersected in all parts by a number of hillocks; which are mostly of a conical form. Three mountains rise above these smaller eminences. The highest bears the indelible marks of a volcano. The woods with which it is covered continually attract the clouds, which occasions noxious damps, and contributes to make it horrid and inaccessible; while the two others are in most parts cultivated. From these mountains issue many springs which water the island, and flow in gentle streams, but are changed into torrents on the slightest storm.

MARTINICO, or **MARTINIQUE**, **LITTLE**, one of the Grenadines. Lon. 61. 18. W. Lat. 13. 38. N.

MARTINMAS, [*martin* and *mass*,] the feast of St. Martin: the 11th of November, commonly corrupted to *martilmass* or *martlemass*.

MARTINVILLE, a town of North Carolina, capital of Guilford county, 28 miles N. W. of Hillsborough. Lon. 79. 43. W. Lat. 36. 5. N.

MARTLETS, in heraldry, little birds represented without feet; and used as a difference or mark of distinction for younger brothers, to put them in mind that they are to trust to the wings of virtue and merit, in order to raise themselves, and not to their feet, they having little land to set their foot on. See **HERALDRY**.

MARTNETS, small lines fastened to the leech of the sail, to bring that part of the leech which is next the yard-arm close up to the yard, when the sail is to be furled.

MARTYNIA, in botany, a genus of the angiospermia order, and didynamia class of plants; natural order, Personata. Calyx five-cleft; corolla ringent; capsule woody, corticate, with a hooked beak, four-celled, two-valved. There are six species. They flower in July and August, and are very ornamental, but require always to be kept in the hottest parts of the stove.

MARTYR, [*martys*, a witness,] a term applied, by way of eminence, to those who suffer in witness of the truth of the gospel. The Christian church has abounded in martyrs, and history is filled with surprising accounts of their singular constancy and fortitude, under the most cruel torments human nature was capable of suffering. The primitive Christians were accused by their enemies of paying a sort of divine worship to the martyrs. Of this we have an evidence in the answer of the church of Smyrna to the suggestion of the Jews, who, at the martyrdom of Polycarp, desired the heathen judge not to suffer the Christians to carry off his body, lest they should leave their crucified master and worship him in his stead. To which they answered, we can neither forsake Christ nor worship any other: for we worship him as the Son of God; but love the martyrs as the disciples and followers of the Lord, for the great affection they have shewn to their King and Master. A similar answer was given at the martyrdom of Prudentius in Spain, by Eulogius, his deacon. The primitive Christians believed, that the martyrs enjoyed very singular privileges; that upon their death they were immediately admitted to the beatific vision, while other souls waited for the completion of their happiness till the day of judgement, &c. The churches built over the graves of the martyrs, and called by their names, to preserve the memory of their sufferings, were distinguished by the title martyrion, confession, or memoria. The festivals of the martyrs are of very ancient date in the Christian church, and took their rise about the time of Polycarp, who suffered martyrdom

about the year 168. On these days the Christians met at the graves of the martyrs, and offered thanksgivings to God for the examples they had afforded them: they celebrated the eucharist, and gave alms to the poor; which, together with a panegyric oration or sermon, and reading the acts of the martyrs, were the spiritual exercises of these anniversaries. Of the sayings, sufferings, and deaths, of the martyrs, we have but very little left, the greatest part of them having been destroyed during the dreadful persecution carried on by Dioclesian for ten years, against the Christians; when diligent search was made after their books and papers, and all that were found were burnt. Eusebius, indeed, composed a martyrology, but it never came down to us; and those since compiled are extremely suspected. From the eighth century, several Greek and Latin writers endeavoured to make up the loss by compiling, with vast labour, accounts of the lives and actions of the ancient martyrs, but which consist of little else than a series of fables.

MARTYROLOGY, a list of martyrs, including the history of their lives and sufferings for the sake of religion. The martyrologies draw their materials from the calendars of particular churches, in which the several festivals dedicated to them are marked; and which seem to be derived from the practice of the ancient Romans, who inserted the names of heroes and great men in their fasti or public registers. The Roman martyrologies are very numerous, and contain many ridiculous and even contradictory narratives; which is easily accounted for, if we consider how many forged and spurious accounts of the lives of the saints and martyrs appeared in the first ages of the church, which the legendary writers afterwards adopted without examining into the truth of them. However, some good critics, of late years, have gone a great way towards clearing the lives of the saints and martyrs from the monstrous heap of fiction they laboured under. The martyrology of Eusebius of Cæsarea was the most celebrated in the ancient church. It was translated into Latin by St. Jerom; but the learned agree, that it is not now extant. That attributed to Beda, in the eighth century, is of very doubtful authority; the names of several saints being there found who did not live till after the time of Beda. The ninth century was very fertile in martyrologies; then appeared that of Florus, subdeacon of the church at Lyons; who, however, only filled up the chasms of Beda. There are also several Protestant martyrologies, containing the sufferings of the reformed under the papists, viz. an English martyrology, by J. Fox; with others by Clark, Bray, &c. and a Scottish martyrology entitled, "A Cloud of Witnesses," &c.

MARTYROLOGY is also used, in the Romish church, for a toll or register kept in the vestry of each church, containing the names of all the saints and martyrs, both of the universal church, and of the particular ones of that city or monastery.

MARTYROLOGY is also applied to the painted or written catalogues in the Romish church, containing the foundations, obits, prayers, and masses, to be said each day.

MARVEJOLS, a town of France, in the department of Lozere, on the Colange; 10 miles N. W. of Mende, and 300 S. of Paris. Lon. 2. 23. E. Lat. 44. 36. N.

MARY, the mother of our Saviour Jesus Christ, and a virgin at the time that she conceived him; daughter of Joachim and of Anna, of the tribe of Judah, and married to Joseph of the same tribe. The scripture tells us nothing of her parents, not so much as their names, unless Heli mentioned by Luke iii. 23, be the same with Joachim. All that is said concerning the birth of Mary and of her parents is only to be found in some apocryphal writings: which, however, are very ancient. Mary was of the royal race of David, as was also her husband. (See Luke i. 27.) Mr. Whitby thinks the passage might be better rendered thus: 'A virgin of the house of David, espoused to a man whose name was Joseph, and the virgin's name was Mary; because this agrees better with the words of the angel, 'The Lord shall give him the throne of his father David,' ver. 32. For since the angel had plainly told the virgin, that she should have this son without the knowledge of any man, it was not Joseph's but Mary's being of the house of David, that made David his father. Mary was also a-kin to the race of Aaron, as Elizabeth the wife of Zacharias was her cousin (ver. 36.) Her visit to her cousin Elizabeth during her pregnancy; her journey with Joseph to Bethlehem, in consequence of Augustus's decree of universal taxation; her delivery

very disadvantageous circumstances; the congratulations and presents of the Eastern Magi, and the shepherds; the prophecies of Simeon and Anna; her flight with her husband and infant to Egypt, with their return to Nazareth; her presence at the marriage in Cana of Galilee, which Jesus dignified not only with his presence, but by performing his first miracle, in honour of matrimony, and to supply the festive scene; with other interesting particulars are recorded in Matth. ii; Luke i. ii; and John ii. Capernaum seems to have been the place where she afterwards chiefly resided. St. Epiphanius thinks that she followed Jesus every where during the whole time of his preaching; though we do not find the evangelists make any mention of her among the holy women that followed him, and ministered to his necessities. She was, however, at Jerusalem at the last passover that our Saviour celebrated there; she saw all that was transacted against him, followed him to Calvary, and stood at the foot of his cross with a constancy worthy of the mother of the suffering Saviour of mankind. On that trying occasion Jesus recommended her to the care of his beloved disciple. It is not to be doubted, but that our Saviour appeared to his mother immediately after his resurrection; and that she was one of the first, to whom he vouchsafed this great consolation. She was with the apostles at his ascension, and continued with them at Jerusalem, expecting the coming of the Holy Ghost, (Acts i. 14.) After this, she dwelt in the house of St. John the Evangelist, who took care of her as of his own mother. It is thought that he took her along with him to Ephesus, where she died in an extreme old age. There is a letter of the oecumenical council of Ephesus, importing, that in the 5th century it was believed she was buried there; yet there are authors of the same age, who think she died and was buried at Jerusalem.

MARY, the wife of Alpheus, or Cleophas, and the mother of James, Jude, Joseph, Simon, and Salome, is generally reckoned the sister of the blessed virgin; whence her children are called the brethren and sisters of our Saviour. She witnessed his crucifixion; was present at his burial, and prepared spices for embalming his body. See Matth. xiii. 55, xxviii. 1. Mark vi. 3, and xv. 40, Luke xxiii. 56, and xxiv. 10, John xix. 25.

MARY, Queen of England, was the daughter of Henry VIII. by Catherine of Arragon, and born in 1517. Her education was liberal, and she acquired so great a knowledge of the Latin language as to undertake a translation of Erasmus's paraphrase on St. John's gospel, which, however, she did not complete. During the life of her father she experienced many marks of his brutal temper, and her inflexible opposition to his will made him sometimes form a resolution of putting her to death, from which he was diverted by archbishop Crammer. The treatment which her mother had experienced, contributed much towards increasing her dislike to Henry, and to the alterations which he introduced into the church. During the reign of Edward she could not be prevailed with to join in communion with the Protestant divines. On this account that amiable prince was persuaded by the duke of Northumberland, to set aside his sisters from the succession, and to declare lady Jane Grey his heir. At his death in 1553 that lady was proclaimed queen; but her reign lasted only a few days. The partisans of Mary became numerous, and she entered London without opposition. In putting to death lady Jane and her husband lord Dudley she betrayed that sanguinary and vengeful temper which was soon displayed in a violent persecution of the Protestants. Even Crammer, to whom she was indebted for her life, could not escape her bigotry and cruelty. In 1554 she married Philip of Spain, eldest son of Charles V. with whom she lived on indifferent terms. A disappointment occasioned by a supposed miscarriage, and aggravated by the loss of Calais, produced a fever, of which she died in 1558, and with her ended the domination of the papal power in England.—Watkins.

MARY STUART, the daughter of James V. king of Scotland, by Maria of Lorraine, was born in 1542. She was only eight days old when her father died, on which she became heiress to the throne. Henry VIII. of England endeavoured to unite the two kingdoms by a marriage between his son Edward and the infant queen of Scots, but his offer being rejected, he sent his troops into Scotland, where they took and plundered Edinburgh, but were soon obliged to return. In 1548 Mary was contracted to Francis dauphin of France, at which court she acquired those accomplishments which rendered her an object of universal admiration, and

there also she imbibed those prejudices which proved the source of her misfortunes. In 1558 the marriage was celebrated, and by the direction of their father-in-law Mary and her husband assumed the title of king and queen of England, on the supposed ground of the illegitimacy of Elizabeth, an act of ridiculous ambition, which was afterwards fatal to Mary. In 1559 Henry II. died, and Francis became king of France, but in less than two years he left Mary a widow, on which she returned to her native country, and was received by her subjects with joy. Scotland was at this time a prey to fanatical zeal. The presbyterian party carried reformation to shocking lengths, by destroying abbeys, cathedrals, libraries, and even the monuments of the dead. Such was the state of the kingdom at the landing of Mary, who, the first Sunday after her arrival, ordered mass to be said in her chapel. This gave great offence to the people, and it was with difficulty they granted to their sovereign that liberty of conscience which they claimed themselves. Mary shewed a different temper, for she proclaimed, that any attempt towards a change or subversion of the reformed church, should be treated as a capital offence. Notwithstanding this liberality on her part, the people in every pageant and spectacle, delighted to insult the queen by ridiculing her religion. Even the royal chapel was assaulted by the mob, at the instigation of Knox the reformer. Several offers of marriage were made to Mary, who rejected them, and bestowed her hand on Henry Lord Darnley, son of the earl of Lennox, a young nobleman of prepossessing appearance, but weak and impetuous in his mind and temper, and mean and intemperate in his habits. This inauspicious marriage soon ended in disgust, and the enemies of both took the advantage of widening the breach. They persuaded Darnley that David Rizzio, an old Italian musician, whom the queen had appointed her foreign secretary, had supplanted him in her affections. A conspiracy was formed, and one night, while the queen was at supper with the countess of Argyle, Henry conducted his confederates to the royal apartment, where Rizzio was murdered in the presence of Mary, who was then advanced in her pregnancy. James Hepburn, earl Bothwell, became now a favourite in the court of Scotland; a man of considerable intrigue, but of unprincipled conduct. By his arts he gained an ascendancy over the mind of Mary, who appointed him lieutenant of the marches. In 1566 she was delivered of a son, afterwards James VI. of Scotland, and the first of England. Darnley in the mean time seeing himself deprived of power, and generally despised, retired to his country-house, which was blown up one night, and the body of the king found in a garden adjoining, without any marks of violence. This deed of darkness occasioned universal horror, and as it left no doubt that Bothwell was the principal cause, so it drew on Mary suspicions which were never effaced till our own days. After a mock trial Bothwell was acquitted, and he was strengthened in the power he had acquired. He now laid aside the mask, and on the 24th of April, 1567, seized the queen, and carried her to the castle of Dunbar, where by entreaties and force he prevailed on her to marry him. This is the great stain on the character of this ill-fated woman, which has called forth the utmost exertions of her enemies and her advocates. The conduct of Bothwell towards her after this, in keeping her a prisoner under a strong guard, does certainly carry strong presumption that she was forced into this union against her own inclination. A confederacy of the most powerful lords, in the kingdom was formed against Bothwell, who finding himself unable to oppose them, left the kingdom, and died miserably in Denmark. Mary was committed to the charge of her greatest enemy, the mother of the earl of Murray, who had assumed the title of regent, and the lords of the confederacy forced the queen to sign a renunciation of her crown in favour of her son, and he was accordingly crowned at Stirling. After this, the enemies of Mary, who had suffered Bothwell to quit the kingdom, caused different persons to be executed for being concerned in the king's murder. All these solemnly acquitted Mary of being privy to that transaction. Notwithstanding this, the council, for the purpose of rendering her odious, and colouring their own tyranny, produced letters, purporting to be written by her, which if true, would clearly establish the fact. But they have been proved forgeries. Mary having escaped from her prison in the island of Lochleven, hastened to Hamilton, where she found many friends; but the relentless Murray marching against them, the royal party was defeated. On this Mary fled into England, where she im-

explored the protection of Elizabeth, who acted with great duplicity for some time, and at length declared that no assistance could be afforded her unless she submitted to a legal trial. After some difficulties this was agreed to, and the cause was to be determined at York by a commission, which was, finally, removed to London, where it was declared, that "nothing had been produced whereby the queen of England could conceive or take any evil opinion of her good sister, for any thing yet seen." This is a sufficient vindication of Mary's innocence, and yet she was still kept in close confinement. The duke of Norfolk formed the design of marrying Mary, in which he was encouraged by several of the English nobility, and also by the regent Murray. But this being discovered by Elizabeth, the duke was sent to the Tower, from whence he was not released till he promised to renounce all correspondence with the queen of Scotland:—but afterwards renewing his ambitious project, he was tried and executed. After a long confinement at Coventry, Mary was removed to Fotheringay castle, where she was to undergo the mock formality of a trial on the charge of fomenting conspiracies against Elizabeth. When brought before the commissioners she disclaimed their authority, and asserted her innocence. The commissioners, after hearing her defence, removed the matter to Westminster, and, though no proof appeared to the charges, she was declared guilty of conspiring the death of Elizabeth. Mary received the tidings with complacency, being wearied by her unparalleled persecutions. Many foreign powers interested themselves in her behalf, and her son James endeavoured to save her life, but in vain. A warrant was sent down, and read to the royal captive, who only entreated that she might be permitted the consolations of her own religion. Even this favour was inhumanely refused. She was beheaded in the castle of Fotheringay, Feb. 8, 1587, after praying to God to forgive all who had thirsted for her blood. Thus fell Mary Stuart, a princess of uncommon beauty and accomplishments as well as misfortunes. Her remains were interred in Peterborough cathedral, from whence they were removed by her son, and deposited in Westminster abbey. Her memory has been successfully vindicated by the learned Whitaker and other writers.—Watkins.

MARY II. queen of Great Britain, eldest daughter of James II. by his first wife, was born at St. James's in 1662. She was bred up a Protestant, and married to William III. of Nassau, then prince of Orange, afterward king of England, in the 16th year of her age. She staid in Holland with her husband till Feb. 12, 1689, when she came over, and was proclaimed queen of England, &c. She was an equal sharer with her husband in all the rights belonging to the crown; but the administration was lodged solely in the king. She was a princess endowed with the highest perfections both of body and mind: she loved history and poetry, of which last she was a good judge. She studied much, and would have read more than she did, if the delicacy of her eyes had permitted her. She devoted her leisure to architecture and gardening. She was a most gracious sovereign to her subjects; too good a wife to such a husband, and a most excellent mistress to her servants. She ordered good books to be laid in their places of attendance, that they might not be idle while waiting. She was zealous for a reformation of manners, and charitable in the highest degree, without ostentation. This excellent queen died on the 25th December 1694, at Kensington, of the small-pox, aged 33. In her the arts lost a protectress, the unfortunate a mother, and the world a pattern of every virtue. As to her person, she was tall, of a majestic graceful mien, her countenance serene, her complexion ruddy, and her features beautiful.

MARY MAGDALEN, who has been generally confounded with Mary the sister of Martha and Lazarus, but very improperly, was probably that sinner mentioned by St. Luke, in chap. vii. 36, 37, &c. whose name he does not tell us. There are some circumstances, which render it probable, that she is the same person whom he calls Mary Magdalen, in chap. viii. 2, and out of whom he says, Jesus drove seven devils. These passages, it must be owned, afford no positive proof that the sinner mentioned before was Mary Magdalen; however, it is all we have in support of this opinion, which has been very general, though it has been ably controverted. Mary Magdalen had her surname, it is thought, from the town of Magdala in Galilee. Lightfoot thinks that this Mary is the same with Mary the sister of Lazarus. Magdalen is mentioned by the evangelists among the women that followed our

Saviour, to minister to him, according to the custom of the Jews. St. Luke (viii. 2,) and St. Mark (xvi. 9,) observe, that this woman had been delivered by Jesus Christ from seven devils. This some understand literally, but others take it figuratively, for the crimes and wickedness of her past life, (supposing her to be the sinner above mentioned,) from which Christ had rescued her. Others maintain, that she had always lived in virginity; and make her quite a different person from the sinner above-mentioned; and by the seven devils of which she was possessed, they understand a real possession, which is not inconsistent with a holy life. This indeed is the most probable opinion, and has been best supported. The author of a Letter to Jonas Hanway on the Subjects of Magdalen House, published in 1758, has shewn by a variety of learned remarks and quotations, both from the scriptures and from the best commentators, that Mary Magdalen was not the sinner spoken of by Luke, but on the contrary that she "was a woman of distinction, and very easy in her worldly circumstances; that she had laboured under some bodily indisposition, which our Lord miraculously healed; and that, so far as we know, her conduct was always regular and free from censure;" &c. Mary Magdalen followed Christ in the last journey that he made from Galilee to Jerusalem, and was at the foot of the cross with Mary his mother. (John xix. 25. Mark xv. 47.) She also had the happiness of first seeing our Saviour after his resurrection. See Matt. xxviii. 5, &c. Mark xvi. 6, &c. John xx. 11, 17. As to the pretended History of Mary Magdalen, which is said to have been written in Hebrew by Marcella, servant of Martha; this can only relate to Mary the sister of Martha were it true, but it is a mere piece of imposture.

MARY, St. an island in the East Indian Ocean, on the N. W. coast of Borneo. Lon. 114. 30. E. Lat. 6. 30. N.

MARY, St. a fertile island in the Indian Ocean, 9 miles from the E. coast of Madagascar; 45 miles long and about 8 broad.

MARYBOROUGH, a town of Ireland, the capital of Queen's county, in Leinster. Lon. 7. 20. W. Lat. 53. 0. N.

MARYLAND, one of the seventeen United States of America, so named in honour of Henrietta Maria, the consort of king Charles I. It lies between 38° and 40° Lat. N. and between 74° and 78° Lon. W. of London. It is bounded on the N. by Pennsylvania; E. by Delaware; S. E. and S. by the Atlantic Ocean, and by Virginia on the S. W. and W. It is divided into nineteen counties, eleven of which are on the western shore of Chesapeake bay, viz. St. Mary's, Calvert, Montgomery, Washington, Charles, Baltimore, Ann Arundel, Harford, Frederick, Allegany, and Prince George's; and eight on the eastern shore; viz. Cecil, Kent, Queen Anne's, Caroline, Talbot, Somerset, Dorchester, and Worcester. The climate is mild and agreeable, suited to agricultural productions and fruit-trees. In the interior hilly country the inhabitants are healthy; but in the flat country, near the marshes, they are subject to intermittents. Chesapeake bay divides this state into the eastern and western shores. It affords several good fisheries, and is of immense advantage to the state. It receives a number of the largest rivers in the United States. East of the blue ridge of mountains, which stretches across the W. part of this state, the land is generally level and free of stones. Wheat and tobacco are the staple commodities. In the interior country, on the uplands, considerable quantities of hemp and flax are raised. Those of the country live on their plantations, often several miles distant from each other. The chief towns are Annapolis and Baltimore. The trade of Maryland is principally carried on from Baltimore, with the other states, with the West Indies, and with some parts of Europe. To these places they sent annually about 30,000 hogsheads of tobacco, besides large quantities of wheat, flour, pig-iron, lumber, and corn; beans, pork and flax-seed, in smaller quantities; and receive in return, clothing for themselves and negroes, and other dry goods, wines, spirits, sugars, and other West India commodities. The Roman Catholics, who were the first settlers in Maryland, are the most numerous religious sect. Besides these, there are Protestant Episcopalians, English, Scots, and Irish, Presbyterians, German Calvinists, German Lutherans, Friends, Baptists, Methodists, and Nicolites or New Quakers.

MASAFUERO, an island of the South Sea, lying in Lat. 33 45. S. Lon. 80. 46. W. It is very high and mountainous, and a distance seems to consist of one hill. It is of a triangular form

even or eight leagues in circumference. The coast abounds with coal-fish, cavilliers, cod, halibut, cray-fish, &c.

MASBOTHEI, MASBUTHLEI, or MESBOTHEI, the name of a sect, or rather of two sects; for Eusebius, or rather Hegeippus, whom he cites, mentions two different sects of Masbotheans. The first was one of the seven Jewish sects before the birth of Christ: the other was one of the seven sects that arose out of Judaism, and proved very troublesome to the church. The name is derived from the Hebrew שבת *schabat*, to rest or repose, and signifies idle, easy, indolent, people. Eusebius supposes they had been so called from one Masbotheus their chief; but it is more probable that their name is Hebrew, or Chaldaic, signifying a Sabbatarian, or one who professes to keep the Sabbath strictly.

MASCLEFF, FRANCIS, was at first a curate in the diocese of Amiens, the place of his birth, and afterwards theologian and confidant to the virtuous Bishop De Bron. He was appointed to the charge of a seminary of learning under that prelate, which he merited both from his piety and learning. The oriental languages were as familiar to him as his native tongue. He was made canon of Amiens in 1706. But his opinions on the Jansenist controversy were so offensive to Sabbatier, that he was removed from the seminary and from almost every other public office which he held. He then devoted himself to study with so much ardour, that he contracted a disease of which he died November 14, 1728, aged 66. His principal works are, 1. A Hebrew Grammar in Latin, Paris, 1716, 12mo. 2. Les Conférences Ecclesiastiques du Diocèse d'Amiens, in 12mo. 3. Le Catechisme d'Amiens, in 4to. 4. Une Philosophie et une Theologie, in MS.

MASCULINE, in grammar. See GENDER, and LANGUAGE.

MASCULINE RHYME, in the French poetry, is that made with a word which has a strong, open, and accented pronunciation; as all words have, excepting those which have an *e* feminine in their last syllable. For instance, *amour* and *four*, *mort* and *sort*, are masculine rhymes; and *pere* and *mere*, *gloire* and *memoire*, are feminine.

MASCULINE SIGNS. Astrologers divide the planets and signs into masculine and feminine by reason of their qualities, which are either active, and hot or cold, accounted masculine; or passive, dry and moist, which are feminine. On this principle they call the Sun, Jupiter, Saturn, and Mars, masculine; and the Moon and Venus, feminine. Mercury, they suppose, partakes of the two. Among the signs, Aries, Libra, Gemini, Leo, Sagittarius, Aquarius, are masculine: Cancer, Capricornus, Taurus, Virgo, Scorpio, and Pisces, are feminine.

MASHAM, Lady DAMARIS, a learned and ingenious English lady, daughter of the celebrated Dr. Cudworth, and wife of Sir Francis Masham, by whom she had one son, was born in 1658. She and Sir Francis were the intimate friends of the celebrated Mr. Locke, whom they entertained at their seat at Oates in Essex, for many years before he died. She wrote "A Discourse on the Love of God," 8vo. and "Occasional Thoughts in Reference to a Virtuous and Christian Life;" 8vo. She died in 1708, aged 50.

MASKELYNE, Rev. NEVIL, a very eminent British astronomer, was born in 1733. Early in his life he was made Fellow of Trinity College, Cambridge. He had the title of B. A. conferred on him in 1754, M. A. in 1757, B. D. in 1768, D. D. in 1777, and was appointed Astronomer Royal to his present Majesty, February 13, 1765, on the death of Dr. Nathaniel Bliss. When promoted to this eminent situation, his assiduity to promote the interests of astronomy and navigation was very great, successful, and unremitting; he, among many other improvements, which would be here too tedious to enumerate, brought into general practice the method of determining the longitude by means of the moon's distances from the sun and the principal fixed stars; for which great purpose the "Nautical Almanac or Astronomical Ephemeris," under his superintendence, has been calculated for four or five years in advance, that it might be useful to persons who undertake long voyages, as well as for other navigators who do not visit very distant countries. In this invaluable work the distances of the moon from the sun and fixed stars, contained in the VIIth, IXth, Xth, and XIth pages of the months, are set down to every three hours of apparent time by the meridian of

Greenwich, and are designed to relieve the mariner from the necessity of a calculation, which he might think prolix and troublesome, and likewise to enable him, when compared with the distance carefully observed at sea, to infer his longitude readily, and with little danger of mistake to a degree of exactness that may be thought necessary for most nautical purposes; and the late eminent improvements in the Lunar Tables by the celebrated Mr. Burg of Vienna, has rendered this method of determining the longitude of places at sea, the most complete of any hitherto laid before the public. Dr. Maskelyne also proposed the project, and superintended the experiment, for accurately measuring the effect of a mountain on the plumbline. It was found that the sum of its deflections from the perpendicular on the opposite sides of Scheibellien, a mountain in Scotland, are $11^{\circ} \frac{1}{2}$, and it is proved, to the satisfaction of the whole mathematical world, that every particle of matter is attractive. From these observations Dr. Hutton has computed the mean density of the earth to be about $4 \frac{1}{2}$ times that of common water. Dr. Maskelyne has also determined the proper annual motions in right ascension of Sirius, Castor, Procyon, Pollux, Regulus, Arcturus, and α Aquilæ, which are as follow: $-0^{\circ}, 63$, $-0^{\circ}, 28$, $-0^{\circ}, 80$, $-0^{\circ}, 93$, $-0^{\circ}, 41$, $-1^{\circ}, 40$, and $+0^{\circ}, 57$. Two of them, Sirius and Arcturus, he has found to have also a change of declination, viz. $1^{\circ}, 20$ and $2^{\circ}, 01$, annually, both southward. In the Philosophical Transactions for 1777, he has given us an account of his invention of a new instrument for measuring small angles, called the prismatic micrometer. This excellent invention consists of two achromatic prisms or wedges, applied between the object-glass and eye-glass of an achromatic telescope, about thirty inches long, by moving of which wedges nearer to, or farther from, the object-glass, the two images of an object produced by them appear to approach to, or recede from, each other; so that the focal length of the object-glass becomes a scale for measuring the angular distance of the two images. The Dr.'s title to this invention has been brought in question, but without any proper foundation; for it is attested that he was the sole inventor of it by Alex. Aubert, Esq. F. R. S. and Mr. Dollond, by whom it was executed, and the other saw it so executed, in May 1776, above a twelve-month before the communication of the Abbé Boscovich's paper, though he described it as the invention of the Abbé Rochon, and also claimed some share in it himself. In the Nautical Almanacs, besides the common matter necessary for such a publication, he has, from time to time, added several very useful and important discoveries and observations made by himself in the sciences of astronomy and navigation. To the Astronomical Ephemeris for 1769 he has annexed excellent instructions relative to the observation of the Transit of Venus over the Sun's disk, which happened in the evening of June 3, of that year. To the Nautical Almanac of 1772, he has annexed two very valuable methods for clearing the apparent distance of the moon from the sun or a fixed star of the effect of refraction and parallax. To the Nautical Almanac of 1774, he has added Remarks on the Hadley's Quadrant. To the Nautical Almanac of 1787 he has added some remarks on the tremors of reflecting telescopes. To the Nautical Almanac of 1791, he has annexed an advertisement of the expected return of the comet of 1532 and 1661 in 1788, which, (though it entirely disappointed the astronomical world, the comet not making its appearance agreeably to his calculations,) yet served to shew the world the extensive knowledge possessed by this able astronomer in the science of the mathematics; and he certainly would not have failed in this point, had not the data upon which he, and his great predecessor Dr. Halley, built their calculations been entirely hypothetical. Dr. Maskelyne was presented in January 1775, by his nephew Lord Clive, to the rectory of Shrawarden, in Salop, and in 1782, by the Master and Fellows of his college to the living of North Runcton in Norfolk. He has published three folio volumes of Astronomical Observations made by himself at the Royal Observatory at Greenwich; and these volumes have been so highly beneficial in the service of astronomy and navigation, that the best Lunar Tables yet extant have been almost entirely computed from them by Mr. Burg, a German astronomer; and these Tables agree with observation to the surprising nicety of about $30''$ of a minute, a degree of accuracy which only a century ago could not have been imagined even possible ever to be obtained. Vol. I. contains his observations from 1765 to 1774, together with his Tables for com-

putting the apparent places of the fixed stars, and reducing observations of the planets. Vol. II. contains his observations from 1775 to 1786; and Vol. III. continues them from 1787 to 1798. For 1799, and forward, his observations are published annually at the small expence of 2s. 6d. for each year. As a man Dr. Maskelyne was esteemed by all who knew him, as a philosopher he had scarce his equal. Mr. Grosley, in his book intituled, "Londres," 3 vols. 8vo. 1770, among many disparaging characters of Englishmen whom he saw in his stay at London in 1765, gives this advantageous one of Dr. Maskelyne, "chez lequel je trouvai une politesse et une complaisance que les Savans de ce rang n'ont pas toujours pour des Passans." This was at the Observatory at Greenwich. He died at the Royal Observatory, on Feb. 9, 1811, in the 79th year of his age, after he had held the eminent situation of Astronomer Royal for very near 46 years.

MASON, [*machio*, low Lat.] a person employed under the direction of an architect, in raising a stone-building. His chief business is to make the mortar; raise the walls from the foundation to the top, with the necessary retreats and perpendiculars; to form the vaults, and employ the stones as delivered to him. When the stones are large, the business of hewing or cutting them belongs to the stone cutters, though these are frequently confounded with masons: the ornaments of sculpture are performed by carvers in stones or sculptors. The tools or implements principally used by them are the square, level, plumb-line, bevel, compass, hammer, cli el, mallet, saw, trowel, &c. See **SQUARE**, &c. Besides the common instruments used in the hand, they have likewise machines for raising great burdens, and conducting large stones; the principal of which are the lever, pulley, wheel, crane, &c. See **CRANE**, **LEVER**, &c.

MASONS, FREE AND ACCEPTED, a very ancient society; so called, either from some extraordinary knowledge of masonry, which they are supposed to be masters of, or because the first founders of that society were persons of that profession. These are now very considerable, both for number and character, being found in every country in Europe, and N. America; and consisting principally of persons of merit and consideration. As to antiquity, they claim a standing of some thousand years. What the end of their institution is, seems still in some measure a secret; and they are said to be admitted into the fraternity by being put in possession of a great number of secrets, called the mason's word, which have been religiously kept from age to age. See **MASONRY**.

MASONRY, in general, a branch of architecture, consisting in the art of hewing or squaring stones, and cutting them level or perpendicular, for the uses of building; but, in a more limited sense, it is the art of joining stones together with mortar. Hence arise as many different kinds of masonry as there are different forms for laying and joining stones. Vitruvius mentions several kinds of masonry used among the ancients; three of hewed stone, viz. that in form of a net, that in binding, and that called the Greek masonry; and three of unhewed stone, viz. that of an equal course, that of an unequal course, and that filled up in the middle; and the seventh was a composition of all the rest. Net-masonry, called by Vitruvius *reticulatum*, from its resemblance to the meshes of a net, consists of stones squared in their courses, and so disposed as that their joints go obliquely; and their diagonals are the one perpendicular and the other level. This is the most agreeable masonry to the eye, but is very apt to crack. See Plate CIII. fig. 10. Bound masonry, that in which the stones were placed one over another, like tiles; the joints of their beds being level, and the mounters perpendiculars, so that the joint that mounts and separates two stones always falls directly over the middle of the stone below. This is less beautiful than the network; but more solid and durable, fig. 11, and 12. Greek masonry, according to Vitruvius, is that where, after we have laid two stones, each of which makes a course, another is laid at the end, which makes two courses, and the same order is observed throughout the building; this may be called double-binding, in regard the binding is not only of stones of the same course with one another, but likewise of one course with another course, fig. 13. Masonry by equal courses, called by the ancients *isodomum*, differs in nothing from the bound masonry, but this, that its stones are not hewn, fig. 14. Masonry by unequal courses, called *pseudisodomum*, is also made of unhewed stones, and laid

in bound work; but then they are not of the same thickness, nor is there any equality observed, excepting in the several courses, the courses themselves being unequal to each other. Fig. 15. Masonry filled up in the middle, is likewise made of unhewed stones, and by courses; but the stones are only set in order as to the courses, fig. 16. A, the courses; B, the parts filled up. Compound masonry is of Vitruvius's proposing, so called as being composed of all the rest. In this the courses are of hewed stone; and the middle being left void, is filled up with mortar and pebbles thrown in together: after this the stones of one course are bound to those of another course with iron-cramps fastened with melted lead, fig. 17. E, the stones cramped; F, the cramps; G, the middle-part filled up. Fig. 18, represents another sort of compound masonry, the middle of which is stone, and the edges board. All the kinds of masonry now in use may be reduced to these five, viz. bound masonry; that of brick work, where the bodies and projectures of the stones enclose square spaces or pannels, &c. set with bricks; that de moilon, or small work, where the courses are equal, well squared, and their edges or bed rusticated; that where the courses are unequal; and that filled up in the middle with little stones and mortar.

MASONRY, FREE, the system of mysteries and secrets peculiar to the society of free and accepted masons.

MASORA, a term in the Jewish theology, signifying a work on the Bible, performed by several learned rabbins, to secure it from any alterations which might otherwise happen. Their work regards merely the letter of the Hebrew text, in which they have, first, fixed the true reading by vowels and accents. 2dly, They have numbered not only the chapters and sections, but the verses, words, and letters, of the text: and they find in the Pentateuch 5245 verses, and in the whole Bible 23206. The masora is called by the Jews, the hedge or fence of the law because this enumeration of the verses, &c. is a means of preserving it from being corrupted and altered. 3dly, They have marked whatever irregularities occur in any of the letters of the Hebrew text: such as the different size of the letters, their various positions and inversions, &c. and they have been fruitful in finding out reasons for these irregularities, and mysteries in them. 4thly, They are supposed to be the authors of the Keri and Chetiph, or the marginal corrections of the text in the Hebrew Bibles. The text of the sacred books, it is to be observed, was originally written without any breaks or divisions into chapters or verses, or even into words; so that a whole book, in the ancient manner, was but one continued word: of this kind we have still several ancient MS. books, both Greek and Latin. As, therefore, the sacred writings had undergone an infinite number of alterations, whence various readings had arisen, and the original was become much mangled and disguised, the Jews had recourse to a canon, which they judged infallible, to fix the reading of the Hebrew text; and this rule they call masora, tradition, from *מסרה*, tradidit, as if this critique were nothing but a tradition which they had received from their forefathers. Accordingly they say, that when God gave the law to Moses at Mount Sinai, he taught him, first, the true reading of it; and, 2dly, its true interpretation; and that both these were handed down by oral tradition, from generation to generation, till at length they were committed to writing. The former of these, viz. the true reading, is the subject of the masora; the latter, or true interpretation, that of the mishna and gemara. There is a great and little masora printed at Venice and at Basil, with the Hebrew text in a different character. Buxtorf has written a masoretic commentary, which he calls *Tiberias*.

MASORITES, the compilers of the Masora. Elias Levita says, they were the Jews of a famous school at Tiberias, who about A. D. 500, composed, or at least began, the masora; whence they are called masorites, and masoretic doctors. Aben Ezra makes them the authors of the points and accents in the Hebrew text, as we now find it; and which serve for vowels. The age of the masorites has been much disputed. Archbishop Usher places them before Jerom; Capel, at the end of the fifth century; father Morin, in the tenth century. Basnage says, that they were not a society, but a succession of men; and that the masora is the work of many grammarians, who, without associating and communicating their notions, composed this collection of criticisms on the Hebrew text. It is urged that there were masorites from the time of Ezra and the men of the great synagogue, to about A. D. 1030; and

and that Ben Asher and Ben Naphtali, who were the best of the profession, and who according to Basnage, were the inventors of the masora, flourished at this time. Each of these published a copy of the whole Hebrew text, as correct, says Dr. Prideaux, as they could make it. The eastern Jews followed that of Ben Naphtali, and the western that of Ben Asher; and all that has been done since is to copy after them, without making any more corrections or masoretical criticisms. The Arabs have done the same thing by their Koran that the masorites have done by the Bible; nor do the Jews deny their having borrowed this expedient from the Arabs, who first put it in practice in the seventh century.

MASOVIA, MASSOVIA, or MASUREN, one of the most ancient provinces of Poland, and one of the last that remained to that unfortunate kingdom. It consisted of two palatinates, viz. Czersk, or Massovia Proper, and Polotosk. Warsaw is the capital.

MASQUE, or MASK, a cover for the face, contrived with apertures for the eyes and mouth; originally worn chiefly by women of condition, either to preserve their complexion from the weather, or out of modesty to prevent their being known. Poppea, wife of Nero, is said to have invented the masque; to guard her complexion from the sun, being uncommonly delicate with regard to her person. Theatrical masques, however, were in use both among the Greeks and Romans: Suidas and Athenæus ascribe the invention of them to the poet Choerilus, a contemporary of Thespis; Horace attributes them to Æschylus; but Aristotle says that the real inventor, as well as the time of their first introduction and use, were unknown. Brantome observes, that the use of masques was not introduced till towards the end of the 16th century.

Masque is also used to signify any thing made to cover the face, and prevent a person's being known.

Masque, in architecture, is applied to certain pieces of sculpture, representing some hideous forms, grotesque, or satyrs' faces, &c. used to fill up and adorn vacant places, as in friezes, the pannels of doors, keys of arches, &c. but particularly the grottos.

MASQUERADE, or MASCARADE, an assembly of persons masqued, and dressed in peculiar habits, who, for want of better and more rational employment, meet to dance and divert themselves. The word is derived from the Italian *mascarata*, and that from the Arabic *maskara*, which signifies raillery, or buffoonery.

MASRAKITHIA, a pneumatic instrument of music among the ancient Hebrews, composed of pipes of various sizes, fitted into a kind of wooden chest, open at the top, and stopped at the bottom with wood covered with a skin.

MASS, in mechanics, is the matter of any body cohering with it, *i. e.* moving and gravitating along with it; in which sense, mass is distinguished from bulk, or volume, which is the expansion of a body in length, breadth, and thickness. The mass of any body is rightly estimated by its weight. And the masses of two bodies of the same weight are in reciprocal ratio of their bulks. See **MECHANICS**.

Mass, in the Latin church, the prayers used at the celebration of the eucharist, in consecrating the bread and wine into the body and blood of Christ, and offering them so transubstantiated as an expiatory sacrifice for the quick and the dead. By the Roman Catholics it is in general believed to be a representation of the passion of our blessed Saviour; so every action of the priest, and every particular part of the service, is supposed to allude to the particular circumstances of his passion and death. Nicod, after Baronius, observes that the word *missa* comes from the Hebrew *missach*, oblation; or from the Latin *missa*, *missorum*; because formerly the catechumens and excommunicated were sent out of the church, when the deacons said, *Ite, missa est*, after sermon and reading of the epistle and gospel; they not being allowed to assist at the consecration. Menage derives the word from *missio*, dismissing: others from *missa*, sending; because in the mass, the prayers of men on earth are sent up to heaven. The general division of masses consists in high and low. The former are sung by the choristers, and celebrated with the assistance of a deacon and subdeacon; the latter are those in which the prayers are barely rehearsed without singing. There is a great number of different occasional masses in the Romish church, many of which

have nothing peculiar but the name; such are the masses of the saints; that of St. Mary of the snow, celebrated Aug. 5; that of St. Margaret, patroness of lying-in women; that of the feast of St. John the Baptist, at which are said three masses; that of the Innocents, at which the gloria in excelsis and the hallelujah are omitted, and it being a day of mourning, the altar is of a violet-colour. As to ordinary masses, some are said for the dead, and are supposed to contribute to fetch the soul out of purgatory: at these masses the altar is put in mourning, and the only decorations are a cross in the middle of six yellow wax-lights; the dress of the celebrant, and the very mass-book, are black; many parts of the office are omitted, and the people are dismissed without the benediction. If the mass be said for a person distinguished by his rank or virtues, it is followed with a funeral-oration; they erect a chapelle ardente, that is, a representation of the deceased with branches and tapers of yellow wax, either in the middle of the church, or near the deceased's tomb, where the priest pronounces a solemn absolution of the deceased. They are likewise private masses said for stolen or strayed goods or cattle, for health, for travellers, &c. which go under the name of votive masses. There is still a further distinction of masses denominated from the countries in which they were used; thus the Gothic mass, or missa Mosarabum, used among the Goths when they were masters of Spain, which is still kept up at Toledo and Salamanca; the Ambrosian mass composed by St. Ambrose, and used only at Milan, of which city he was bishop; the Gallic mass used by the ancient Gauls; and the Roman mass, used by almost all the churches in the Romish communion.

MASSA, a town of Italy, capital of the district of Massa and Carrara. Lon. 14. 23. E. Lat. 40. 40. N.

MASSA, a town of Naples in Lavora. Lon. 10. 0. E. Lat. 43. 5. N.

MASSA AND CARRARA, a district of Italy, in the department of Crostolo, and late duchy of Modena.

MASSACHUSETTS, one of the United States of N. America, bounded on the E. by the Atlantic; S. by that ocean, and the States of Rhode Island and Connecticut; W. by New York; and N. by Vermont and New Hampshire. It lies between Lon. 69. 57; and 73. 38. W. and between Lat. 41. 13, and 43. 52. N. The climate of this state is the same with that of New England, of which it was formerly a province. It is divided in 17 counties, viz. Suffolk, Norfolk, Essex, Middlesex, Hampshire, Plymouth, Bristol, Barnstable, Duke's county, Nantucket, Worcester, Berkshire, York, Cumberland, Lincoln, Hancock, and Washington. The chief cities are Boston, Salem, Cambridge, Concord, Newbury, Charlestown, Worcester, and Northampton. The soil consists of all kinds of varieties from the best to the worst; and produces Indian corn, wheat, rye, barley, oats, potatoes, peas, beans, flax, hemp, hops, apples, pears, peaches, plums, cherries, &c. The principal rivers are the Housatonic, Deerfield, Connecticut, Merrimack, Nashua, Concord, Charles, and Neposet. Cape Ann and Cape Cod are the chief promontories. The principal bays are Boston, Plymouth, Barnstable, Buzzard's, and Massachusetts. The chief islands are Nantucket, Martha's Vineyard, Elizabeth and Plumb Island. Great quantities of iron-ore, and several mineral waters, are found in this state; also, copper-ore, plumbago, marble, alum, slates, red and yellow ochre, &c. and in some places asbestos. The western part of it is mountainous.

MASSAFRA, a town of Naples, in Otranto, 23 miles E. of Matera. Lon. 17. 20. E. Lat. 40. 30. N.

MASSALIANS, a sect of enthusiasts who sprang up about A. D. 361, in the reign of the emperor Constantius, who maintained that men have two souls, a celestial and a diabolical, and that the latter is driven out by prayer.

MASSERANO, a town and territory of France, in the department of the Sezia, and late principality of Piedmont, 40 miles N. E. of Turin. Lon. 8. 14. E. Lat. 45. 38. N.

MASSETER, in anatomy, a muscle which had its origin in the lower and interior part of the jugum, and its end at the external superficies of the angle of the jaw. See **ANATOMY**.

MASSICOT, a name given to the yellow oxide of lead, as minium is applied to the red oxide.

MASSILIA, in ancient geography, a town of Gallia Narbonensis. It is now called Marseilles.

MASSILLON, JOHN BAPTIST, the son of a notary at Hieres in Provence, born in 1663, and entered into the congregation of the oratory in 1681. He gained the affections of every person in the towns to which he was sent, by the charms of his genius, the liveliness of his character, and by a habit of the most delicate and affecting politeness. His first attempts in the art of eloquence were made at Vienne, while he was professor of theology. His funeral-oration on Henry de Villars, archbishop of that city, received universal approbation. This success induced F. de la Tour, then general of the congregation, to call him to Paris. Upon preaching his first advent sermon at Versailles he received this eulogium from Lewis XIV. "Father, when I hear others preach, I am very well pleased with them; but whenever I hear you, I am dissatisfied with myself." The first time he preached his famous sermon "on the small number of the elect," the whole audience, were, at a certain place of it seized with a sudden and violent emotion, and almost every person half rose from his seat by a kind of involuntary movement. The murmur of acclamation and surprise was so great, that it threw the orator into confusion; but this only heightened the impression of that pathetic discourse. Baron, the famous comedian, one day said to him, "continue to deliver as you do. Your manner is peculiar to yourself; leave the observance of rules to others." And to one of his dramatic companions he said, "Friend, here is an orator; we are only actors." In 1717, the regent appointed him bishop of Clermont. In 1718, being appointed to preach before Lewis XV. then only nine years of age, he composed in six weeks the discourses well known by the name of *Petit Carême*, which are the chef d'œuvre of this orator, and indeed of the oratorical art. They ought continually to be read by preachers as models for the formation of their taste, and by princes as lessons of humanity. He was admitted into the French academy in 1719. The abbacy of Savigny becoming vacant, the cardinal du Bois procured it for him. The funeral-oration of the duchess of Orleans, in 1723, was the last discourse he pronounced in Parliament. He never afterwards left his diocese, where his gentleness, politeness, and humanity, gained him the affection of all who knew him. He reduced the exorbitant rights of the episcopal roll to moderate sums. In two years, he caused 20,000 livres to be privately conveyed to the Hotel Dieu of Clermont. He died on the 28th Sept. 1742, aged 79. No public speaker ever knew better how to touch the passions. Preferring sentiment to every thing, he communicated to the soul that lively and salutary emotion which excites the love of virtue. His eloquence was pathetic, and equally suited to please the man of genius and the multitude, the philosopher, and the courtier. He could at once think, describe, and feel. In a word, of all the French orators, he is most esteemed by foreigners. An excellent edition of Massillon's works was published by his nephew at Paris in 1745 and 1746, in 14 vols. large 12mo, and 12 vols. of a small size. The Abbé de la Porte collected into 1 vol. 12mo. the most striking and sublime ideas in Massillon's works. This collection appeared at Paris in 1748, 12mo, intitled, *Pensées sur differens sujets de morale, de piété, tirées, &c.* A Selection and Translation of Massillon's Sermons, in 3 vols. 8vo. by Mr. William Dickson of Edinburgh, was published at Perth, in 1798.

MASSIVE, among builders, is applied to whatever is too heavy; thus a massive column is one too short and thick for the order whose capital it bears; and a massive wall is one whose openings or lights are too small in proportion.

MASSIUS, or MASIUS, ANDREW, a learned lexicographer, born at Linnich, near Brussels, in 1516. He became counsellor to the Duke of Cleves. He published, 1. A Syriac Lexicon and Grammar. 2. A Commentary on Joshua; and other works. He died in 1573, aged 57.

MASSONIA, a genus of the class and order hexandria monogynia, natural order, Coronaria. Corolla inferior, border six-parted; filaments on the neck of the tube; capsule three-winged, three-celled, many-seeded. There are four species, natives of the Cape.

MASSOOLAH BOAT, a boat used at Madras, for conveying strangers ashore, from on board a ship. It is of curious construction, and well calculated to elude the violent shocks of the surf, that breaks there with great violence. It is formed without a keel, flat-bottomed, with the sides raised high, sewed together

with the fibres of the cocoa-nut-tree, and caulked with the same material.

MASSUAH, or MASUAH, a small island in the Red Sea, near the coast of Abyssinia, about three quarters of a mile long, and half as broad.

MAST, in naval architecture, a large timber in a ship, for sustaining the yards, sails, &c. The mast, which is placed at the middle of the ship's length, is called the main-mast; that which is placed in the fore-part, the fore-mast; and that which is towards the stern, the mizen. Mizen is applied to this mast by all the nations of Europe, except the French, who alone call the fore-mast *misaine*. See *SHIP-BUILDING*.

MASTER, [*magister*, Lat.] in general, is a title of authority. The Romans had a great many officers thus denominated; as the master of the people; *magister populi*, who was the dictator. Master of the cavalry, *magister equitum*, who held the second post in an army after the dictator. Under the later emperors there were also masters of the infantry, *magistri peditum*. A master of the census, *magister census*, who had nothing of the charge of a censor, or subcensor, as the name seems to intimate; but was the same with the *propositus frumentarium*.

MASTER AT ARMS, an officer appointed to teach the officers and crew of a ship of war the exercise of small arms; to confine and plant centinels over the prisoners, and superintend whatever relates to them during their confinement. He is also to observe that the fire and lights are extinguished as soon as the evening-gun is fired, except those which are permitted by proper authority, or under the inspection of centinels. It is likewise his duty to attend the gangway when any boats arrive aboard, and search them carefully, together with their rowers, that no spirituous liquors may be conveyed into the ship unless by permission of the commanding officer. In these several duties he is assisted by proper attendants, called his corporals, who also relieve the centinels and one another at certain periods.

MASTER-ATTENDANT is an officer in the royal dock-yards, appointed to hasten and assist at the fitting out or dismantling, removing or securing, vessels of war, &c. at the port where he resides. He is particularly to observe, that his majesty's ships are securely moored, and for this purpose he is expected frequently to review the moorings which are sunk in the harbour, and observe that they are kept in proper repair. It is also his duty to visit all the ships in ordinary, and see that they are frequently cleaned and kept in order; and to attend at the general musters in the dock-yards, taking care that all the officers, artificers, and labourers, registered at the navy-books, are present at their duty.

MASTER, GRAND, a title given to the chiefs of the orders of knighthood, &c. such as, the grand master of Malta; of St. Lazarus; of the Golden Fleece; of the Free Masons, &c.

MASTER OF ARMS, [*magister armorum*, Lat.] was an officer or comptroller in the lower empire under the master of the militia.

MASTER OF ARTS, the first degree taken up in foreign universities, as well as in those of Scotland; but the second in those of Cambridge and Oxford; candidates not being admitted to it till they have studied in the university seven years.

MASTER OF A SHIP, an officer to whom is committed the direction of a merchant-vessel, who commands it in chief, and is charged with the merchandises aboard. In the Mediterranean the master is frequently called patron, and in long voyages captain. The proprietor of the vessel appoints the master; and the master provides the equipage, hires the pilots, sailors, &c. The master is obliged to keep a register of the seamen and officers, the terms of their contract, the receipts and payments, and, in general, of every thing relating to his commission.

MASTER OF A SHIP OF WAR, is an officer appointed by the commissioners of the navy, to take charge of navigating a ship from port to port under the direction of the captain. The management and disposition of the sails, the working of a ship into her station in the order of battle, and the direction of her movements in the time of action, and in other circumstances of danger, are also more particularly under his inspection. It is likewise his duty to examine the provisions, and accordingly to admit none into the ship but such as are sound, sweet, and wholesome. He is moreover charged with the stowage; and for the performance of

of these services he is allowed several assistants who are properly termed mates and quarter-masters.

MASTER OF THE CEREMONIES is an officer instituted by King James I. for the more solemn and honourable reception of ambassadors, and strangers of quality, whom he introduces into the presence. The badge of this office is a gold-chain and medal, having on one side an emblem of peace, with King James's motto; and on the reverse the emblem of war, with *Dieu & mon droit*. He is always supposed to be a person of good address, and a master of languages, and has an appointment of 300*l.* a year; he is constantly attending at court, and hath under him an assistant-master, or deputy at 6*s.* 8*d.* a day, who holds his place during the king's pleasure. There is also a third officer, called marshal of the ceremonies, with 100*l.* a year, whose business is to receive and distribute the master's orders, or the deputy's, for the service; but without their order he can do nothing. This is the king's gift.

MASTER OF THE FACULTIES, an officer under the archbishop of Canterbury, who grants licences and dispensations; he is mentioned in stat. 22 and 23 Car. II.

MASTER OF THE HORSE is the third great officer of the court, and the office is of great honour and antiquity, and always (when not put in commission) filled by noblemen of the highest rank and abilities. He has the management and disposal of all the king's stables and bred horses. He has authority over the equeries and pages, coachmen, footmen, grooms, riders of the great horse, farriers, and smiths. He appoints all the other tradesmen who work for the king's stables; and by his warrant to the avenor, makes them give an oath to be true and faithful. In short, he is entrusted with all the lands and revenues appropriated for the king's breed of horses, the expences of the stable, and of the coaches, litters, &c. He alone has the privilege of making use of any of the king's horses, pages, footmen, &c.; and at any solemn cavalcade he rides next the king, and leads a horse of state. His salary is 1276*l.* 13*s.* 4*d.* per annum. There is also a master of the horse in the establishment of her majesty's household, with a salary of 800*l.* a-year.

MASTER OF THE HOUSEHOLD is an officer under the treasurer of the household, in the king's gift: his business is to survey the accounts of the household.

MASTER OF THE MILITIA, [*magister militiae*, Lat.] was an officer in the lower empire, created, as it is said, by Dioclesian, who had the inspection and government of all the forces, with power to punish, &c. somewhat like a constable of France.

MASTER OF THE MINT, was anciently the title of him who is now called Warden of the Mint; whose office is take care of the silver and bullion which comes to the mint to be coined.

MASTER OF THE OFFICERS, [*magister officiorum*, Lat.] had the superintendence of all the officers of the court: he was also called *magister officii palatini*; simply *magister*; and his post magisteria.

MASTER OF THE REVELS, an officer with an appointment of 100*l.* a-year, whose business is to order all things relating to the performance of plays, masques, balls, &c. at court.

MASTER OF THE ROLLS, a patent officer for life; who has the custody of the rolls and patents which pass the great seal, and of the records of the chancery. In the absence of the lord chancellor or keeper, he also sits as judge in the court of chancery; and is by Sir Edward Coke called his assistant. He hears causes in the rolls chapel, and makes orders and decrees. He is also the first of the masters of chancery, and has their assistance at the rolls: but all hearings before him are appealable to the lord chancellor. He has also his writ of summons to parliament, and sits next to the lord chief justice of England on the second woollack. He has the keeping of the parliament-rolls, and has the rolls-house for his habitation; as also the custody of all charters, patents, commissions, deeds, and recognizances, which being made of rolls of parchment gave rise to the name. Anciently he was called clerk of the rolls.

MASTER OF THE TEMPLE. The founder of the order of the templars, and all his successors were called *magni templi magistri*; and ever since the dissolution of the order, the spiritual guide and director of the house is called by that name.

MASTERS OF CHANCERY are usually chosen out of the barristers of the common law; and sit in chancery, or at the rolls, as

assistants to the lord chancellor and master of the rolls. All these, so late as the reign of Queen Elizabeth, were commonly doctors of the civil law. To them are also committed interlocutory reports, examination of bills in chancery, stating of accounts, taxing costs, &c. and sometimes by way of reference, they are empowered to make a final determination of causes. They have time out of mind had the honour to sit in the house of lords, though they have neither writs nor patent to empower them; but they are received as assistants to the lord-chancellor and the master of the rolls. They had anciently the care of inspecting all writs of summons, which is now performed by the clerk of the petty bag. When any message is sent from the lords to the commons, it is carried by the clerk of the petty bag. When any message is sent from the lords to the commons, it is carried by the masters of chancery. Before them also affidavits are made, and deeds and recognizances acknowledged.

MASTERS AND SERVANTS, in English law, and domestic economy. The relation of Master and Servant is founded in convenience, whereby a man is directed to call in the assistance of others, where his own skill and labour will not be sufficient to answer the cares incumbent upon him. In this article we shall consider, first, the effect of this relation with regard to the parties themselves; and secondly, its effects with regard to others. Blackstone observes, I. On the manner in which this relation affects either the master or servant. That, 1st, by hiring and service for a year, or apprenticeship under indentures, a person gains a settlement in that parish wherein he last served 40 days. 2dly, Persons serving seven years as apprentices to any trade have an exclusive right to exercise that trade in any part of England. This law, with regard to the exclusive part of it, has by turns been looked upon as a hard law, or as a beneficial one, according to the prevailing humour of the times; which has occasioned a great variety of resolutions in the courts of law concerning it; and attempts have been frequently made for its repeal, though hitherto without success. At common law every man might use what trade he pleased; but this statute restrains that liberty to such as have served as apprentices: the adversaries to which provision say, that all restrictions (which tend to introduce monopolies) are pernicious to trade; the advocates for it allege, that unskilfulness in trades is equally detrimental to the public as monopolies. This reason indeed only extends to such trades, in the exercise whereof skill is required: but another of their arguments goes much farther; viz. that apprenticeships are useful to the commonwealth, by employing youth, and learning them to be early industrious; but that no one would be induced to undergo a seven years servitude, if others, though equally skilful, were allowed the same advantages without having undergone the same discipline; and in this there seems to be much reason. However, the resolutions of the courts have in general rather confined than extended the restriction. No trades are held to be within the statute, but such as were in being at the making of it: for trading in a country-village, apprenticeships are not requisite, and following the trade seven years is sufficient without any binding; for the statute only says, the person must serve as an apprentice, and does not require an actual apprenticeship to have existed. A master may by law correct his apprentice for negligence, or other misbehaviour, so it be done with moderation: though, if the master or master's wife beats any other servant of full age, it is good cause of departure. But if any servant, workman, or labourer, assaults his master or dame, he shall suffer one year's imprisonment, and other open corporal punishment, not extending to life or limb. By service all servants and labourers except apprentices, become entitled to their wages: according to agreement, if menial servants; or according to the appointment of the sheriff or sessions, if labourers or servants in husbandry: for the statutes for regulation of wages extend to such servants only; it being impossible for any magistrate to be a judge of the employment of menial servants, or of course to assess their wages. II. Let us now see how strangers may be affected by this relation of master and servant; or how a master may behave towards others on behalf of his servant, and what a servant may do on behalf of his master. And first, the master may maintain, that is, abet and assist, his servant in any action at law against a stranger: whereas, in general, it is an offence against public justice to encourage suits and animosities, by helping to bear the expence of them, and is called in law Maintenance. A master also may bring

an action against any man for beating or maiming his servant : but in such case he must assign, as a special reason for so doing, his own damage by the loss of his service ; and this loss must be proved upon the trial. A master likewise may justify an assault in defence of his servant, and a servant in defence of his master ; the master because he has an interest in his servant, not to be deprived of his service ; the servant, because it is part of his duty, for which he receives his wages, to stand by and defend his master. Also, if any person do hire and retain my servant, being in my service, for which the servant departeth from me, and goeth to serve the other, I may have an action for damages against both the new master and the servant, or either of them : but if the new master did not know that he is my servant, no action lies ; unless he afterwards refuse to restore him upon information and demand. The reason and foundation upon which all this doctrine is built, seem to be the property that every man has in the service of his domestics ; acquired by the contract of hiring, and purchased by giving them wages. As for those things which a servant may do on behalf of his master, they seem all to proceed upon this principle, that the master is answerable for the act of his servant, if done by his command, either expressly given or implied : *nam qui facit per alium, facit per se*. Therefore, if the servant commit a trespass by the command or encouragement of his master, the master shall be guilty of it : not that the servant is excused, for he is only to obey his master in matters that are honest and lawful. If an innkeeper's servant robs his guests, the master is bound to restitution ; for as there is a confidence reposed in him, that he will take care to provide honest servants, his negligence is a kind of implied consent to the robbery ; *nam, qui non prohibet, cum prohibere possit, jubet*. So likewise if the drawer at a tavern sells a man bad wine, whereby his health is injured, he may bring an action against the master ; for although the master did not expressly order the servant to sell it to that person in particular, yet his permitting him to draw and sell it at all is impliedly a general command. In the same manner, whatever a servant is permitted to do in the usual course of his business, is equivalent to a general command. If I pay money to a banker's servant, the banker is answerable for it : if I pay it to a clergyman's or a physician's servant, whose usual business it is not to receive money for his master, and he imbezzles it I must pay it over again. If a steward lets a lease of a farm, without the owner's knowledge, the owner must stand to the bargain : for this is the steward's business. A wife, a friend, a relation, that use to transact business for a man, are quoad hoc his servants ; and the principal must answer for their conduct : for the law implies, that they act under a general command ; and without such a doctrine as this no mutual intercourse between man and man could subsist with any tolerable convenience. If I usually deal with a tradesman by myself, or constantly pay him ready money, I am not answerable for what my servant takes up upon trust ; for here is no implied order to the tradesman to trust my servant : but if I usually send him upon trust, or sometimes on trust and sometimes with ready money, I am answerable for all he takes up ; for the tradesman cannot possibly distinguish when he comes by my order and when upon his own authority. If a servant, lastly, by his negligence does any damage to a stranger, the master shall answer for his neglect : if a smith's servant lames a horse while he is shoeing him, an action lies against the master, and not against the servant. But in these cases the damage must be done while he is actually employed in the master's service ; otherwise the servant shall answer for his own misbehaviour. Upon this principle, by the common law, if a servant kept his master's fire negligently, so that his neighbour's house was burned down thereby, an action lay against the master ; because this negligence happened in his service : otherwise, if the servant, going along the street with a torch, by negligence sets fire to a house ; he is not in his master's immediate service, and must himself answer the damage personally. But now the common law is in the former case, altered by stat. 6 Ann. c. 3, which ordains, that no action shall be maintained against any in whose house or chamber any fire shall accidentally begin : for their own loss is sufficient punishment for their own or their servant's carelessness. But if such fire happens through negligence of any servant (whose loss is commonly very little), such servant shall forfeit 10*l.* to be distributed among the sufferers ; and, in default of payment, shall be committed to some workhouse, and there kept to hard labour for 18 months. A master is, lastly,

chargeable if any of his family layeth or casteth any thing out of his house into the street or common highway, to the damage of any individual, or the common nuisance of his majesty's liege people : for the master hath the superintendence of all his household. And this also agrees with the civil law ; which holds, that the *pater familias* in this and similar cases, ob alterius culpam tenetur, sive servi, sive liberi. In all the cases here put, the master may be frequently a loser by the trust reposed in his servant, but never can be a gainer : he may frequently be answerable for his servant's misbehaviour, but never can shelter himself from punishment by laying the blame on his agent. The reason of this is still uniform and the same ; that the wrong done by the servant is looked upon in law as the wrong of the master himself ; and it is a standing maxim, that no man shall be allowed to make any advantage of his own wrong.

MASTER-LOAD, in mining, a term used to express the larger vein of a metal, in places where there are several veins in the same hill.

MASTER-WORT. See **IMPERATORIA**.

MASTICATION, [*masticatio*, Lat.] the act of agitating the solid parts of our food between the teeth, by the motion of the jaws, the tongue, and the lips, whereby it is broken into small pieces, impregnated with saliva, and so fitted for deglutition and a more easy digestion. See **ANATOMY**.

MASTICH, a kind of resin exuding from the lentiscus-tree ; and brought from Chio, in small yellowish transparent grains, of an agreeable smell, especially when heated or set on fire. See **PISTACHIA**. This resin is recommended in old coughs, dysenteries, hæmoptoes, weakness of the stomach, and in general in all debilities and laxity of the fibres. Geoffroy directs an aqueous decoction of it to be used for these purposes : but water extracts little or nothing from this resin. Rectified spirit almost entirely dissolves it, and the solution is very warm and pungent. Mastich is to be chosen in drops, clear, well-scented, and brittle.

MASTICH is also a cement composed of the above gum, and several other ingredients, and formed into cakes, for the use of lapidaries, to fill up cracks in stones, &c. but on no account to be used for any medicinal purposes.

MASTICOT, [*marum*, Lat.] See **MASSICOT**.

MASTIFF, or **BAND-DOG**, **CANIS VILLATICUS**, is said by Manwood, to derive its name from *mase thefese*, because it frightens away thieves by its tremendous voice. See **CANIS**.

MASTIGADOUR, or **SLABBERING-BIT**, in the manege, a snaffle of iron, all smooth, and of a piece, guarded with paternosters, and composed of three halves of great rings, made into demi-ovals, of unequal bigness ; the lesser being inclosed within the greater, which ought to be about half a foot high.

MASUAH, or **MATSUAH**, the most eastern province of Abyssinia. It is of considerable length, but no great breadth ; running parallel to the Indian Ocean and Red Sea, in a zone of about 40 miles broad, as far as the island Massuah.

MASULIPATAM, a populous town of Asia, in the East Indies, and on the coast of Coromandel, in the dominions of the Great Mogul. It is seated on the W. side of the Bay of Bengal, 200 miles N. of Fort St. George. Lon. 81. 25. W. Lat. 16. 30. N.

MATAMAN, a desert country of Africa, bounded on the N. by Benguela, E. by Monomotapa ; S. by Caffraria, and W. by the Atlantic Ocean. Lon. from 13° to 18° E. Lat. from 16° to 24° S.

MATAN, or **MACTAN**, an island of Asia, in the East Indian sea, and one of the Philippines.

MATARAN, a large town of Asia, in the island of Java. Lon. 111. 25. E. Lat. 7. 55. S.

MATARO, a town of Spain, in Catalonia ; seated on the coast of the Mediterranean, 15 miles N. E. of Barcelona.

MATCH, a kind of rope slightly twisted, and prepared to retain fire for the uses of artillery, mines, fire-works, &c. It is made of hempen tow, spun on the wheel like cord, but very slack ; and is composed of three twists, which are afterwards again covered with tow, so that the twists do not appear ; lastly, it is boiled in the lees of old wines. This, when once lighted at the end, burns on gradually and regularly, without ever going out till the whole be consumed : the hardest and driest match is generally the best.

MATCHING, in the wine-trade, the art of preparing vessels to preserve wines and other liquors, without their growing sour or vapid. The method is as follows : Melt brimstone in an iron ladle

ladle, and when thoroughly melted, dip into it slips of coarse linen-cloth; take these out and let them cool: this the wine-coopers call a match. Take one of the matches, set one end of it on fire, and put it into the bung-hole of a cask; stop it loosely, and thus suffer the match to burn nearly out: then drive in the bung tight, and set the cask aside for an hour or two. At the end of this time examine the cask, and you will find that the sulphur has communicated a violent pungent and suffocating scent to the cask, with a considerable degree of acidity. The cask may after this be filled with a small wine which has scarce done its fermentation; and bunging it down tight, it will be kept good, and will soon clarify; this is a common and very useful method; for many poor wines could scarce be kept potable even a few months without it.

MATE OF A MERCHANT-SHIP, the officer who commands in the absence of the master thereof, and shares the duty with him at sea; being charged with every thing that regards the internal management of the ship, the directing of her course, and the government of her crew.

MATE OF A SHIP OF WAR, an officer under the direction of the master, by whose choice he is generally appointed, to assist him in the several branches of his duty. Accordingly he must be particularly attentive to the navigation in his watch, &c. to keep the log regularly, and examine the line and glasses by which the ship's course is measured, and to adjust the sails to the wind in the fore-part of the ship. He must pay a diligent attention to the cables, and see that they are well coiled and kept clean when laid in the tier, and sufficiently served when employed to ride the ship. He must also superintend and assist the stowage of the hold, taking special care that all the ballast and provisions are properly stowed

therein. The number of mates allowed to ships of war and merchantmen is always in proportion to the size of the vessel. Thus a first-rate man of war, and an East Indiaman have six mates each, a frigate of ten guns, and a small merchant-ship only one each; and the intermediate ships have a greater or smaller number, according to their sizes, or to the services on which they are employed.

MATER DURA, or **MATER PIA**, two membranes surrounding the brain. See **ANATOMY**.

MATERA, a considerable town of Naples, in Otranto, with a bishop's see, seated on Canapro. Lon. 16. 43. E. Lat. 40. 51. N.

MATERIAL. See **MATTER**, and **METAPHYSICS**.

MATERIALISTS, a sect in the ancient church, composed of persons, who being prepossessed with that maxim in the ancient philosophy, *Ex nihilo nihil sit*, "Out of nothing nothing can arise," had recourse to an eternal matter, on which they supposed God wrought in the creation; instead of admitting God alone as the sole cause of the existence of all things. Tertullian vigorously opposes the doctrine of the materialists in his treatise against Herogenes, who was one of their number.

MATERIALISTS is also a name given to those who maintain that the soul of man is material; or that the principle of perception and thought is not a substance distinct from the body, but the result of corporeal organization. See **METAPHYSICS**. There are others, called by this name, who have maintained that there is nothing but matter in the universe; and that the Deity himself is material. See **SPINOZA**.

MATERIA MEDICA.

MATERIA MEDICA, [Lat.] a general name for all the substances used in medicine, in their simple states. The consideration of these are compounded, and the compounding of them belongs to the subject of pharmacy. The different substances used in medicine have been variously arranged by the writers on this subject. Some have placed them in an alphabetical order; others have classed them according to the respective kingdom to which they belong, as animal, vegetable, and mineral; others according to their more obvious qualities, as being acid, unctuous, absorbent, &c.; and others according to their effects on the human body. The first of these is the most simple, the last the most scientific. Concerning the manner in which medicine acts, physicians have greatly differed, and each has followed his own particular theory. The followers of Boerhaave suppose they act directly upon the solids and fluids; while those who adopt the hypothesis of Hoffman assert, that they act immediately upon the nervous system, and thence only in a secondary manner on the solids and fluids. The decision of this question is not a matter of great consequence, seeing all parties own, that certain effects follow the use of certain substances, whether these substances act first upon the nervous system, or upon the solids and fluids. From their operations on the human body, medicines are most usually divided into classes. Some render the solid parts of the body more lax than before, and are therefore called relaxing medicines; others have an effect directly contrary, and are therefore called indurating medicines; a third kind excite inflammation in the part to which they are applied, and are therefore called inflammatory medicines; and lastly, a fourth kind either increase or diminish the vigour of the body, or what is called the tone of the solids; and have therefore got the name of tonics if they increase, and sedatives if they diminish, this tone. Some medicines are supposed neither remarkable to increase nor diminish the tone of the solids; but to perform their office either by correcting some morbid matter in the body, or by evacuating it: in the former case they are called alterants, in the latter evacuants. These are the general classes into which medicines are commonly divided, but when we consider their virtues more particularly, a great number of inferior divisions arise. Of the relaxing medicines, some, when externally applied, are supposed

only to soften the part; and in that case are called emollients; while others, which have a power of converting the humours stagnating in any inflamed part into pus, are called maturants, or suppuratives. Sedative medicines externally applied, are sometimes called pargotics: when taken internally, if they take off a spasm then existing in the body, they are called antispasmodics; if they mitigate pain, anodynes; if they produce a quiet sleep, hypnotics; or if they produce a very deep and unnatural sleep, together with a remarkable stupefaction of the senses, they are then called narcotics. Tonic medicines are called corroboratives, analeptics, or nervine medicines, when they slightly increase the contractile power of the solids; but astringents, if they do this in a great degree, especially if at the same time that they indurate the solids they also coagulate the fluids. Some of these medicines received their names from their supposed virtue of promoting the growth of the flesh, consolidating wounds, and stopping fluxes of blood: but it is now discovered that no medicines whatever are endowed with any such powers; and therefore the divisions into sarcotics, traumatic, or vulneraries, &c. are seldom used. If astringent medicines are used with an intention to drive, by constriction, any matter from the surface towards the internal parts of the body, they are called repellents; but if they insensibly expel any stagnating matter from the parts where it is contained, they are then called discutients; and lastly, stimulants, or attractives, if they bring a greater flux of humours to the part to which they are applied. As to inflammatory medicines, they are divided into vesicatories, or blisters, which by their application raise watery bladders on the skin; and cathartics, escharotics, or corrosives, if they eat into and destroy the substance of the solid parts themselves. Another subdivision is that of rubefactive medicines, or such as only induce a redness on the part to which they are applied; but these belong to the vesicatories, and what proves only rubefactive to one will frequently blister another. The alterants are divided into absorbents, such as by their alkaline quality neutralise and destroy any acid matter which may be in the stomach; and antiseptics or those which correct any putrid matter in it; coagulants when they thicken the humours, and resolvents if they thin them; heating medicines when they increase the velocity of the blood, and re-

frigerating if they diminish it. The evacuating medicines are divided according to the nature of the humour they evacuate. Thus, if they evacuate the contents of the stomach by vomiting, they are called emetics; if they induce purging, they are called cathartics; if they only evacuate the immediate contents of the intestines, they are named ecoprotics: or if a moderate evacuation is produced, without sickness or pain, they are called laxatives. The medicines which gently promote the expulsion of humours through the pores of the skin, are called diaphoretics. If they do this in great quantity and with violence, they are called sudorifics. Such as excite urine, are called diuretics. Such as produce their evacuation by the glands of the palate, mouth, and salival ducts, are called salivating medicines; those which promote the evacuation of mucus from the throat are called apoplegmatics; while those which evacuate by the nose, are called ptarmics, errhines, or sternutatories: and those which promote the menstrual flux, emmenagogues. To the order of evacuants also some reduce those medicines which expel any unnatural bodies, as worms, stones, and flatus. Those which destroy worms are called anthelmintics, those which dissolve the stone in the bladder, lithontriptics; and such as expel flatus, carminatives. This general outline of arrangement according to the effects of the substances on the human frame it is obvious will admit of several modifications; especially as these effects will be various, on account of the different doses, different state of the body, and other circumstances. Hence authors have varied greatly in the number of their classes, as it suited their fancy or opinion of superior utility or convenience. Thus the classes of Cullen amount to twenty-three; those of Darwin to not more than seven, while others have given us twelve, fourteen, or fifteen, as seemed to them most suitable. The twenty-three classes of Dr. Cullen are as follow:

Astringents	Antacids
Tonics	Antalkalines
Emollients	Antiseptics
Corrosives	Errhines
Stimulants	Sialagogues
Narcotics	Expectorants
Refrigerants	Emetics
Antispasmodics	Cathartics
Diluents	Diuretics
Attenuants	Diaphoretics
Inspissants	Menagogues
Demulcents	

The seven classes of Dr. Darwin are the ensuing:

Nutrients	Invertents
Incitants	Revertents
Secernents	Torpents
Absorbents	

From a little consideration it will be evident that the former of these divisions is too diffuse, and the latter by far too contracted. The classification which appears in the New British Encyclopædia appears to be less exceptionable, it is as follows, viz.

Class 1. Emetics	10. Refrigerants
2. Expectorants	11. Astringents
3. Diaphoretics	12. Tonics
4. Diuretics	13. Stimulants
5. Cathartics	14. Antispasmodics
6. Emmenagogues	15. Narcotics
7. Errhines	16. Anthelmintics
8. Sialagogues	17. Absorbents.
9. Emollients.	

Of the nature of each of these classes we shall give some account, and for the cases in which they should be applied with their particular effects, we refer to the article MEDICINE.

1. OF EMETICS.

Emetics are irritative or evacuant, or both. Of the first kind are sulphuret of antimony, the tartar emetic of popular language, sulphate of zinc, or white vitriol, and the sulphate of copper, or blue vitriol, &c. Of the second we have instances in ipecacuanha and squills; of the third, in tobacco and foxglove. Emetic medicines excite sickness, nausea, and their common attendants. They

produce the action of vomiting itself. They occasion sudden and opposite changes in the circulation. They increase the secretion or the discharge of secreted matter from the various glands which prepare fluids to be deposited in the alimentary canal. In the use of emetics we ought to pay attention to the circumstances of infancy, old age, pregnancy, delicacy of habit, and plethora. The circumstances chiefly to be regarded with respect to the regimen necessary for this class, are, the state of the stomach when the emetic is exhibited; the means of facilitating the operation; the time of exhibiting the medicine; the temperature in which the patient is kept, after its operation is finished.

2. OF EXPECTORANTS.

These medicines stimulate the lungs; they augment the secretion taking place by the mucous glands of the lungs; they increase the excretion of mucus from the lungs. The change induced in the system, from the primary effects of expectorants, are; an alteration in the state of the mucus excreted to a more thin and fluid consistency; an increase of the sensibility of the lungs; free circulation through the blood-vessels of the secreting glands; and the evacuation of those cavities in the lungs in which mucus is deposited. Expectorants may be divided into the nauseating, as squills, gum-ammoniac, and garlic; the antispasmodic, as blisters, feet, and vapour-baths; and irritative, as acid vapours, and the common smoking of tobacco.

3. OF DIAPHORETICS.

These are medicines, which, taken internally, increase the discharge by the skin without exciting this effect in consequence of violent agitation or acute pain. The following are their direct results: they accelerate the motion of the blood; produce free circulation through the vessels on the surface; and excite a discharge of sweat. The changes induced in the system, from the more immediate effects of diaphoretics, are, a change in the balance of the circulation; a diminution of the quantity of circulating fluids; and a diminution more particularly of the serosity. Diaphoretics may be regarded as pungent, of which we have instances in spirit of hartshorn, oil of lavender, or amber; stimulant, as various preparations of antimony and quicksilver, guaiacum, contrayerva, and snake-root; antispasmodic, as musk, opium, and camphor; and diluent, as water and whey.

4. OF DIURETICS.

These medicines augment the flow of urine from the kidneys, by stimulating its secretion from the mass of circulating fluids. The changes induced in the system from these direct effects, are, a change in the balance of circulation; a diminution of the quantity of circulating fluids; but more especially of the serosity and of the saline parts of the blood; an increase of absorption by the lymphatic vessels; a diminution of the quantity of matter discharged by perspiration; and an uncommon flow of fluid through the urinary passages. Diuretics may be divided into such as are stimulant, of which we have instances in squills, broom, cochium, cantharides; refrigerant, as sorrel, berberry, vinegar, cream of tartar; and diluent, as water, whey, and acidulated waters.

5. OF CATHARTICS.

Cathartics increase the number of stools by stimulating the alimentary canal, increasing the peristaltic motion of the intestines, and promoting the secretion of the fluids which constitute alvine evacuations. They may be subdivided into the following tribes: stimulant, as jalap, aloes, bitter-apple; refrigerant, as Glauber's salts, sal polychrest, cream of tartar; astringent, as rhubarb, rose-leaves; and emollient, as manna, mallows, castor-oil.

6. OF EMMENAGOGUES.

This term denotes medicines which possess a power of promoting that periodical secretion from the uterus which should take place in certain conditions of the female frame. They stimulate the whole circulating system. They stimulate, in a particular manner, the vessels in the neighbourhood of the uterus; and this effect seems, in some degree, to be communicated to the vessels of the uterus themselves. They occasion a particular affection of the whole nervous system. Emmenagogues may be divided into the following tribes: stimulant, as various forms of quicksilver; and

and antimony; irritant, as aloes, savin, cantharides; tonic, as iron, cold-bath, corporeal exercise; and antispasmodic, as assafoetida, castor, warm foot-bath.

7. OF ERRHINES.

Errhines are medicines which, when topically applied to the internal membrane of the nose, excite sneezing, and increase the secretion without any mechanical irritation. They may be regarded as of two kinds, sternutatory, or those used for the purpose of general agitation, chiefly, as tobacco, snuff, hellebore, euphorbium; and evacuant, or those designed to produce determination of the fluids to the nostrils, as asarum, beta, betonica.

8. OF SIALAGOGUES.

Under this class are ranked those medicines which excite an uncommon flow of saliva. They stimulate the salivary glands, or their excretories. They increase the action of the vessels secreting saliva. They accelerate the circulation through the salivary glands, and through the blood-vessels in the neighbourhood of these. They produce a preternatural discharge of saliva, both in point of quantity and consistence. They may be distributed into topical, as squills, tobacco, peppers, and other aromatics; and general, as mercurial preparations.

9. OF EMOLLIENTS.

Emollients are such medicines as have a power of relaxing the living animal fibre, independently of mechanical action; they render the part to which they are immediately applied more soft and flexible than it was before. They excite a peculiar sensation indistinctly referred to the part to which they are applied; they produce through the rest of the system an effect in some degree analogous to that taking place in the part on which they more immediately act. The changes induced in the system from the primary effects of emollients are, a diminution of the power of cohesion in various parts of the animal body; a diminution of the tonic power in the system; an increase of the capacity of containing vessels in the part on which they more particularly act, and in some degree in the system in general; and an increase of irritability and sensibility through the entire frame. They may be regarded as humectant, of which we have examples in warm water, warm vapour, and warm baths; laxative as marsh-mallows, nialows, white lily root; lubricative, as bland-oils, suet, hog's-lard; atonic, as opium, foot-bath.

10. OF REFRIGERANTS.

These medicines diminish the heat of the living body, not by the application of an actual cold, but by a power peculiar to themselves. They may be considered under the two divisions of acids or acetous fruits, as tamarinds, berberies, lemons, wood-sorrel; and neutral salts, as nitre, Glauber's salt, sal polychrest. They may hence be usefully employed; 1. In cases of febrile heat, or of general plethora, and an useful auxiliary to the tribe of refrigerant cathartics. 2. As sedatives to diminish undue irritability and action of any of the vascular systems, and are hence usefully conjoined with the sedatives.

11. OF ASTRINGENTS.

These are medicines which possess a power of condensing the animal fibre without the aid of mechanical action. In general they are found to excite a peculiar sensation referred to the part to which they are applied; if to the organs of taste, a sense of dryness. They produce a remarkable corrugation in the parts on which they more immediately act. They occasion, in some degree, a similar affection through the rest of the system. Some individuals belonging to this class produce an evident condensation in dead animal fibres. The changes induced in the system from the primary effects of astringents are: an increase of the power of cohesion in various parts of the animal body: an increase of what may be termed the tonic power in the system: a diminution of the capacity of containing vessels in the system: a diminution of irritability, and perhaps, in some degree, of sensibility. Astringents may be divided into styptic, of which we have examples in most metallic oxids, as well as in aluminous earths: corrugant, as rose-leaves, galls, oak-bark; indurant, as alcohol and acids; and tonic, as exercise, cold, and friction.

12. OF TONICS.

Tonics are those medicines which increase the tone of the muscular fibre, are supposed to brace the system when constitutionally relaxed, and give it vigour when debilitated by immediate disease. They may be divided into stimulants, as various preparations of mercury, iron, zinc, and other metals; and astringents, as chamomile-flowers, myrrhs, Peruvian, and other barks, and gentian.

13. OF STIMULANTS.

These, like the last, are medicines which have a power of exciting the animal energy; but for the most part topically, rather than generally, or for a shorter period of time. They occasion a particular sensation referred to the part more immediately acted upon; frequently a sense of pain; they increase the action of muscular fibres in that part, particularly in its vessels; they increase the energy of the sensorium; they increase the nervous energy in the moving fibres through the system in general. They may be divided into the following heads: topical, of which we have examples in mustard-seed, cantharides, mercurial preparations; diffusible, of which we have instances in volatile alkali, electricity, heat; cardiac, such as cinnamon, nutmegs, and other spices, and wine.

14. OF ANTISPASMODICS.

These are medicines used to allay inordinate motions in the system, particularly those involuntary contractions which take place in muscles naturally subject to the command of the will; they counteract and remove various causes exciting contractions; they diminish the influence of the nervous energy in the parts spasmodically affected. They may be thus divided: stimulant, as volatile alkali, essential oils, ether; sedative, as camphor, musk, opium.

15. OF NARCOTICS.

These are medicines which have a power of diminishing the animal energy, and hence inducing torpor and sleep, during which this energy is usually recruited and restored. They diminish the sensibility of the part to which they are particularly applied. They diminish the action and tonic power of its muscular fibres. They produce a peculiar sensation in the system in general. They diminish the energy of the sensorium. Narcotics may be divided into those which act directly, and those which act indirectly. Of the former tribe are poppies, opium, hyoscyamus, hops, and lettuce; of the latter, neutral salts and acids.

16. OF ANTHELMINTICS.

Anthelmintic medicines, without endangering the life of the patient, are effectual in procuring the removal of worms lodged in the human body. The direct effects arising from this class of medicines are intended to be exerted only on the worms themselves; but there are at the same time few, if any, medicines, which, when employed with this intention, do not also produce some effect on the animal body. Anthelmintics may be divided into poisonous, as quicksilver, tin, sulphur; lubricant, as oil of olives, and oil of linseed; tonic, as savin, tansy, santonicum; cathartic, as scammony, jalap, aloes, gamboge.

17. ABSORBENTS.

By this term is generally understood such medicines as, possessing no acrimony in themselves, possess, notwithstanding, a power of destroying acidities in the stomach and bowels: at other times, however, it is employed more largely to indicate those substances, as well, which increase the general action of the absorbent system. They may hence be divided into two kinds: the calcareous, as burnt hartshorn, oyster-shells, and chalk; and stimulative, as burnt sponge, salt of hartshorn, and alkalies.

We shall here give a catalogue of the simples used in the materia medica, in their alphabetical order, according to their technical names; after which is subjoined the Linnæan name of the plants, and that employed in modern chemistry of the other substances; after which is given the English name, the parts used in medicine, the class to which they belong, and the preparations from them. The Linnæan names are distinguished by being printed in Italics: the articles referred to in small capitals, are to be found in this Catalogue, or in their order in the Encyclopedia. Those distinguished by the letter *L* are to be found in the latest London Pharmacopœia.

- Abies resina**, L. *Pinus abies*. The fir-tree. The wood, tops, and cones. Diuretic and diaphoretic. A decoction.
- Abrotanum mas**, *Artemisia abrotanum*. Southernwood. The leaves. Stimulant, detergent, aperient, and sudorific. Decoction and tincture; also lotion and ointment for eruptions.
- Absinthium maritimum**, *Artemisia maritima*. Sea-wormwood. The tops. Stomachic. An oil, extract, conserve, and several distilled tinctures. It also enters the common fomentation and green oil.
- Absinthium**, L. *Artemisia absinthium*. Common wormwood. The leaves and flowering tops. Stomachic. An oil, extract, and several distilled tinctures. It also enters the common fomentation and green oil.
- Acacia Germanica**, *Prunus spinosa*. The sloe. Inspissated juice. Astringent.
- Acacia gummi**, L. *Acacia vera*. Acacia. Inspissated juice. Astringent.
- Acetosæ**, *Rumex acetosa*. Sorrel. The leaves. Astringent and antiscorbutic. An essential salt for taking spots out of clothes. A decoction.
- Acetosella**, *Oxalis acetosella*. Wood-sorrel. The leaves. Astringent and antiscorbutic. A conserve.
- Acetum**, L. *Impure acetic acid*. Vinegar. Cordial, refrigerant, sudorific, and antiseptic. A distilled spirit.
- Acidum sulphuricum**, L. Sulphuric acid. Astringent. It is given in the form of dilute acid.
- Aconiti folia**, L. *Aconitum napellus*. Wolf's-bane. The herb and leaves. Narcotic. Tincture.
- Acorus**. See **CALAMI**.
- Adeps**, L. *Sus scrofa*. Hog's-lard. Demulcent, emollient. Employed in the composition of ointments, &c.
- Adiantum verum**, *Adiantum capillus Veneris*. Maiden-hair. The leaves. Attenuating and aperient. Decoction and syrup. Infusion of the herb, sweetened with sugar and liquorice; drank as tea.
- Ærugo**, L. *Subacetatæ cupri impura*. Verdigris, or impure subacetate of copper. Astringent. Used as a collyrium, from its astringent styptic quality.
- Agaricus**, *Boletus piniloricis*. Agaric. Cathartic. An aqueous extract, much disused.
- Agaricus chirurgorum**, *Boletus ignarius*. Female agaric, agaric of the oak, or spunk.
- Agnus castus**, *Vitex agnus castus*. The chaste tree. The seeds. Antaphrodisiac.
- Agrimonia**, *Agrimonia Eupator*. Agrimony. The leaves. Attenuant and tonic. Digested in whey, a diet-drink used in spring.
- Albumen ovi**. White of an egg. Discutient.
- Alchemilla**, *Alchemilla vulgaris*. Ladies-mantle. The leaves. Astringent.
- Alkekengi**, *Physalis alkekengi*. Winter-cherry. The fruit. Aperient and diuretic. Dried and powdered. Inspissated juice.
- Alliaria**, *Erysimum alliaria*. Sauce-alone, or Jack-by-the-hedge. The leaves. Sudorific and deobstruent.
- Allii radix**, L. *Allium sativum*. Garlic. Roots. Stimulant, attenuant, discutient, and diuretic. A syrup and oxymel, ointment and poultice.
- Alnus**, *Betula alnus*. Alder. Leaves and bark. Astringent. Decoction: the leaves chapt and heated disperse milk in the breasts.
- Aloes spicata extractum**, L. *Aloe spicata*. Aloes. Aloespicata, L. Extract, inspissated juice. Cathartic. Ingredient in several tinctures and pills.
- Aloes vulgaris**, L. *Aloe vulgaris*. Common aloes. Extract. Cathartic. Used in tinctures, &c.
- Alsine**, *Alsine media*. Chickweed. The leaves. Refrigerant.
- Althæa**, L. *Althæa officinalis*. Marsh-mallow. The leaf and root. Emollient. A syrup and ointment.
- Alumen**, L. *Supersulphas aluminis et potassæ*. Alum. Strongly astringent. A styptic powder and water, whey, &c.
- Ambragrisea**. Ambergrise. A high cordial. A tincture or essence.
- Amni vulgaris**. Bishop's-weed. The leaves. Stimulant. An ingredient in the theriaca.
- Amomum vulgare**, *Sison amomum*. Bastard stone-parsley. The seeds. Carminative and diuretic.
- Ammonia murias**, L. *Murias ammonia*. Muriate of ammonia. Diuretic. Not much used.
- Ammoniacum**, L. See **GUMMI**.
- Amygdale amara**, L. *Amygdalis communis*. Sweet and bitter almonds. The fruit. Relaxing. Expressed oil and emulsion.
- Amylum**, L. Starch. Astringent.
- Anacardium**, *Anacardium occidentale*. Cashew-tree. The nuts. Corrosive. Oil outside; kernels used as almonds; the gum instead of gum arabic.
- Anagallis**, *Anagallis arvensis*. Pimpernel. The leaves. Sudorific and nervine. Extract, or inspissated juice.
- Ananas**, *Bromelia ananas*. The pine apple. The fruit. Refrigerant.
- Anchusa**, *Anchusa tinctoria*. Alkanet. The root. Only used for its colour.
- Anethi**, L. *Anethum graveolens*. Dill. The seeds. Carminative. Distilled oil, water, and spirituous extract.
- Angelica**, *Angelica Archangelica*, and *syvestris*. Angelica. Roots, stalks, leaves, and seeds. Aromatic. Several compound waters.
- Angusturæ cortex**, *Brucea antidysenterica*. The angustura bark. The bark. Corroborant.
- Anisi**, L. *Pimpinella anisum*. Anise. The seeds. Aromatic and tonic. An essential oil, a spirituous compound water, &c.
- Anthemidis**, L. *Anthemis nobilis*. Common chamomile. Diaphoretic, cathartic. The single flowers.
- Antimonii sulphuretum**, L. *Sulphuretum antimonii*. Sulphuret of antimony. Diaphoretic, cathartic, emetic, or caustic. Several chemical preparations.
- Aparine**, *Galium aparine*. Goosegrass, or clivers. The leaves. Aperient.
- Apium**, *Apium graveolens*. Smallage. Roots, leaves, and seeds. Carminative. Diet-drinks.
- Aqua-marina**. Sea-water. Cathartic and alterative.
- Argentina**, *Potentilla argentina*. Silverweed. The leaves. Corroborant.
- Argentum**, L. *Argentum purificatum*. Pure silver.
- Aristolochia**, *Aristolochia clematitis*. Birthwort. The roots. Attenuating, stimulant, and detergent.
- Armeniaca**, *Prunus Armeniaca*. The plum-tree. The fruit refrigerant, and the gum demulcent.
- Armoracia radix**, L. *Cochlearia armoracia*. Horse-radish. The root. Stimulant and attenuant. A compound water.
- Arnica**, *Arnica montana*. German leopard's-bane. The herb, flowers, and roots. Antispasmodic, emetic, cathartic. A warm infusion.
- Arsenici oxydum**, L. *Oxydum arsenicum*. White oxide of arsenic. Corrosive.
- Arum**, *Arum maculatum*. Wake-robin, or cuckowpint. The root. Stimulant. A compound powder and conserve.
- Asæfetida**. See **GUMMI**.
- Asari folia**, L. *Asarum Europæum*. Asarabacca. The leaves and roots. Errhine, cathartic, and emetic. A compound powder.
- Asparagus**, *Asparagus officinalis*. Asparagus. The roots. Supposed diuretic.
- Asperula**. Woodruff. The flowers. Attenuant and aperient.
- Asphodelus**, *Asphodelus fistulosus*. Asphodel, or king's-spear. The roots. Emollient and suppurative.
- Atriplex**, *Chenopodium vulvar*. Stinking orach. The leaves. Antispasmodic. A spirituous tincture, decoction, or conserve.
- Avena**, L. *Avena sativa*. Oats. The grain. Emollient. Decoction.
- Aura electrica**. Electricity. A violent stimulant.
- Aurantium**, L. *Citrus aurantium*. The orange. The leaves, fruit, and flowers. Cordial, stomachic, and refrigerant. An essential oil, a distilled water, and a conserve.
- Asungia porcina**. See **ADEPS**.
- Balanstia**, *Punica granata*. Double-flowered pomegranate. Astringent. Ingredient in a powder.
- Balsamita**, *Tanacetum balsamita*. Costmary. The leaves. Aromatic, antihysterical. Distilled water and spirituous tincture.
- Balsamum Canadense**, *Pinus balsamea*. Balsam of Canada. The resin. Diuretic and tonic.
- Balsamum Copayvæ**, *Copaifera officinalis*. Balsam of Copai. The resin. Diuretic and tonic. An empyreumatic oil, and an ingredient in some tinctures.
- Balsamum Gileadense**, *Amyris Gileadensis*. Opo-balsam, or balm

- balm of Gilead. The resin. Said to be a most extraordinary vulnerary.
- Balsamum Peruvianum, L. *Myroxylon peruiferum*. Balsam of Peru. The resin. A fine warm aromatic. An ingredient in many tinctures, and some ointments.
- Balsamum Tolutanum, L. *Toluytera balsamon*. Balsam of Tolu. The resin. Aromatic and corroborant. An ingredient in several tinctures, elixirs, and pectoral pills.
- Bardana major, *Arcetium lappa*. Burdock. The roots and seeds. Aperient, diuretic, and sudorific. Decoction.
- Beccabunga, *Veronica Beccabunga*. Brooklime. The herb. Attenuating, and antiscorbutic.
- Bechen album, *Centaurea bechen*. The root. Stimulant.
- Bechen rubrum, *Statice limon*. The root. Stimulant.
- Belladonna, L. *Atropa belladonna*. Deadly night-hade. The juice. Narcotic. An extract of the juice; decoction, infusion, powders.
- Bells Min r. *Bellis perennis*. Common daisy. The leaves. Attenuant.
- Benzoinum, L. *Styrax benzoin*. Benzoin. The resin. Pectoral. Ingredient in the paregoric elixir.
- Berberis, *Berberis vulgaris*. Barberry. The bark and fruit. Astringent. A jelly.
- Beta, *Beta vulgaris*. The beet. Root and leaves. Cathartic and emollient.
- Betonica, *Betonica officinalis*. Betony. Leaves and flowers. Corroborant.
- Betula, *Betula alba*. The birch-tree. Bark and sap. Antiscorbutic and diuretic.
- Bistorta, L. *Polygonum bistorta*. Bistort. The roots. Powerfully astringent. An ingredient in a powder.
- Boli. Boles. Astringent, and slightly absorbent. Ingredients in several powders.
- Bonus Henricus, *Chenopodium bonus henricus*. English mercury, all good or good Henry. The leaves. Laxative.
- Brucea antidysenterica. See *ANGUSTURÆ*. The bark. Corroborant.
- Bryonia, *Bryonia alba*. White briony. The root. Discutient, and very cathartic.
- Bursa pastoris, *Thlapsi bursa pastoris*. Shepherd's purse. The leaves. Astringent; but very doubtful.
- Cacao, *Theobroma cacao*. Chocolate-tree. The fruit. Analeptic. Chocolate.
- Cajuputi, *Melaleuca cajuputi*. Cajeput. The fruit. Stimulant, healing, carminative. Distilled oil.
- Calamina, L. *Carbonas zinci impura*. Calamine-stone, or impure carbonate of zinc. Desiccative, healing. An ingredient in collyria, eyulotic cerate, &c.
- Calamintha, *Melissa calamintha*. Calamint. The leaves. Aromatic and stimulant.
- Calami, *Acorus calamus*. Sweet flag. The roots. Aromatic and stomachic.
- Calendula, *Calendula officinalis*. Garden-marigold. The flowers. Supposed attenuating and sudorific.
- Calumbæ radix, L. Antiseptic. Stomachic. Tincture.
- Cambogia, L. *Stalagmitis cambogioides*. Gamboge. Emetic and cathartic. An ingredient in pills.
- Camphora, L. *Laurus Camphora*. Camphor. The concreted essential oil. Refrigerant, diaphoretic, stimulant, antispasmodic. A solution in rectified spirit, in expressed and essential oils. Ingredient in many other compositions.
- Canela, L. *Canella alba*. White cinnamon. The bark. Aromatic and stimulating. An ingredient in several tinctures.
- Canabis, *Cannabis sativa*. Hemp. The seeds. Aperient and refrigerant, but doubtful. Decoctions and infusions.
- Cantharis, *Meloe vesicatorius*. Spanish-fly. Violently stimulating and vesicatory. A spirituous tincture, a plaster, ointment, &c.
- Capparis, *Capparis spinosa*. Capër-bush. The bark of the root, and flower-buds. Aperient and stomachic. Pickled.
- Capsici baccæ, L. *Capsicum annuum*. Capsicum, Guinea pepper. The berries. Stimulant. A powder called Cayenne pepper, not much used in medicine.
- Carbo Ligni, L. Charcoal.
- Cardamines, L. *Cardamine pratensis*. Cardamine. The flowers. Antispasmodic. Powder.
- Cardamomum, L. *Ellettaria cardamomum*. Cardamom. The seeds. Aromatic and stimulant. A spirituous water and tincture. Ingredient also in several officinal compositions.
- Caryiaca, *Leonurus cardiaca*. Mother-wort. The leaves. Antispasmodic.
- Cardus benedictus, *Centaurea benedicta*. Blessed thistle. The leaves and seed. Stomachic. An ingredient in a stomachic tincture. Infusions.
- Carica, L. *Ficus carica*. The fig. The dried fruit. Emollient, suppurative. Ingredient in a pectoral decoction and lenitive electuary.
- Carlina, *Carlina araulis*. Carline-thistle. The root. Diaphoretic.
- Carpobalsam, *Amiris Gileadensis*. Carpopal-am. The fruit. Aromatic. In substance applied warm as a cataplasm.
- Carthamus, *Carthamus tinctorius*. Bastard saffron. The seeds. Cathartic.
- Carui, L. *Carum carui*. Caraway. The seeds. Aromatic. An essential oil; a spirituous water; an ingredient in some officinal compositions.
- Caryophylla rubra, *Dianthus Caryophyllata*. Clove, July-flower. The flowers. Cardiac and alexipharmic. A syrup.
- Caryophyllum, L. *Eugenia caryophyllata*. The clove-tree. The flower-cups. Strongly aromatic. An essential oil, and ingredient in many officinal compositions.
- Cascarilla, L. *Croton cascarilla*. Cascarilla. The bark. Aromatic and stimulant. Infusions.
- Cassia, L. *Cassia fistula*. Cassia. The fruit. Purgative. An ingredient in electuaries.
- Castoreum, L. *Castor fiber*. Castor. Nervine and antispasmodic. A simple water; a spirituous water; a tincture; an ingredient in several officinal compositions.
- Catechu, *Acaia catechu*. Catechu, or Japan earth. Astringent. A tincture, troches, and confection, and an ingredient in several officinal compositions.
- Celeri, *Apium graveolens*. Celery. The leaves. Laxative.
- Centaureum majus, *Centaurea centaureum*. Greater centaury. The root. Astringent, aperient, and vulnerary.
- Centaureum, L. *Chironia centaureum*. Centaury. The tops. Stomachic. Tincture and infusion.
- Cepa, *Allium cepa*. The onion. The root. Attenuating and diuretic.
- Cera alba, L. White wax. Emollient. Ingredient in many plasters and ointments.
- Cera flava, L. Yellow wax. Emollient. Ingredient in almost all ointments.
- Cerasus, *Prunus cerasus*. The cherry-tree. The fruit refrigerant; the gum astringent and mucilaginous.
- Cerefolium, *Sandix cerefolium*. Chervil. The juice. Aperient and diuretic.
- Chamamelum, *Anthemis nobilis*. See *ANTHEMIDIS*.
- Chamapithys, *Teucrium chamapithys*. Ground-pine. The leaves. Aperient and vulnerary.
- Chelidonium majus. Commoncelandine. The leaves and roots. Stimulating, diuretic, and sudorific. Infusion. Dried root powdered.
- Cichorium, *Cichorium intybus*. Wild succory. The roots and leaves. Laxative and antiscorbutic.
- Cicuta major, *Conium maculatum*. Hemlock. The leaves and seeds. Resolvent and alterant. Inspissated juice of the leaves, and an extract from the seeds.
- Cinara, *Cynara scolymus*. Artichoke. The leaves. Diuretic. Expressed juice of the leaves; or a decoction with artichoke-leaves and stalks, bruised juniper-berries, horse-radish, green fir-tops, and bruised white mustard-seed.
- Cinchona. See *PERUVIANUS CORTEX*.
- Cinnamomum, L. *Laurus Cinnamomum*. The cinnamon-tree. The bark. Aromatic and corroborant. An essential oil, a simple and spirituous distilled water, an ingredient in a great number of compositions.
- Citrullus, *Cucurbita citrullus*. Citruls. The seeds. Refrigerant.
- Cucci, L. *Coccus cacti*. Cochineal. Sudorific, but chiefly used for colouring.
- Cocculus Indicus, *Menispermum cocculus*. Indian berry. The fruit. Narcotic.
- Cochlearia, *Cochlearia officinalis*. Scurvy-grass. The leaves. Stimulating.

- Stimulating and attenuant. A conserve and spirit. An ingredient in other compositions.
- Coffea.** *Coffea arabica*. The coffee-tree. The fruit. Stomachic and corroborant. A decoction.
- Colchicum, L.** *Colchicum autumnale*. Meadow-saffron. The root. Diuretic. A syrup and oxymel.
- Colocynthis, L.** *Cucumis colocynthis*. Coloquintida, or bitter apple. Medullary part of the dried fruit. Violently cathartic. An ingredient in some pills and extracts.
- Columbo.** See **CALUMBÆ**. A vinous tincture.
- Conessi.** *Nerium undisentericum*. Conessi. The bark. Antiseptic and tonic. An electuary of the fine powder with syrup of oranges.
- Coniifolia, L.** *Conium maculatum*. See **CICUTA**.
- Consolida major.** *Symphitum officinale*. Comfrey. The root. Emollient.
- Contrayerva, L.** *Dorstenia Contrayerva*. Contrayerva. The root. Aromatic and diaphoretic. Spirituous tincture; extract; powder.
- Convallaria.** *Convallaria Polygonatum*. Solomon's seal. The root. Suppurative. Poultice, decoction in milk recommended in some cases of hemorrhagy.
- Coriandrum, L.** *Coriandrum sativum*. Coriander. The seeds. Carminative and stomachic. Formerly an ingredient in some official compositions.
- Cornua, L.** *Cervus elephas*. Hartshorn. Emollient and nutritious. Shavings, a jelly, a volatile alkaline salt and spirit, and an empyreumatic oil.
- Costus.** *Costus arabicus*. Costus. The root. Attenuant and diuretic.
- Creta, L.** *Carbonas calcis friabilis*. Chalk, or friable carbonate of lime.
- Crithmum.** *Crithmum maritimum*. Samphire. The leaves. Aperient, stomachic, and diuretic.
- Crocus, L.** *Crocus sativus officinalis*. Saffron. Chives, or fleshy capillaments at the end of the flower. Aromatic and cordial. A spirituous tincture; and an ingredient in several official compositions.
- Cr ton.** See **CASCARILLA**.
- Cubeba.** *Piper cubeba*. Cubebs. The fruit. Aromatic and stimulant. An ingredient in several official compositions.
- Cucumis agrestis.** *Momordica elaterium*. Wild cucumber. The fruit. Violently cathartic. The juice inspissated.
- Cucumis hortensis.** *Cucumis sativus*. Garden-cucumber. The seeds. Refrigerant.
- Cuminum, L.** *Cuminum cyminum*. Cummin. The seeds. Aromatic, stimulant. An essential oil by distillation; and gives name to a plaster and cataplasm.
- Cupri sulphas, L.** *Sulphus cupri*. Sulphate of copper. Emetic, diuretic, and alterative.
- Curcuma.** *Curcuma longa*. Turmeric. The root. Aromatic, aperient, and an emmenagogue.
- Cydonium, L.** *Pyrus cydonia*. The quince. The fruit and seeds. Stomachic and corroborative. A syrup and jelly of the fruit, and mucilage of the seeds.
- Cyminum.** See **CUMINUM**.
- Cynosbatum.** *Rosa canina*. The wild-briar, dog-rose, or hip-tree. The fruit and flowers. Refrigerant and antiscorbutic. A distilled water and conserve.
- Dactylus.** *Phoenix dactylifera*. The date-tree. The fruit. Emollient and slightly astringent.
- Daucus sativus, L.** *Daucus carota*. The garden-carrot. The roots. Powerfully antiseptic. A poultice for cancers, and a marmalade.
- Daucus silvestris, L.** *Daucus carota*. Wild-carrot. The seeds. Aromatic.
- Dictamnus.** *Dictamnus albus*. Bastard dittany. The roots. Alexipharmic, tonic, and anthelmintic.
- Digitalis, L.** *Digitalis purpurea*. Fox-glove. The leaves. Emetic, cathartic, and diuretic. The leaves in powder or infusion.
- Delichos, L.** *Delichos pruricus*. Couhage, or cow-itch. The hairy matter of the pods. Anthelmintic.
- Doricum.** See **ARNICA**.
- Dulcamara, L.** *Solanum Dulcamara*. Bitter-sweet, or woody night-shade. The herb and root. Diaphoretic. Attenuant, and cathartic. Watery infusions.
- Elaterium, L.** See **CUCUMIS**.
- Elatine.** *Veronica officinalis*. Fluellin, or female speedwell. The leaves. Diuretic and attenuant. Gives name to an official honey.
- Elecampane.** See **ENULA**.
- Elemi, L.** *Amyris elemifera*. Gum elemi. Aromatic. Gives name to an ointment.
- Endivia.** *Cichorium Endivia*. Endive. The leaves and roots. Aperient and refrigerant.
- Enula.** *Inula helenium*. Elecampane. The roots. Expecto- rant, stomachic, attenuant, and tonic. Spirituous and watery extracts. A collection.
- Eruca.** *Sisymbrium amphibium*. Rocket. The seeds. Stimu- lant.
- Erysimum.** *Erysimum officinale*. Hedge-mustard. The recent plant. Attenuant and diuretic.
- Eupatorium.** *Eupatorium Cannabinum*. Hemp or water-agri- mony; or water-hemp. The leaves. Attenuant, corroborant, and antiscorbutic.
- Euphorbia, L.** *Euphorbia officinalis*. Euphorbium. Sternuta- tory. Powder.
- Faba vicia.** *Vicia faba*. The seeds and flowers. Nutritive and cosmetic. A distilled water from the flowers.
- Fagopyrum.** *Polygonum fagopyrum*. Snakeweed. The seeds. Refrigerant.
- Farina, L.** *Triticum hyburnum*. Wheat-flower. Discutient.
- Ferrum, L.** *Iron*. Corroborative and alterant. Infusions in wine; the metal, filings, and wire. Some salts produced by combinations with different acids.
- Filipendula.** *Spiraea filipendula*. Common drop-wort. The root. Astringent and corroborant.
- Filix, L.** *Aspidium filix mas*. The male fern. The leaves and root. Anthelmintic and deobstruent. Powder.
- Flammula Jovis.** *Clematis flammula*. Upright virgin's-bower. The leaves and flowers. Very acid. Powder for sprinkling on cancerous and venereal ulcers; infusion and extract for internal use, in watings, &c. from lues venerea.
- Feniculum dulce et vulgare, L.** *Anethum feniculum*. Sweet and common fennel. The seeds, roots, and leaves. Aromatic, stimulant, and carminative. A simple water; and an ingredient in some compositions.
- Fœnum Græcum.** *Trigonella fœnum græcum*. Fenugreek. The seeds. Emollient. Chiefly used in cataplasms, fomentations, emollient glisters, &c.
- Formica.** *Formica rufa*. The ant. The whole insect. Stimu- lant. An oil and acid spirit.
- Fragaria.** *Fragaria vesca*. The strawberry-bush. The leaves and fruit. Astringent, corroborant, and refrigerant.
- Fraxinella.** *Dictamnus albus*. White or bastard dittany. The root. Diaphoretic.
- Fraxinus.** *Fraxinus excelsior*. The ash-tree. The bark and seeds. Astringent and stimulant.
- Fumaria.** *Fumaria officinalis*. Fumitory. The leaves. Stimu- lating, attenuant, and antiscorbutic.
- Fungus melitensis.** *Cynomorium coccin*. The stems and tops. Tonic and astringent. Decoction and tincture.
- Galanga minor.** *Kempferia galangal*. Galangal. The root. Stomachic.
- Galbanum, L.** *Bubon galbanum*. Galbanum. The gum. An- tihysterie. An ingredient in several official compositions.
- Galla.** *Er Querc. cerr*. Galls. Astringent. An ointment of the powder, with eight parts of hogs-lard.
- Gallium.** *Galium liberum*. Yellow ladies bed-straw, or cheese- rennet. The tops. Astringent.
- Gambogia.** See **CAMBOGIA**.
- Genista.** *Spartium scoparium*. Broom. The leaves, flowers, and seeds. Diuretic and cathartic.
- Gentiana, L.** *Gentiana lutea*. Common gentian. The root. Stomachic and stimulant. A spirituous tincture, and an ingre- dient in many official compositions.
- Geoffræa.** *Geoffroya inermis*. Cabbage-bark, or worm-bark- tree. The bark. Anthelmintic and purgative. Powder, de- coction, syrup, extract.

- Geranium.** *Geranium Robertianum.* Herb Robert. The leaves. Astringent, but very doubtful.
- Ginseng.** *Panax quinquefol.* Ginseng. The root. Stimulant, and corroborant.
- Gladiolus luteus.** *Iris pseudacorus.* Yellow water-flag, bastard acorus, or water flower-de-luce. Strongly cathartic.
- Glycyrrhiza.** *L. Glycyrrhiza glabra.* Liquorice. The root. Emollient and pectoral. An extract and powder. An ingredient in many official compositions.
- Grana paradisi.** *Anomum grana paradisi.* Grains of paradise. The seeds. Aromatic and stimulant.
- Granatum.** *L. Punica granatum.* The pomegranate. The fruit and flowers. Refrigerant and astringent.
- Gratiola.** *Gratiola officinalis.* Hedge-hyssop. The herb. Emetic and cathartic.
- Guaiacum.** *L. Guaiacum officinale.* Lignum vitæ, or guaiacum. The wood and bark. Aperient, stimulant, and corroborative. An extract, two tinctures, and a gummy resin. An ingredient in many compositions.
- Gummi arabicum.** *Mimosa nilotica.* Gum-arabic. Astringent and mucilaginous. An ingredient in many official compositions.
- Gummi ammoniacum.** *Ferula meoides?* Gum ammoniac. Aperient, antispasmodic, and emollient. A solution. An ingredient in several pectoral compositions.
- Gummi assaetida.** *Ferula assaetida.* Asaetida. The concrete juice. Antihysterical and anthelmintic. Tinctures.
- Gummi bdellium.** *Bdellium.* Sudorific, diuretic, and emollient.
- Gummi benzoin.** *Terminalia benzoin, Styrax benzoin.* Benzoin. Cosmetic. An ingredient in several anodyne compositions. See BENZOINUM.
- Gummi elemi.** *Amyris elemifera.* Aromatic. An essential oil, and gives name to an ointment.
- Gummi galbanum.** *Bubon galbanum.* Galbanum. Antispasmodic. An ingredient in many antihysterical medicines.
- Gummi labdanum.** *Cistus labdanifera.* Labdanum. Stomachic. An ingredient in the stomachic pills and plasters.
- Gummi lacca.** *Coccus lacca.* Gum-lac. Astringent. A tincture.
- Gummi mastic.** *Pistachia lentiscus.* Mastich. Corroborant.
- Gummi myrrha.** *Myrrh.* Antispasmodic and corroborant. A tincture, and an ingredient in many compositions.
- Gummi olibanum.** *L. Juniperus Lycia.* Olibanum. Astringent, but uncertain. An ingredient in some powders, and other official compositions.
- Gummi opoponax.** *L. Pastinaca opoponax.* Opoponax. Attenuant and stimulant. An ingredient in some official compositions.
- Gummi tragacanth.** *Atragalus tragacantha.* Gum-tragacanth, or gum-dragon. Astringent and corroborant.
- Hæmatoxyli lignum.** *L. Hæmatoxylon campechianum.* Logwood.
- Hedera arborea.** *Hedera helix.* Ivy. The leaves, berries, and resin. Diaphoretic.
- Hedera terrestris.** *Glechoma hederacea.* Ground-ivy. The leaves. Aperient and corroborant.
- Helleboraster.** *Helleboraster fatidus.* Bear's-foot. The leaves. Emetic, purgative, and anthelmintic. Syrup.
- Helleborus fetidus.** *L. Fætid hellebore.* The leaves. Emetic and errhine. Tincture.
- Helleborus.** *L. Helleborus niger.* Black hellebore, or Melampodium. The root. A powerful alterative and emmenagogue. A tincture and extract.
- Hepatica nobilis.** *Anemone hepatica.* Noble liverwort. The leaves. Cooling and corroborant.
- Hermodactylus.** *Iris tuberosa.* Hermodactyl. The root. Purgative, but doubtful.
- Herniaria.** *Herniaria glabra.* Rupture-wort. The leaves. Astringent.
- Hippocastanum.** *Æsculus hippocastanum.* Horse-chestnut. The bark and fruit. Corroborant and errhine.
- Hordeum.** *L. Hordeum distichon.* Pearl-barley. Refrigerant. A decoction.
- Horminum.** *Salvia horminum.* Garden-clary. The leaves and seeds. Corroborative.
- Hydrargyrum.** *L. Argentum vivum.* Quicksilver. A most powerful alterant. Used in various preparations.
- Hydrolapathum.** *Rumex aquaticus.* The leaves and roots. Alterant and laxative.
- Hyosciamus.** *L. Hyosciamus niger.* Common wild or black hen-bane. The leaves and seeds. Narcotic. Cataplasm, plaster, powder, ointment.
- Hypericum.** *Hypericum perforatum.* St. John's wort. The leaves, flowers, and seeds. Diuretic, sudorific, and alterant. Gives name to a coloured oil.
- Hyssopus.** *Hyssopus officinalis.* Hyssop. The leaves. Aromatic and pectoral. A distilled water.
- Jalappa.** *L. Convolvulus jalappa.* Jalap. The root. Cathartic. An extract, a simple and compound tincture, a resin, and powder.
- Japonica terra.** See CATECHU.
- Ipecacuanha.** *L. Callicoca Ipecacuanha.* Ipecacuanha. The root. Emetic and cathartic. A vinous tincture, and a powder.
- Juglans.** *Juglans regia.* The walnut-tree. The fruit. The kernel emollient, the shell astringent.
- Juniperus.** *L. Juniperus communis.* Juniper. The berries, wood, and resin. Carminative and stomachic. An essential oil, and spirituous water. Ingredients in several official compositions.
- Kermes.** *Coccus quercus ilicis.* Kermes. Astringent and corroborant. A confect on.
- Kino.** *L. A resin.* Astringent. A tincture.
- Lacca.** See GUMMI LACCA.
- Lactuca.** *Lactuca sativa.* Garden-lettuce. The leaves and seeds. Supposed narcotic.
- Lactuca.** *Lactuca virosa.* Wild lettuce. Juice. Laxative, diuretic, and diaphoretic. An extract.
- Ladanum.** See OPIUM.
- Lamium.** *Lamium album.* White archangel, or dead-nettle. The leaves and flowers. Supposed corroborant.
- Lapis calcareus.** *L. Carbonas calcis dura.* Limestone, or indurated carbonate of lime. Corrosive. A powder alterant and absorbent. A medicated water.
- Lavendula.** *L. Lavendula spica.* Greater, or broad-leaved lavender. The flowers. An excellent cordial and aromatic. An essential oil; a simple and compound spirit; and a conserve. An ingredient in some official preparations.
- Laurus.** *L. Laurus nobilis.* The bay-tree. The leaves and berries. Carminative and antispasmodic. An expressed oil. An ingredient in different compositions.
- Lentiscus.** *Pistacia lentiscus.* The lentisc, or mastich-tree. The wood. Astringent, tonic, and diuretic.
- Lepidum.** *Lepidium latifolium.* Common broad dittander, or pepperwort. The leaves. Antiscorbutic and diuretic.
- Lichen.** *L. Lichen Islandicus.* Eatable liverwort. The herb. Nourishing, antiseptic, and laxative.
- Lignum campechense.** *Hæmatoxylon campechense.* Logwood. The wood. Astringent. An extract.
- Lignum rhodium.** *Genista canariensis.* Rose-wood. The wood. Cordial. An essential oil.
- Lilium convallium.** *Convallaria maialis.* Lily of the valley. The root and flowers. Cephalic and nervine.
- Lilium album.** *Lilium candidum.* White lily. The root. Emollient. Poultice.
- Limon.** *L. Citrus medica.* The lemon-tree. The fruit. Aromatic, antiscorbutic, and cordial. An essential oil; an ingredient in several compositions.
- Linum catharticum.** *L. Purging flax.* The leaves. Cathartic. Infusion in whey. Dried powder.
- Linum Sativum.** *L. Linum usitatissimum.* Flax. The seeds. Emollient. An expressed oil. Cataplasm.
- Lobelia.** *Lobelia siphilitica.* Blue cardinal flower. The roots. Alterant, detergent, cathartic, and anti-venereal. Decoction of a handful of the roots in three measures of water; one-half taken in the morning fasting; the other at night. This root was long a famous secret among the North American Indians, till it was purchased by Sir William Johnston, and published by Bartram, &c.
- Lujula.** Wood-sorrel. See ACETOSELLA.
- Lumbrici et limaces terrestres.** Earth-worms and snails. Aperient and analeptic. Decoction in milk.
- Lupulus.** *Humululus lupulus.* Hops. The loose leafy heads on the tops of the stalks. Diuretic and stomachic.
- Lycoperdon.

- Lycoperdon*. *Lycoperdon bovista*. Puff-ball, or dusty mushroom. The whole. Styptic.
- Lytta, L. *Lytta vesicatoria*. See CANTHARIS.
- Magnesia sulphas, L. *Sulphas magnesia purificata*. Sulphate of magnesia. Aperient, cathartic.
- Magnesia. *Carbonas magnesia*. Carbonate of magnesia. Absorbent and aperient. An earth.
- Majorana. *Origanum majorana*. Sweet marjoram. The leaves and flowers. Aromatic and errhine. An essential oil.
- Malabathrum. *Laurus cassia*. Indian leaf. Aromatic. An ingredient in mithridate and theriaca.
- Malva, L. *Malva sylvestris*. The mallow. The leaves and flowers. Emollient. Ingredient in the decoctions for gylsters; also in cataplasms and fomentations. Formerly there was a conserve of the flowers.
- Malus. *Pyrus malus*. The apple-tree. The fruit. Refrigerant and laxative.
- Manna, L. *Fraxinus ornus*. The manna-ash. The concreted juice. Laxative. Gives name to an officinal lohoch, and enters several other compositions.
- Marubium, L. *Marubium vulgare*. White horehound. The leaves. Stomachic and aperient. An ingredient in theriaca. The juices of horehound and plaitain mixed, are used as remedies against the bite of the rattlesnake, given in spoonfuls at short intervals; while the wound is covered with a cataplasm of these heads bruised.
- Marum Syriacum. *Teucrium Marum*. Syrian herb mastich. The leaves. Aromatic and errhine. An ingredient in some cephalic snuffs.
- Mastiche. See GUMMI.
- Matricaria. *Matricaria parthenium*. Feverfew. The leaves and flowers. Aperient and antispasmodic.
- Mel. Honey. Aperient and detergent.
- Melilotus. *Trifolium melilot*. Melilot. The leaves and flowers. Emollient and carminative. Gives name to a plaster.
- Melissa. *Melissa officinalis*. Balm. The leaves. Aromatic. An essential oil, and an infusion.
- Mentha vulgaris, L. *Mentha viridis*. Spearmint. The herb. Aromatic and cordial. A distilled water, an essential oil, a spirit, and essence; an ingredient in several officinal preparations.
- Mentha piperitis, L. *Mentha piperita*. Peppermint. The herb. Aromatic and cordial. A distilled water, essential oil, and essence; an ingredient in several officinal preparations.
- Menyanthes, L. *Menyanthes trifoliata*. Marsh trefoil, or buckbean. The leaves. Laxative and alterant.
- Meum. *Aethusa meum*. Spiguel. The root. Aromatic and carminative.
- Mezereon, L. *Daphne mezereum*. Mezereon, or spurge-olive. The bark of the root. Violently cathartic. Decoction and powder.
- Millefolium. *Achillea millefolium*. Millefoil or yarrow. The leaves and flowers. Mildly astringent and aromatic. An essential oil.
- Millepedæ. *Oniscus asellus*. Wood-lice, hog-lice, or slaters. Diuretic. The insects dried and powdered; an infusion in wine; and an ingredient in some other preparations.
- Morus diaboli. *Scabiosa succisa*. Devil's bit. The leaves and roots. Diaphoretic.
- Morus nigra, L. The mulberry-tree. The fruit and bark of the roots. Refrigerant, astringent, anthelmintic. A syrup from the juice of the fruit.
- Moschus, L. *Moschus moschiferus*. Musk. Diaphoretic and antispasmodic. A julep.
- Myrsina nuclea, L. *Myristica aromatica*. The nutmeg-tree. The fruit, and covering called mace. An excellent aromatic, cordial, and stomachic. An expressed oil, falsely called the oil of mace; an essential oil; a simple water; a spirituous water; an ingredient in many officinal compositions.
- Myrobalani. *Prunus myrobalanus*. Myrobalanus. The fruit. Purgative.
- Myrra, L. See GUMMI MYRRA.
- Myrtus. *Pecunium myrtillus*. Whortle-berry. The leaves and berries. Astringent.
- Myrtus. *Myrtus communis*. The myrtle. The berries. Astringent.
- Nasturtium aquaticum. *Sisymbrium nasturtium*. Water-cresses. The leaves and juice. Aperient and antiscorbutic. An ingredient in the succi scorbutici.
- Nasturtium hortense. *Lepidium sativum*. Garden-cresses. The leaves and seeds. Aperient and antiscorbutic, but weaker.
- Nepeta. *Nepeta cataria*. Nep, or catmint. The leaves. Aromatic and cordial.
- Nicotiana. *Nicotiana tabacum*. See TABACUM.
- Nigella. *Nigella sativa*. Fennel-flower. The seeds. Supposed aperient and diuretic.
- Nitrum. Nitre or salt-petre. See POTASSÆ NITRAS.
- Nummularia. *Lysimachia nummularia*. Money-wort. The leaves. Antiscorbutic.
- Nux pistachia. *Pistachiu vera*. The pistachia-tree. The fruit. Emollient and analeptic.
- Nux vomica. *Strjehnos nux vomica*. Nux vomica. The fruit. Narcotic.
- Oenanthe. *Oenanthe crocata*. Hemlock drop-wort. Leaves and root. A virulent poison. The juice of the root, or infusion of the leaf, recommended in chronic eruptions; the latter also useful as an emmenagogue.
- Olibanum, L. See GUMMI OLIBANUM.
- Oliva, L. *Olea Europæa*. The olive-tree. The fruit. Emollient. An expressed oil, used in almost all ointments, plasters, &c.
- Ononis. *Ononis spinosa*. Rest-harrow. The root. Aperient and diuretic.
- Opium. *Papaver somniferum*. The Asiatic poppy. The inspissated juice. A most excellent anodyne and cordial, when properly used; but a very fatal poison taken in too great quantity. Purified by straining, called the Thebaic extract; a vinous and spirituous tincture, called liquid laudanum. A capital ingredient in many preparations.
- Opopanax, L. See GUMMI OPOPANAX.
- Origanum, L. *Origanum vulgare*. Wild marjoram. The leaves. Aromatic. An essential oil.
- Oryza. *Oryza sativa*. Rice. The grain. Emollient and refrigerant.
- Oxylapathum. *Rumex acutus*. Sharp-pointed dock. The roots and leaves. Alterant and laxative.
- Pæonia. *Pæonia officinalis*. Male and female peony. Roots, flowers, and seeds. Emollient and antispasmodic. Ingredient in some anti-epileptic powders.
- Palma. *Cocos butyracea*. The palm-tree. Kernels of the fruit. Emollient and anodyne. An expressed oil, used in stomachic plasters.
- Papaver album, L. *Papaver somniferum*. White poppy. The heads. Anodyne. A syrup.
- Papaver erratium. *Papaver rhæas*. See RHŒADOS PÉTALA.
- Paralysis. *Primula veris ossic*. Cowslip. The flowers. Corroborant and antispasmodic. A syrup.
- Parietaria. *Parietaria officinalis*. Pellitory of the wall. The leaves. Emollient and diuretic. Ingredient in a nephritic decoction.
- Pastinaca. *Pastinaca sativa*. Garden-parsnip. The roots and seeds. Emollient and aromatic.
- Pastinaca silvestris. Wild parsnip. The seeds. Aromatic.
- Persicaria urens. *Polygonum hydropiper*. Bitter arsemart, lake-weed, or water-pepper. The leaves. Diuretic and detergent when externally applied.
- Persicaria mitis. *Polygonum persicaria*. Spotted arsemart. The leaves. Anti-septic and astringent.
- Persica. *Amygdalus persica*. The peach-tree. The leaves, flowers, and fruit. Laxative, anthelmintic, and refrigerant.
- Peruvianus cortex. *Cinchona officinalis*. The quinquina, Jesuit's bark, or Peruvian bark-tree. The bark. A most excellent corroborative. An extract, a resin, a spirituous, and a compound tincture; a tincture in volatile spirit; an ingredient in the stomachic tincture.
- Petroleum. Rock oil. Anodyne and corroborative when applied externally.
- Petroselinum. *Apium petroselinum*. Common parsley. The roots, leaves, and seeds. Aperient and somewhat aromatic. The seeds an ingredient in an emetuary.
- Pimenta, L. *Myrtus pimenta*. Pimento, Jamaica pepper or allspice.

- spice. The berry. Aromatic and stimulant. The basis of a distilled water, a spirit, and an essential oil.
- Pimpinella sanguisorba*. *Sanguisorba officinalis*. The greater wild burnet. The leaves. Astringent.
- Pimpinella saxifraga*. Burnet saxifrage. The root-leaves, and seeds. Diaphoretic, diuretic, and antiscorbutic.
- Pinus*. *Pinus sylvestris*. The pine-tree. The kernels of its fruit emollient: for the resin, see *TEREBINTHINA*.
- Piper*, L. *Piper longum*. Long pepper. Highly aromatic and stimulant.
- Piper*, L. *Piper nigrum*. Black Pepper. Highly aromatic and stimulant.
- Piper Jamaicense*. See *PIMENTA*.
- Piper Indicum*. *Capsicum annuum*. See *CAPSICI BACCÆ*.
- Pix liquida*, L. *Pinus sylvestris*. Tar. Attenuant and stimulating. Infusion in water; and an ingredient in a kind of pectoral pills.
- Pix arida*, L. *Pinus abies*. Burgundy pitch. A warm adhesive resinous substance. Ingredient in several plasters, ointments, and cerates.
- Plantago latifolia*. *Plantago major*. Common broad-leaved plantane. The leaves. Astringent.
- Plumbi oxydum semivitrificum*, L. Semivitrified lead, or litharge. Astringent and refrigerant but dangerous. A tincture and extract, or solution in acids. An ingredient in several ointments, &c.
- Polygala senega*. See *SENEGA*.
- Polypodium*. *Polypodium vulgare*. Polypody. The root. Laxative.
- Populus*. *Populus nigra*. Black-poplar. The buds. Aromatic. An ointment, but might be used to better purposes.
- Porrum*, L. *Allium porrum*. The leek. The root. A stimulating diuretic.
- Portulaca*. *Portulaca oleracea*. Purslane. The seeds. Refrigerant.
- Potassa impura*, L. *Carbonas potassæ impura*. Impure potass. Absorbent, aperient, diuretic, and caustic. Neutral salts.
- Potassæ nitras*, L. *Nitras potassæ purificata*. Purified nitrate of potass. Diaphoretic, diuretic, and refrigerant. A fixed salt, a spirit, a solution. An ingredient in several preparations.
- Potassæ Supertartaras*, L. *Supertartaras potassæ purificata*. Purified supertartrate of potass. Expectorant, and cathartic. Powder and solution.
- Primula*. *Primula veris*. Primrose. The herb and root. Aromatic and stomachic. An infusion and distilled spirit.
- Pruna*, L. *Prunus domestica*. Common prunes. The fruit. Cooling and aperient.
- Prunella*. *Prunella vulgaris*. Self-heal. The leaves. Attenuant and detergent.
- Parnica*. *Achillea ptarmica*. Sneezewort, or bastard pellitory. The root. Errhine and stimulating.
- Pterocarpus*, L. See *SANTALUM RUBRUM*.
- Pulegium*, L. *Mentha Pulegium*. Pennyroyal. The flower. A warm aromatic. A simple, and a spirituous water; an essential oil; an ingredient in some other officinal compositions.
- Pulmonaria maculosa*. *Pulmonaria officinalis*. Spotted lungwort, or Jerusalem sage. The leaves. Said to be aperient and analeptic.
- Pulsatilla nigricans*. *Anemone pratensis*. Meadow anemone. The herb and flower. Emetic, diuretic, and cathartic. An extract and distilled water, used in venereal complaints, and certain disorders of the eye.
- Pyrethrum*, L. *Achimis pyrethrum*. Pellitory of Spain. The root. Promotes the salival flux.
- Quassia*. *Quassia simaruba*. See *SIMAROBA*.
- Quassia*. *Quassia amara*. Quassy. The wood. Stomachic and tonic. An extract.
- Quercus*. *Quercus robur*. Oak-tree. The bark. Strongly astringent.
- Quercus marina*. *Fucus vesiculosus*. Sea-wrack, or Sea-oak. The herb. Astringent and detergent. A powder of the burnt herb.
- Raphanus rusticus*. *Cochlearia armoracea*. See *ARMORACIA*.
- Rheum*, L. *Rheum palmatum*. Rhubarb. The root. Cathartic and stomachic. Toasted; a watery infusion; vinous and spirituous tinctures. Ingredient in several officinal compositions.
- Rhamnus cathartica*, L. See *SPINA CIRVINA*.
- Rhapoticum*. *Rhacum Rhapoticum*. Rhapontic. The roots. Laxative.
- Rhododendron chrysanthemum*. Rhododendron. The herb. Powerfully sedative. Decoction and powder; serviceable in gout and rheumatism.
- Rhæados petala*, L. *Papaver rhæas*. The petals of the red poppy, or corn-rose. Anodyne. A syrup.
- Ribes nigrum*. The black currant-bush. The fruit. Refrigerant and detergent. A jelly.
- Ribes rubrum*. The red currant-bush. The fruit. Refrigerant and detergent. A jelly.
- Ricinus*, L. *Ricinus communis*. Palma Christi. The seed. Laxative; anthelmintic. Expressed oil.
- Rosa damascena*. *Rosa centajolia*. Damask rose. The flower. Aromatic and gently laxative. A distilled water and syrup.
- Rosa rubra*, L. *Rosa Gallica*. The red-rose. The flower. Astringent and corroborative. Conserve, honey, tincture, troches, vinegar, and syrup. Ingredient in several compositions.
- Rosmarinus hortensis*, L. *Rosmarinus officinalis*. Rosemary. The tops and flowers. A fine aromatic and cordial. An essential oil; a distilled spirit, called, Hungary-water. Ingredient in many cordial and anti-spasmodic medicines.
- Rubia*, L. *Rubia tinctorum*. Madder. The root. Aperient and detergent.
- Rubus*. *Rubus idæus*. The raspberry bush. The fruit. Refrigerant. A syrup.
- Rubus niger*. *Rubus fruticosus*. The bramble. The leaves. Astringent.
- Ruscus*. *Ruscus aculeatus*. Butcher's broom. The root. Aperient. Ingredient in diet-drinks.
- Ruta*, L. *Ruta graveolens*. Broad-leaved rue. The leaves and seed. Very stimulant, attenuating, and detergent. An extract: and an ingredient in several compositions.
- Sabina*, L. *Juniperus Sabina*. Savin. The leaves or tops. Stimulating and aperient. An essential oil; a watery extract. Ingredient in several compositions.
- Saccharum*, L. *Saccharum officinale*. Sugar. Emollient and laxative.
- Saccharum purificatum*, L. Refined sugar. Emollient and laxative. A preparation from the expressed juice.
- Sagapenum*, L. *Ferula orientalis*. Gum sagapenum. Aperient and deobstruent. An ingredient in several antispasmodic medicines.
- Sal alkali vegetabile*. See *POTASSA IMPURA*.
- Sal alkali minerale*. See *SODA IMPURA*.
- Sal commune*. Common salt. See *SODÆ MURIAS*.
- Salicaria*. *Lythrum salicaria*. Purple loose-strife. The l.e.b. Astringent.
- Salix*, L. *Salix caprea*. Great round curved willow. The bark. Corroborant.
- Salvia*. *Salvia officinalis*. Common sage. Leaves. Stimulant and astringent.
- Sambucus*, L. *Sambucus nigra*. Blackberried alder. Leaves, bark, flowers, and berries. Cathartic, aromatic, and aperient. A rob for internal use from the berries; ointment and oil from the flowers and bark; the flowers an ingredient in some compound waters.
- Santalum citrinum*. *Santalum album*. Yellow sanders. The wood. Greatly recommended by Hoffman as a restorative. Essential oil; extract.
- Santalum rubrum*. *Pterocarpus santalinus*. Red sanders. The wood. Used only for its colour.
- Sapo durus*, L. Hard Spanish soap. Resolvent and stimulant. A plaster, liniment, balsam, and pills.
- Sapo mollis*, L. Common soft soap. Resolvent and stimulant. Ingredient in the milder caustic.
- Sapo niger*. Black soap. Resolvent and stimulant. Ingredient in an anodyne plaster.
- Saponaria*. *Saponaria officinalis*. Soapwort or bruisewort. The herb and root. Aperient, corroborant, and sudorific. Tincture; extract.

- Sarsaparilla, L. *Smilax sarsaparilla*. Sarsaparilla. The root. Alterant, and diaphoretic. Infusions and extract.
- Sassafras, L. *Laurus sassafras*. The root. Alterant, aperient, and corroborant. An essential oil; an ingredient in some official preparations.
- Satureia, *Satureia hortensis*. Summer savory. The leaves. A very pungent warm aromatic.
- Satyrion mas. *Orchis mascula*. Orchis. The root. Coagulant and corroborative. Salep supposed to be a preparation from a root of this kind.
- Scabiosa, *Scabiosa arvensis*. Scabious. The leaves. Aperient, sudorific, and expectorant.
- Scammonia, L. *Convolvulus scammonia*. Scammony. Roots. Strongly cathartic. Gives name to a powder, and is an ingredient in some official preparations.
- Scilla, L. *Scilla maritima*. The squill, or sea-onion. The root. Powerfully diuretic, stimulant, and expectorant. A syrup, vinegar, oxymel, pills; the root dried, baked, and made into troches.
- Scordium, *Teucrium scordium*. Water germander. The leaves. Deobstruent, diuretic, and sudorific; but doubtful. An ingredient in mithridate, theriaca, and other preparations.
- Sedum, *Sedum acre*. Wall-stone-crop, or wall-pepper. The fresh plant. Strongly purgative, emetic, and diuretic.
- Sedum majus. *Sedum album*. Greater house-leek. The leaves. Refrigerant.
- Senega, L. *Polygala senega*. Senega. Rattlesnake-root. The root. Stimulant, attenuant, and diuretic.
- Senna, L. *Cassia senna*. Senna. The leaves. Cathartic. Infusion; spirituous tinctures; compound powders; and an electuary.
- Serpentaria Virginiana, L. *Aristolochia serpentaria*. Virginian snakeweed. The root. A warm diaphoretic and diuretic. A spirituous tincture; an ingredient in many tinctures.
- Serpyllum, *Thymus serpyllum*. Mother of thyme. The herb. Aromatic.
- Sigillum Salomonis. *Convallaria polygonatum*. Solomon's seal. The root. Probably emollient.
- Simarouba, L. *Quassia simarouba*. Simarouba. The bark. Antiseptic, used in dysenteries.
- Sinapi, *Sinapis alba et nigra*. Mustard. Seeds, black and white. Strongly pungent and stimulant. An expressed oil.
- Sium, *Sium nodosum*. Creeping skerrit, or water-parsnip. The herb. The juice; serviceable in some cutaneous disorders.
- Soda impura, L. *Carbonas soda impura*. Impure subcarbonate of soda. Aperient, diuretic, and caustic. Neutral salts.
- Sodæ murias, L. *Murius sodæ*. Muriate of soda. Sea-salt. Cathartic, taken in large doses.
- Sodæ boras, L. *Subboras sodæ*. Borate of soda or borax. Stimulant.
- Sodæ sulphas, L. *Sulphas sodæ*. Sulphate of soda. Cathartic, refrigerant and stimulant.
- Solanum, *Solanum nigrum*. Nightshade. The leaves. Powerfully evacuant.
- Spermaceti, *Physeter macrocephalus*. Spermaceti. A mild emollient.
- Spigelia, L. *Spigelia Marilandica*. Indian pink. The root. Anthelmintic.
- Spina cervina, L. *Rhamnus catharticus*. Buckthorn. The berries. Strongly cathartic. A syrup.
- Spiritus rectificatus, L. Alcohol. Rectified spirit. Used in most preparations for tinctures.
- Spiritus tenuior, L. Proof spirit. Used in preparations for tinctures.
- Spongia, L. *Spongia officinalis*. Sponge. Used as a tent for dilating ulcers, &c. Burnt, recommended in scrophulous affections.
- Stannum, *Stanni limatura*. Tin. The filings. Anthelmintic. Powdered.
- Staphisagria, *Delphinium staphisagria*. Stavesacre. The seeds. Violently cathartic taken internally. Applied externally, destroys lice, &c.
- Stramonium, *Datura stramonium*. Thorn-apple. The herb. Narcotic. An extract.
- Styrax, L. *Styrax officinalis*. Aromatic, stimulant, and nervine. Ingredient in some tinctures and pills.
- Suber. *Quercus suber*. The cork-tree. The bark. Astringent.
- Saccharum, L. Amber. Astringent and corroborant. Tincture, balsam, essential oil, and an ingredient in several official compositions.
- Sulphur, L. Sulphur, and flowers of sulphur. Laxative, diaphoretic, and alterant. Solutions in oils, called balsams, and an ingredient in some ointments.
- Sumach, *Rhus coriaria*. Common sumach. The leaves and seeds. Astringent.
- Tabacum, L. *Nicotiana tabacum*. Virginian tobacco. The dried leaves. Violently emetic, cathartic, and narcotic. An extract.
- Swietenia, *Swietenia febrifuga*. Mahogany. The bark proposed as a substitute for the Peruvian bark. Tonic.
- Tamarindus, L. *Tamarindus Indica*. Tamarinds. The fruit. Refrigerant and laxative. Ingredients in some laxative electuaries.
- Tamariscus, *Tamarix Gallica*. The tamarisk-tree. The leaves and bark. Astringent.
- Tanacetum, *Tanacetum vulgare*. Tansy. The leaves, flowers, and seeds. Stimulant, antispasmodic, and anthelmintic.
- Taraxacum, L. *Leontodon taraxacum*. Dandelion. The leaves and root. Attenuant and resolvent. A distilled spirit, recommended by professor Delius of Erlang, in asthma and dropsy.
- Terebinthina Veneta, *Pinus larix*. Venice turpentine. Warm, stimulating, diuretic, and aperient.
- Terebinthina Chia, L. *Pistacia terchinthus*. Chian, or Cyprus turpentine. Warm, stimulating, diuretic, and aperient.
- Terebinthina vulgare, L. *Pinus sylvestris*. Common turpentine. Used chiefly in external applications. An essential oil. This residuum forms the white and black rosin used in most ointments.
- Terra Japonica. See CATECHU.
- Thapsus barbatus, *Verbascum thapsus*. Great white mullein. The leaves and flowers. Analeptic. A spirituous extract from the flowers.
- Thea bohea et viridis. Bohea and green tea. The leaves. Cordial, diuretic, and diaphoretic. An infusion.
- Thlaspi, *Thlaspi arvense*. Treacle, or mithridate mustard. The seeds. Aromatic and stimulant. Ingredient in theriaca.
- Thymus, *Thymus citratus*. Lemon-thyme. The leaves. An agreeable aromatic. A distilled water and essential oil.
- Thymus vulgaris. Common thyme. The leaves. An agreeable aromatic. A distilled water and essential oil.
- Tilia, *Tilia Europea*. The lime or linden-tree. The flowers. Antispasmodic. Infusion.
- Tithymalus, *Euphorbia lathyrus*. The spurge. The juice of the root. Violently cathartic.
- Tormentilla, *Tormentilla officinalis*. Tormentil, or septfoil. The root. Astringent. An ingredient in several official compositions.
- Tritolium paludosum, *Menyanthes trifoliata*. See MENYANTHES.
- Triticum, *Triticum hybernium*. Wheat. The grain and flour. Nutritive and glutinous. Starch.
- Turpethum, *Convolvulus Turpethum*. Turbith. The root. Violently cathartic. An extract.
- Tussilago, L. *Tussilago farfura*. Coltsfoot. The leaves and flowers. Emollient and mucilaginous. An ingredient in pectoral decoctions.
- Valeriana, L. *Valeriana officinalis*. Wild valerian. The root. Antispasmodic. A tincture in proof and volatile spirits; and an ingredient in several cephalic and anticephalic medicines.
- Veratrum, L. *Veratrum album*. White Hellebore. The root violently emetic and errhine. A tincture and honey.
- Veronica mas. *Veronica officinalis*. Male speedwell. The leaves. Aperient and pectoral. Infusions.
- Vinum, L. Wine. Sherry. Cordial and corroborant. A menstruum for a great number of medicinal substances.
- Viola, L. *Viola odorata*. The single March violet. The flowers. Laxative. A syrup.
- Vipera, *Coluber berus*. The viper. The flesh and fat. Restorative.

storative and emollient. A vinous tincture. An ingredient in theriaca.

Uva passa. *Vitis vinifera*. The vine. The leaves, sap, flowers, and fruit. Astringent, diuretic, aromatic, and pectoral. Wine. The dried fruit or raisins are ingredients in some pectoral and stomachic medicines.

Ulmus, L. *Ulmus campestris*. The elm-tree. The inner bark. Astringent. A decoction recommended by Dr. Letson, in obstinate cutaneous eruptions.

Urtica. *Urtica dioica*. Nettle. The herb. Rubefacient.

Uva ursi, L. *Arbutus uva ursi*. Whortle-berry. The leaves. Astringent and lithontriptic.

Winteranus cortex. *Wintera aromatica*. Winter's bark. Aromatic.

Zincum, L. Zinc. Supposed to be a good antiepileptic and tonic. The metal reduced to a calx by fire. Calamine and tutty, ores of this metal are the bases of two ointments.

Zinci sulphas. Sulphate of zinc. An emetic. This salt is sudden in its operation; and is principally used when poison has been received into the stomach.

Zingiber. *Zingiber officinale*. Ginger. The root. Aromatic. A syrup. Also an ingredient in several official compositions.

GENERAL RULES FOR COLLECTING AND PRESERVING SIMPLS.

I. ROOTS. Annual roots are to be taken up before they shoot out stalks or flowers: biennial ones chiefly in the autumn of the same year in which the seeds were sown: the perennial, when the leaves fall off, and therefore generally in the autumn. Being washed clean from dirt, and freed from the rotten and decayed fibres, they are to be hung up in a warm, shady, airy place, till sufficiently dried. The thicker roots require to be slit longitudinally, or cut transversely into thin slices. Such roots as lose their virtues by exsiccation, or are desired to be preserved in a fresh state, for the greater convenience of their use in certain forms, are to be kept buried in dry sand. There are two seasons in which the biennial and perennial roots are reckoned the most vigorous, the autumn and spring; or rather the time when the stalks or leaves have fallen off, and that in which the vegetation is just to begin again, or soon after it has begun; which times are found to differ considerably in different plants. The college of Edinburgh, in the two first editions of their pharmacopœia, directed them to be dug in the spring, after the leaves were formed; in the third edition the autumn was preferred. The generality of roots appear, indeed, to be most efficacious in spring: but as at this time they are also the most juicy, and consequently shrivel much in drying, and are rather more difficultly preserved, it is commonly thought most advisable to take them up in autumn. No rule, however, can be given, that shall obtain universally; arum-root is taken even in the middle of summer, without suspicion of its being less active than at other seasons; while angelica-root is inert during the summer, in comparison of what it was in the autumn, spring, or winter.

II. HERBS AND LEAVES. Herbs are to be gathered when the leaves have come to their full growth, before the flowers unfold; but of some plants the flowery tops are preferred. They are to be dried in the same manner as roots. For the gathering of leaves, there cannot perhaps be any universal rule more than for roots: for though most herbs appear to be in their greatest vigour about the time of their flowering, or a little before, there are some in which the medicinal parts are more abundant at an earlier period. Thus mallow and marshmallow-leaves are most mucilaginous when young, and by the time of flowering approach more to a woody nature. A difference of the same kind is more remarkable in the leaves of certain trees and shrubs: the young buds, or rudiments of the leaves, of the black poplar-tree, have a strong fragrant smell, approaching to that of storax; but by the time that the leaves have come to their full growth, their fragrance is exhausted. Herbs are directed by most of the pharmaceutic writers to be dried in the shade; a rule which appears to be very just, though it has sometimes been misunderstood. They are not to be excluded from the sun's heat, but from the strong action of the solar light: by which last their colours are more liable to be altered or destroyed than those of roots. Slow drying of them in a cool

place is far from being of any advantage: both their colours and virtues are preserved in greatest perfection when they are dried hastily by the heat of a common fire, as great as that which the sun can impart: the juicy ones, in particular, require to be dried by heat, being otherwise subject to turn black. Odoriferous herbs, dried by fire till they become friable, discover indeed, in this arid state, very little smell; not that the odorous matter is dissipated, but on account of its not being communicated from the perfectly dry subject to dry air: for as soon as a watery vehicle is supplied, whether by infusing the plant in water, or by exposing it for a little time to a moist air, the odorous parts begin to be extracted by virtue of the aqueous moisture, and discover themselves in their full force. Of the use of heat in the drying of plants, we have an instance in the treatment of tea among the Chinese. The leaves, as soon as gathered, are brought into an apartment furnished with a number of little furnaces or stoves, each of which is covered with a clean smooth iron-plate; the leaves are spread on the plates, and kept rolling with the hands till they begin to curl up about the edges; they are then immediately swept off on tables, on which one person continues to roll them, while another fans them that they may cool hastily: this process is repeated two or three times, or oftener, according as the leaves are disposed to unbind on standing.

III. EXSICCATION OF HERBS AND FLOWERS. Herbs and flowers are to be dried by the gentle heat of a stove or common fire, and only in that quantity at a time by which the exsiccation may be very soon finished. By these means their strength is best preserved; and this is indicated in proportion as they retain their native colour. But the leaves of hemlock, and some other herbs replete with a subtile volatile matter, are to be powdered immediately after the exsiccation, and preserved in glass-vessels, well shut.

IV. FLOWERS. Flowers are to be gathered when moderately expanded, on a clear dry day, before noon. Red roses are taken before they open, and the white heels clipped off and thrown away. The quick drying, above recommended for the leaves of plants, is more particularly proper for flowers; in most of which both the colour and smell are more perishable than in leaves, and more subject to be impaired by slow exsiccation. Of the flowers which come fresh into the apothecaries hands, the only ones employed dry in the London pharmacopœia are red roses; and these, in all the compositions in which they are used in a dry state, are expressly ordered to be dried hastily. One of the most valuable aromatics of European growth, saffron, is part of a flower, dried on paper on a kind of kiln, with a heat sufficient to make it sweat, taking care only not to endanger the scorching of it. It may here be observed, that the virtues of flowers are confined to different parts of the flower in different plants. Saffron is a singular production growing at the end of the style or pistil. The active part of camomile-flowers is the yellow disk, or button in the middle: that of lilies, roses, clove july-flowers, violets, and many others, the petala or flower-leaves; white rosemary has little virtue in any of these parts, the fragrance admired in the flowers of this plant residing chiefly in the cups.

V. SEEDS AND FRUITS. Seeds should be collected when ripe, and beginning to grow dry, before they fall off spontaneously. Fruits are also to be gathered when ripe, unless otherwise ordered. Of the fruits whose collection comes under the notice of the apothecary, there are few which are used in an unripe state; the principal is the sloe, whose virtue as a mild astringent is much diminished by maturation. The fruit of the orange-tree, raised in our gardens or green-houses, is sometimes gathered in a state of much greater immaturity, soon after it is formed on the tree, before it has acquired its acid juice; at this time it proves an elegant aromatic bitter, nearly resembling Curassao oranges, which appear to be the same fruit gathered at the same period in a warmer climate. All the official seeds being in their greatest perfection at the time of their maturity, this is the only proper time for collecting them. As seeds contain little watery moisture, they require no other warmth for drying them than that of the temperate air in autumn; such as abound with a gross expressible oil, as those commonly called the cold-seeds, should never be exposed to any considerable heat; for this would hasten the rancidity, which, however carefully kept, they are very liable to contract. Seeds are best preserved in their natural husks or coverings, which should be separated

pared only at the time of using; the husk, or cortical part, serving to defend the seed from being injured by the air.

VI. WOODS AND BARKS. The most proper season for the felling of woods, or shaving off their barks, is generally the winter. No woods of British growth are now retained by the London or Edinburgh colleges. The only two which had formerly a place in the catalogues of simples were the juniper and the box; the first of which is never kept in the shops, or employed in practice; the other may be produced from the turner, and it is indifferent at what season it has been cut down, being at all times sufficiently fit for the only use to which it was applied, the yielding an empyreumatic oil by distillation in a strong fire. It is doubted, whether barks are not generally more replete with medicinal matter in summer and spring than in winter. The barks

of many trees are in summer so much loaded with resin and gum as to burst spontaneously, and discharge the redundant quantity. It is said that the bark of the oak answers best for the tanners at the time of the rising, of the sap in spring; and as its use in tanning depends on the same astringent quality for which it is used in medicine, it should seem to be also fittest for medicinal purposes in the spring. It may be observed likewise, that it is in this last season that barks in general are most conveniently peeled off.

VII. ANIMAL SUBSTANCES. Animal substances are to be chosen in their most perfect state, unless they be ordered otherwise. Whatever virtues these bodies may have, they are supposed to be best when they have attained to their common full growth. For the compounding of these medicines see **PHARMACY**, and for their application see **MEDICINE**.

MATHEMATICAL INSTRUMENTS, such instruments as are usually employed by mathematicians, as compasses, scales, quadrants, &c. See these articles.

MATHEMATICAL INSTRUMENTS, MACHINE FOR DIVIDING. See **RAMSDEN'S MACHINE**.

MATHEMATICIAN, a person versed in the mathematics. The first who cultivated mathematics after the flood were the Assyrians and Chaldeans; from whom Josephus says, they were carried by Abraham to the Egyptians; who proved such notable proficient, that Aristotle fixes the first rise of mathematics among them. From Egypt they passed into Greece through the hands of Thales, B. C. 584; who having learned geometry of the Egyptian priests, taught it in his own country. After Thales, Pythagoras, among other mathematical arts, paid a particular regard to arithmetic; fetching the greatest part of his philosophy from numbers: he was the first, as Laertius tells us, who abstracted geometry from matter; and to him we owe the doctrine of incommensurable magnitude, and the five regular bodies, besides the first principles of music and astronomy. Pythagoras was seconded by Anaxagoras, Ctenopides, Briso, Antipho, and Hippocrates of Scio; who all applied particularly to the quadrature of the circle, the duplicature of the cube, &c. but the last with most success: this last is also mentioned by Proclus, as the first who compiled elements of mathematics. Democritus excelled in mathematics as well as physics; though none of his works in either kind are extant, the destruction of which some authors lay at Aristotle's door. The next in order is Plato, who not only improved geometry, but introduced it into physics, and so laid the foundation of a solid philosophy. Out of his school proceeded a crowd of mathematicians. Proclus mentions thirteen of note; among whom was Leodamus, who improved the analysis first invented by Plato; Theætetus, who wrote elements; and Archiatus, who was the first who applied mathematics to use in life. These were succeeded by Neocles and Theon, the last of whom contributed to the elements. Eudoxus excelled in arithmetic and geometry, and was the first founder of a system of astronomy. Menechmus invented the conic sections, and Theudius and Hermotimus improved the elements. Aristotle's works are so stored with mathematics, that Blancanus compiled a whole book of them: out of his school came Eudemus and Theophrastus; the first of whom wrote of numbers, geometry, and invisible lines; the latter, a mathematical history. To Aristeus, Isidorus, and Hypsicles, we owe the books of solids; which, with the other books of elements, were improved, collected, and methodised by Euclid, who died B. C. 284. A century after Euclid, came Eratosthenes and Archimedes. Cotemporary with the latter was Conon, a geometrician and astronomer. Soon after appeared Apollonius Pergæus; whose conics are still extant. To him are likewise ascribed the fourteenth and fifteenth books of Euclid, which are said to have been contracted by Hypsicles. Hipparchus and Menelaus wrote on the subtenses in a circle, the latter also on spherical triangles: Theodosius's three books of spherics are still extant. All these, Menelaus excepted, lived before Christ. A. D. 70, was born Ptolemy of Alexandria, the prince of ancient astronomers; and no mean geo-

metrician: he was succeeded by the philosopher Plutarch, of whom we have still extant some mathematical problems. After him flourished Eutocius, who commented on Archimedes, and occasionally mentions the inventions of Philo, Diocles, Nicomedes, Sporus, and Heron, on the duplicature of the cube. To Ctesibius of Alexandria we owe pumps; and Gemirus, who appeared soon after, is preferred by Proclus to Euclid himself. Diophantus of Alexandria was a great master of numbers, and the first inventor of algebra; Nicomachus is celebrated for his arithmetical, geometrical, and musical works; Serenus, for his books on the sections of the cylinder; Proclus, for his comments on Euclid; and Theon has the credit, among some, of being author of the books of elements ascribed to Euclid. The last, among the ancient mathematicians, is Pappus of Alexandria, who flourished A. D. 400, and is celebrated for his books of mathematical collections still extant.

MATHEMATICS may be defined, the science of quantity; or a science that considers magnitudes either as computable or measurable; and hence is divided into arithmetic and geometry. The word in its original, *μαθηματις*, signifies discipline, or science in general; and seems to have been applied to the doctrine of quantity, either by way of eminence, or because, this having the start of all other sciences, the rest took their common name from it. Mathematics are commonly distinguished into pure or speculative, which consider quantity abstractedly; and mixed, which treat of magnitude as subsisting in material bodies, and consequently are interwoven every where with physical considerations. Mixed mathematics are very comprehensive; since to them may be referred astronomy, optics, geography, hydrostatics, mechanics, fortification, navigation, &c. See **ASTRONOMY**, **GEOGRAPHY**, **OPTICS**, &c. Pure mathematics have one peculiar advantage, that they occasion no disputes among wrangling disputants, as in other branches of knowledge; and the reason is, because the definitions of the terms are premised, and every body that reads a proposition has the same idea of every part of it. Hence it is easy to put an end to all mathematical controversies, because if what is said to be proved be not true, it is easy to shew that our adversary has not stuck to his definitions, or has not laid down true premises, or else that he has drawn false conclusions from true principles. It is true, that in mixed mathematics, where we reason mathematically upon physical subjects, we cannot give such just definitions as the geometricians: we must therefore rest content with descriptions; and they will be of the same use as definitions, provided we are consistent, and always mean the same thing by those terms we have once explained. Dr. Barrow gives a most elegant description of the excellence and usefulness of mathematical knowledge, in his inaugural oration, upon being appointed professor of mathematics at Cambridge. The mathematics, he observes, effectually exercise, not vainly delude, nor vexatiously torment, studious minds with obscure subtilities; but plainly demonstrate every thing within their reach, draw certain conclusions, instruct by profitable rules, and unfold pleasant questions. These disciplines likewise inure and corroborate the mind to a constant diligence in study; they wholly deliver us from a credulous simplicity, most strongly

strongly fortify us against the vanity of scepticism, effectually restrain us from rash presumption, most easily incline us to a due assent, and perfectly subject us to the government of right reason. While the mind is abstracted and elevated from sensible matter, distinctly views pure forms, conceives the beauty of ideas, and investigates the harmony of proportions; the manners themselves are sensibly corrected and improved, the affections composed and rectified, the fancy calmed and settled, and the understanding raised and excited to more divine contemplations. The late Dr. Minto of New Jersey has many similar observations, in his inaugural Oration on the Progress and Improvement of the Mathematical Sciences; delivered at Princeton in 1785.

MATHER, Cotton, D. D. and F. R. S. an eminent American divine, born at Boston in New England, in 1663. He was educated in Harvard college, and in 1684 became minister of Boston; which office he not only discharged faithfully, but promoted several excellent societies for the public good: particularly one for suppressing disorders, one for reforming manners, and a society of peace-makers, for composing differences and preventing law-suits. His reputation spread far; in 1710, the university of Glasgow sent him a diploma enrolling him D. D. and, in 1714, the Royal Society of London chose him a fellow. He died in 1728; and is said to have published in his life-time 382 pieces, reckoning sermons, essays, &c. But several large works, particularly *Magnalia Christi Americana*, or an Ecclesiastical History of New England, from its first planting in 1620 to 1698, folio. But the most remarkable of all his works was that in which he defended the doctrine of witchcraft, intitled, "The Wonders of the Invisible World; being an account of the trials of several witches lately executed in New England, and of several remarkable curiosities therein occurring." Together with, 1. Observations on the nature, the number, and the operations, of the devils. 2. A short narrative of a late outrage committed by a knot of witches in Swedeland; very much resembling, and so far explaining that under which New England has laboured. 3. Some counsels directing a due improvement of the terrible things lately done by the unusual and amazing range of evil spirits in New England. 4. A brief discourse upon the temptations which are the more ordinary devices of Satan." This work was published by the special command of the governor of the province of Massachusetts Bay in New England." Boston; and London, 1736, 4to.

MATLOCK, a village of Derbyshire, near Wirksworth, on the edge of Derwent, noted for its bath, the water of which is milk-warm; and remarkable for the huge rocks in its environs, particularly those called the Torr, on the E. side of the Derwent, over against it, which seem to be piled one upon another.

MATRASS, CUCURBIT, or BOLT-HEAD, among chemists. See **CHEMISTRY**.

MATRICARIA, FEVERFEW; in botany, a genus of the polygamia superflua order, and syngenesia class of plants; natural order, Composite. Receptacle naked; no pappus; calyx hemispherical, imbricate; marginal leaflets solid, somewhat sharp. There are eight species, herbaceous plants.

M. PARENTHUM, the Common **FEVERFEW**, hath very fibrous clustering roots, crowned with numerous compound leaves. It is easily propagated, as well as by parting the roots and cuttings. This plant has received a most extraordinary character in hysteric and other affect-ions of the nerves, as well as for being a crinative or warm stimulating bitter. Dr. Lewis, however, thinks it inferior to camomile; with which he says it agrees in all sensible qualities, only being somewhat weaker.

MATRICE, or MATRIX, in dyeing, is applied to the five simple colours, whence all the rest are derived or composed. These are the black, white, blue, red, and yellow, or root colour.

MATRICE, or MATRICES, used by the letter-founders, are little pieces of copper or brass, at one end whereof are engraven, dentwise, or en creux, the several characters used in the composing of books. Each character, virgula, and even each point in a discourse, has its several matrix; and of consequence, its several punchon to strike it. Engravers on metal cut or grave the matrices. When types are to be cast, the matrice is to be fastened to the end of a mould, so disposed as that when the metal is poured on it, it may fall into the creux or cavity of the matrice, and take the figure and impression thereof.

MATRICES, used in coining, are pieces of steel in form of dyes, whereon are engraven the several figures, arms, characters, legends, &c. wherewith the species are to be stamped. The engraving is performed with several punchcons, which being formed in relievo, or prominent when struck on the metal, make an indented impression, which the French call *en creux*.

MATRICULA, a register kept of the admission of officers and persons entered into any body or society whereof a list is made. Hence those who are admitted into our universities are said to be matriculated.

MATRÍCULA was also applied to a kind of alms-house, where the poor were provided for. It had certain revenues appropriated to it, and was usually built near the church; whence the name was also frequently given to the church itself.

MATRIMONY. See **MARRIAGE**.

MATRIX, a term applied to places proper for the generation of vegetables, minerals, and metals. Thus the earth is the matrix wherein seeds sprout; and marcasites are by many considered as the matrices of metals.

MATRIX OF ORES is the earthy and stony substances in which these metallic matters are enveloped: these are very various, frequently spar, quartz, fluors, or horn-blend.

MATRONS, JURY OF. When a widow feigns herself with child in order to exclude the next heir, and a supposititious birth is suspected to be intended; then, upon the writ *de ventre inspiciendo*, a jury of women is to be impanelled to try the question whether the woman is with child or not. So, if a woman is convicted of a capital offence, and, being condemned to suffer death, pleads in stay of execution that she is pregnant, a jury of matrons is impanelled to inquire into the truth of the allegation; and, if they find it true, the convict is respited till after her delivery.

MATRONALIA, a Roman festival instituted by Romulus, and celebrated on the kalends of March, in honour of Mars.

MATROSS, in the train of artillery, are a sort of soldiers next in degree under the gunners, who assist about the guns in traversing, spunging, firing, and loading, them: they carry firelocks, and march along with the store-waggons as a guard, and as assistants, in case a waggon should break.

MATT, in a ship, rope-yarn, junk, &c. beaten flat and interwoven; used to preserve the yards from galling or rubbing in hoisting or lowering them.

MATTER, [*materia*, Lat.] in common language, signifies that which is tangible, visible, and extended; but among philosophers it signifies that substance of which all bodies are composed; and in this sense it is synonymous with the word **Element**. See **METAPHYSICS**, and **PHYSICS**.

MATTHEO, ST. or ST. MATTHEW, an island of Africa, 420 miles from Cape Palma, on the coast of Guinea, which is the nearest point of land. Lon. 6. 10. W. Lat. 1. 45. S.

MATTHEO, St. or St. MATTHEW, a town of Spain, in Arragon. Lon. 0. 15. W. Lat. 40. 22. N.

MATTHEW, or LEVI, the apostle and evangelist, the son of Alphaeus, was of Jewish original, and probably a Galilean. Before his call to the apostleship, he was a publican or tax-gatherer to the Romans; an office of bad repute among the Jews, on account of the covetousness of those who managed it. His office particularly consisted in gathering the customs of all merchandize that came by the sea of Galilee, and the tribute payable by passengers who went by water. Here he sat at the receipt of custom, when our Saviour called him. It is probable, that, living at Capernaum, the place of Christ's usual residence, he might have some previous knowledge of him. Matthew immediately expressed his satisfaction, by entertaining our Saviour and his disciples at a great dinner at his own house, whither he invited all his friends, especially those of his own profession, hoping, probably, that they might be influenced by the company and conversation of Christ. He continued with the rest of the apostles till after our Lord's ascension. For the first eight years afterwards, he preached in Judaea. Then he went to propagate the gospel among the Gentiles, and chose Ethiopia as the scene of his apostolical ministry; where it is said he suffered martyrdom, though others say he suffered in Parthia or Persia. Baronius tells us, the body of St. Matthew was transported from Ethiopia to Bithynia, and thence to Salernum in Naples, A. D. 954, where it was found in 1080, and where duke Robert built a church bearing his name.

MATTHEW, GOSPEL OF ST. a canonical book of the New Testament. Matthew wrote his gospel in Judaea, at the request of those he had converted; and it is thought he began in the year 41, eight years after Christ's resurrection. It was written, according to the testimony of all the ancients, in the Hebrew or Syriac language; but the Greek version, which now passes for the original, is as old as the apostolical times.

MATTHEW, ST. an island in the Indian Ocean, on the coast of Siam. Lon. 97. 52. E. Lat. 9. 35. N.

MATTHEW, ST. THE EVANGELIST'S DAY, a festival of the Christian church, observed on Sept. 21.

MATTHIAS, ST. an apostle, chosen to fill up the place of Judas. (See Acts, ch. i.) He was qualified for the apostleship, by having been a constant attendant upon our Saviour all the time of his ministry. He is supposed to have been one of the seventy disciples. After our Lord's resurrection, he preached the gospel first in Judaea, and afterwards in Ethiopia, where he suffered martyrdom. They pretended to shew the relics of St. Matthias at Rome; and at the famous abbey of St. Matthias near Treves. A gospel and some traditions were ascribed to St. Matthias; but are universally rejected as spurious.

MATTHIAS, SR. an island in the East Indian Ocean, 90 miles in circumference. Lon. 144. 30. E. Lat. 1. 50. S.

MATTHIAS'S DAY, SR. a festival of the Christian church, observed on the 24th Feb.

MATTHIEU, PETER, a French historian, born in 1583. He attended Lewis XIII. to the siege of Montauban, where he fell sick, and died at Toulon in 1621. He wrote, 1. A History of memorable Events in the Reign of Henry the Great. 2. History of the Death of Henry IV. 3. The History of St. Lewis; and 4. History of France and Francis I. to Lewis XIII. in two vols. folio.

MATTHIOLA, in botany, a genus of the pentandria monogynia class and order. Calyx entire; corolla tubular, superior, undivided; drupe with a globular nucleus. There is but one species, *M. scabra*, a native of America.

MATTIACÆ AQUÆ, or MATTIACI FONTES, in ancient geography, a town of Germany, seated among mineral waters. It is now called Wisbaden, opposite to Mentz. Lon. 8. E. Lat. 50. 6. N.

MATTIACUM, or MATTIUM, a town of the Mattiaci. Now called Marburg in Hesse. Lon. 8. 40. E. Lat. 50. 40. N.

MATURANTS, in pharmacy, medicines which promote the suppuration of tumors.

MATTUSCHKEA, in botany, a genus of the tetrandria monogynia class and order. Calyx four-parted, with linear leaflets; corolla one-petaled, with a long tube and four-cleft border; germ superior, four-cleft; seeds four, naked. There is but one species, *M. hirsuta*, a native of Guiana.

MAUBEUGE, a town of France, in the department of the North, and late province of French Hamault, 40 miles S. W. of Brussels. Lon. 5. E. Lat. 50. 15. N.

MAUCAUCO, in zoology. See LEMUR.

MAUDLIN. See ACHILLE.

MAULDAH, a commercial city of Bengal, near the N. bank of the Ganges, 190 miles N. of Calcutta. Lon. 88. 28. E. Lat. 25. 10. N.

MAULEON, a town of France, in the department of Lower Pyrenees, on the frontiers of Spain, 21 miles W. S. W. of Pau.

MAULEON, a town of France, in the department of the Vendee, and late province of Poitou, 52 miles N. of Poitiers. Lon. 0. 36. W. Lat. 46. 54. N.

MAUNDAY-THURSDAY, [derived by Spelman from *mande*, a hand-basket, in which the king was accustomed to give alms to the poor: by others from *dies mandati*, the day on which our Saviour gave his great mandate, That we should love one another. The Thursday in Passion-week, which was thus named, from the command which our Saviour gave his apostles to commemorate him in the Lord's supper, which he this day instituted; or from the new commandment which he gave them to love one another, after he had washed their feet as a token of his love to them.

MAUPERTUIS, PETER LEWIS MORCEAU DE, a celebrated French academical, born at St. Malo in 1698, where he was privately educated till he was in his sixteenth year, when he was placed under the celebrated M. le Blond, in the college of la

Marche, at Paris. He soon discovered a passion for mathematical studies, particularly geometry. He likewise practised instrumental music with success; but fixed on no profession till he was 20, when he entered into the army. He first served in the Grey Mousquetaers; but in 1720, his father purchased a commission for him in the regiment of La Rocheguyon. He remained only five years in the army, during which time he pursued his mathematical studies with great vigour. In 1723, he was received into the Royal Academy of Sciences, and read a memoir upon the construction and form of musical instruments, Nov. 15, 1724. He also applied himself to natural philosophy, and discovered great knowledge and dexterity in observations and experiments upon animals. He visited London, where he became a zealous admirer and follower of Sir Isaac Newton. He next went to Basil in Switzerland, where he formed a friendship with the famous John Bernoulli, which continued to his death. At his return to Paris, he pursued his favourite studies with greater zeal than ever. By the Memoirs of the Academy from 1724 to 1736, it appears that the most sublime questions in geometry and the relative sciences received from him that elegance, clearness, and precision, so remarkable in all his writings. In 1736, he was sent by Lewis XV. to the polar circle, to measure a degree, in order to ascertain the figure of the earth, accompanied by Messrs. Clairaut, Camus, Le Monnier, Abbé Outhier, and professor Celsius at Upsal. This distinction rendered him so famous, that, after his return he was admitted a member of almost every academy in Europe. In 1740, he was invited by the king of Prussia to Berlin. He accepted of Frederic's invitation the more readily, that his studies had not wholly effaced his love for arms. He followed the king into the field, and was a witness of the dispositions and operations that preceded the battle of Moltwitz; but was deprived of the glory of being present, when victory declared in favour of his royal patron, by a singular adventure. His horse, during the action, running away with him, he fell into the hands of the enemy; and was at first but roughly treated by the Austrian soldiers, to whom he could not make himself known for want of their language; but being carried prisoner to Vienna, he received the highest honours from their imperial majesties. From Vienna he returned to Berlin; but as the reform of the academy which the king of Prussia then meditated was not yet mature, he went again to Paris, and was chosen in 1742 director of the Academy of Sciences. In 1743 he was received into the French Academy; and was the first person who was a member of both the academies at Paris at the same time. M. de Maupertuis again assumed the military character at the siege of Fribourg, and was pitched upon by marshal Cogne and count Argenson to carry the news to the French king of the surrender of that citadel. He returned to Berlin in 1744, when by the good offices of the queen-mother, he married Madame de Borek, a lady of great beauty and merit, nearly related to M. de Borek, then minister of state. This determined him to settle at Berlin, as he was extremely attached to his spouse, and regarded this alliance as the most fortunate circumstance of his life. In 1746, he was declared by the king president of the Royal Academy of Sciences at Berlin, and soon after was honoured with the order of merit. These accumulated honours only increased his ardour for the sciences. Not a day passed but he produced some new plan for the advancement of knowledge. Nor did he confine himself to mathematical studies; metaphysics, chemistry, botany, literature, all shared his attention, and contributed to his fame. But he had a strange inquietude of spirit, a dark atrabilaire humour, which rendered him miserable amidst all his honours and pleasures. This temperament contributed to engage him in several quarrels; particularly one with professor Koenig at Franeker, and another more terrible with Voltaire. Maupertuis had inserted in the Memoirs of the Academy at Berlin, for 1746, a Discourse upon the Laws of Motion; which Koenig not only attacked but attributed to Leibnitz. Maupertuis, enraged at the imputation of plagiarism, engaged the academy of Berlin to call upon him for his proof; which Koenig failing to produce, he was struck out of the academy, of which he was a member. Several pamphlets were the consequence of this; and Voltaire, to the surprise of the public, engaged against Maupertuis, though they had hitherto been upon the most amicable terms; and Voltaire respected Maupertuis as his master in mathematics. But on this occasion Voltaire exerted all his

his wit, and satire against his late friend, and even went so far beyond the bounds of propriety, that he found it expedient, in 1753, to quit the court of Prussia. Maupertuis's constitution had long been impaired by the great fatigues, in which his active mind had involved him; as well as by the amazing hardships he had undergone in his northern expedition. These had brought on a spitting of blood, which began at least 12 years before he died. Yet still he enjoyed the greatest vigour of mind, for the best of his writings were produced, and his most sublime ideas developed, during his sickness, when he was unable to preside at the academy. He took several journeys to St. Malo, for the recovery of his health; and though he always received benefit from his native air, yet still upon his return to Berlin, his disorder returned. His last journey to France was undertaken in 1757; and on his return he visited Basil, where he was received by his friend Bernoulli and his family with the utmost affection. But as the winter approached, his disorder returned, and after languishing several months, he died in 1759. He was the author of several works, as 1. The Figure of the Earth determined. 2. The Measure of a Degree of the Meridian. 3. A Discourse on the Parallax of the Moon. 4. A Discourse on the Figure of the Stars. 5. The Elements of Geography. 6. Nautical Astronomy. 7. Elements of Astronomy. 8. A physical Dissertation on a white Inhabitant of Africa. 9. An Essay on Cosmography. 10. Reflections on the Origin of Languages. 11. An Essay on Moral Philosophy. 12. A Letter on the Progress of the Sciences. 13. An Essay on the Formation of Bodies. 14. An Eulogium on M. de Montesquieu. 15. Letters, and several other works, and a great number of interesting papers, of which the principal were printed in the Memoirs of the Berlin and Paris academies. The works which he published were collected into 4 vols. 8vo. published at Lyons in 1756, where also a new and elegant edition was printed in 1768.

MAUR, ST. SOCIETY OF, a celebrated society of Benedictines, instituted under the sanction of Gregory XV. in 1621.

MAURA, or ST. MAURA, an island in the Mediterranean, near the coast of Lower Albania, anciently a peninsula, named Leucadia, but made an island by the Carthaginians, who cut through the isthmus.

MAURA, ST. or ST. MAURE, the capital of the above island. Lon. 20. 50. E. Lat. 39. 4. N.

MAURE, ST. two towns of France; 1. in the department of Aube, 3 miles N. of Troyes: 2. in that of Indre and Loire, 18 miles S. of Tours.

MAURICE, of Nassau, prince of Orange, was the son of William, after whose death in 1584, he governed the Low Countries, being then only eighteen years old. He evinced, however, great courage and talents; and being named captain-general of the United Provinces, established that liberty which his father had begun. He made himself master of Breda in 1590, and this was followed by the capture of Zutphen, Deventer, Hulst, Nimeguen, and Gertuydenburg. He defeated the archduke Albert in 1597, and compelled the Spaniards to abandon the Low Countries the same year. In 1600 he was forced to raise the siege of Dunkirk, but he soon after gained a great victory over Albert near Nieuport. This was followed by numerous conquests. Maurice now aimed at the sovereignty of Holland, but was opposed by the virtuous Barneveldt. Barneveldt was an Arminian, and Maurice defended Gomar against Arminius. Taking advantage of the general odium under which the Arminians lay, he got this excellent man condemned in 1619. His death, wholly owing to the cruel ambition of Maurice, made a deep impression on the Hollanders. The truce with Spain being expired, Spinola laid siege to Breda in 1624, and in six months, after great slaughter of his troops, he took the place. Maurice, unsuccessful in every attempt to raise the siege, died of vexation in 1625, aged 55, with the reputation of the greatest warrior of his time.

MAURICE, ST. commander of the Theban legion, of Christian martyrs. He was the patron of a celebrated order in the king of Sardinia's dominions, created by Emanuel Philibert duke of Savoy, to reward military merit, and approved by Gregory XIII.

MAURIPIDA, one of the Laccadive Islands. Lon. 72. 21. E. Lat. 10. 58. N.

MAURITANIA, an ancient kingdom of Africa, bounded on the W. by the Atlantic, on the S. by Getulia or Lybia Interior, and on the N. by the Mediterranean, and comprehending the

greater part of the kingdoms of Fez and Morocco. Its ancient limits are not exactly mentioned by any historian; and cannot now be ascertained by modern observations, these kingdoms being but little known to Europeans. This country was originally inhabited by a people called Mauri, concerning the etymology of which name authors are not agreed. It is probable, however, that this country, or at least a great part of it, was first called Phut, as it appears from Pliny, Ptolemy, and St. Jerom, that a river and territory near Mount Atlas went by that name; probably from Phut, the third son of Ham. See Gen. x. 6. From the Jerusalem Targum it likewise appears, that part of the Mauri may be deemed the offspring of Lud the son of Misraim, as his descendants, mentioned Gen. x. are there called מוראשי, Mauri, or Mauritani. It is certain, that this region, as well as the others E. of it, had many colonies planted in it by the Phoenicians.

MAURITIA, the GINKGO, or MAIDEN-HAIR-TREE, a genus of plants belonging to the natural order Palmae. Calyx of the male one-leaved: corolla one-petaled; stamina six. It has but one species, a native of Surinam.

MAURITIUS, MAURICE, or the ISLE OF FRANCE, an island of Africa, about 400 miles E. of Madagascar, lying in Lon. 57. 29. E. Lat. 20. 15. S. In the beginning of the 16th century it was discovered by the Portuguese, who knowing that Pliny and other ancient writers had mentioned the island of Cerne in these seas, took it for granted that this must be it: and accordingly styled it Cerne or Sirne, in their maps, but, did not think fit to settle it. However they put some hogs, goats, and other cattle, upon it, that in case any of their ships, either going to the Indies, or returning to Portugal, should be obliged to touch there, they might meet with refreshments. The Dutch, in their second voyage to the East-Indies, under Admiral Vanneck, came with five ships on the 15th Sept. 1568; anchored in a commodious port, which they named Warwick Haven; and gave a good account of the place in their journals. Captain Castleton, in the Pearl, an English East-India ship, arrived there on the 27th March 1612; and taking it to be an island undiscovered before, bestowed upon it the name of England's Forest, though others of his crew called it Pearl Island, and in the account of their voyage, written by John Tatton the master, celebrated it as a place very convenient for ships to refresh at. This they sometimes accordingly did, and brought away some cargoes of ebony and rich wood. At length, in 1638, the Dutch seated themselves here; and at the very time they were employed in making their first settlement, the French sent a vessel to take possession of it, who found the Dutch beforehand with them, and refused the assistance of an English Indian, wooding and watering in another part of the island, who offered to drive the Dutch from their half-settled posts. They continued for some time in quiet possession of the places they fortified in this island, to which they gave the name of Mauritius. But having engaged the French, who were settled in Madagascar, to steal 50 of the natives, and sell them for slaves, for the improvement of the Dutch settlements here, this proved the ruin of both colonies; for the negroes surprised and massacred the French in Madagascar; and the slaves in Mauritius fled into the centre of the island; whence they so incessantly molested those who had been their masters, that they chose to quit a country where they could no longer remain in safety. The East-India company, however, from a very imperfect notion of its value, ordered it to be resettled, and erected three forts at the principal havens. Matters now went on somewhat better, but the revolted negroes, in the heart of the isle, whom they could never subdue, still gave the settlers much trouble. The principal use that the company made of it, was to send thither state-prisoners, who, not being men of the best morals, quickly corrupted the rest of the inhabitants, and rendered them such a race of desperate smugglers, that orders were at length given to abandon Mauritius a second time, which were put in execution in 1710. In 1712 the French took possession of it, and named it L' Isle de France, but the other Europeans still continue to call it Mauritius. This island is now in possession of the British; it being taken from the French on the 2d. of Dec. 1810.

MAURA, one of the Society Islands in the South Sea.

MARUCA, a kingdom of Africa, on the E. coast: in about Lon. 37. E. Lat. 14. 30. S.

MAWES, ST. a town of Cornwall on the E. side of Falmouth haven. Lon. 5. 26. W. Lat. 50. 30. N.

MAXILLA,

MAXILLA, the Jaw. See ANATOMY.

MAXILLARY GLANDS. See ANATOMY.

MAXILLARY NERVES. See ANATOMY.

MAXIM, [*maximum*, Lat.] an axiom; a general principle; a leading truth. See AXIOM.

MAXIMUM, in mathematics, denotes the greatest quantity attainable in any given case. If a quantity conceived to be generated by motion, increase, or decrease, till it arrives at a certain magnitude or position, and then, on the contrary, grows less or greater, and it be required to determine the said magnitude or position, the question is called a problem de maximis et minimis. The solution of such questions is easily effected by the method of fluxions. See FLUXIONS.

MAXIMUS, a celebrated Cynic philosopher, and magician of Ephesus. He instructed the emperor Julian in magic; and, according to some historians, from his conversation and company the apostrophy of Julian originated; as he not only visited him, but even submitted his writings to his critical inspection. Maximus, however, refused to live in the court of Julian, who far from being displeased, appointed him high pontiff in Lydia, an office which he discharged with great moderation and justice. When Julian went into the east, the magician promised him success, and even said that his conquests would be more numerous and extensive than those of Alexander. He persuaded his imperial pupil, that, according to the doctrine of Metempsychosis, his body was animated by the soul of Alexander. After the death of Julian Maximus was almost sacrificed to the fury of the soldiers: but was saved by his friends, and he retired to Constantinople. He was accused of magical practices, before the emperor Valens, and beheaded at Ephesus, A. D. 366. He wrote some philosophical and rhetorical treatises, some of which were dedicated to Julian. They are all now lost.

MAXWELL, WILHELMINA, Lady Glenorchy, youngest daughter of William Maxwell, Esq. of Preston, in Dumfriesshire, and sister to the Countess of Sutherland, a late eminently pious lady, remarkable for benevolence, charity, and philanthropy. She was early married to John Lord Viscount Glenorchy, only son of the late earl of Breadalbane, whose death soon after left her a very young widow. "Her understanding," (says her biographer, the late reverend Dr. Gillies,) "was naturally strong and her memory retentive. Her mind was polished by a liberal education, and richly furnished by extensive reading and observation. Her person was agreeable, her manners engaging, her fancy brilliant, and attended by a constant flow of good humour." But, though "fitted to shine in courts," being visited by sickness in her 23d year, she, upon her recovery, resolved to prefer devotion and utility to gaiety and thoughtlessness; and her conduct through life afterwards proved, that her faith was not fruitless of good works. Her private charities were indeed numberless, and great part of them unknown. To some ministers whose congregations were not affluent, she paid regular salaries; to others occasional donations; and to many others stated annuities. Besides the elegant Chapel at Edinburgh, which cost about 6000*l.* and which bears her name, she built and endowed a church at Strathfillan in Perthshire; and purchased chapels at Matlock in Derbyshire, at Carlisle, at Workington, and at Newton Brn-hill in Devonshire, besides contributing along with Lady Henry Hope, to the erection of Hope Chapel at Bristol. Sensible that ignorance and idleness are the great sources of vice, she also founded and endowed various schools, and set on foot several manufactories for the poor. This excellent lady died at Edinburgh, July 17, 1786; leaving 5000*l.* to the Society in Scotland for Propagating Christian knowledge; 5000*l.* for educating young men for the ministry in England, and most of the rest of her fortune, which was considerable, to other pious and charitable uses.

MAY, the fifth month in the year, reckoning from January; and the third, counting the year to begin with March, as the Romans anciently did. It was called *Maius* by Romulus, in respect to the senators and nobles of his city, who were named *maiores*; as the following month was called *Junius*, in honour of the youth of Rome, in *honorem juniorum*, who served him in the war; though some think it was thus called from *Maia*, the mother of Mercury, to whom they offered sacrifice on the first day of it. In this month the sun enters Gemini, and the plants of the earth in general begin to flower. See CHRONOLOGY.

MAY, or the ISLE OF MAY, a small island at the mouth of the Frith of Forth, in Scotland, about a mile and an half in circumference, and seven miles from the coast of Fife.

MAY, or MAYO, one of the Cape de Verd Islands, of an oval form, 21 miles in circumference. See MAYO.

MAY-DUKE, a species of cherry. See PRUNUS.

MAYEN, a town of France, in the department of the Rhine and Moselle, and late bishopric of Treves, 15 miles W. of Coblenz.

MAYEN'S ISLAND, an island in the North Sea, S. W. of Spitzbergen.

MAYER, TOBIAS, one of the greatest astronomers and mechanicians of the last century, was born at Maspach, in Wirtemberg, 1723. He acquired mathematics without a teacher, and at the age of 14 designed machines and instruments with the greatest dexterity and justness. He also acquired the Latin tongue, and wrote it with elegance. In 1750, the university of Gottingen chose him for their mathematical professor; and every year of his short life was thenceforward marked with some considerable discoveries in geometry and astronomy. He invented several useful instruments for the more commodious and exact measurement of angles on a plane. He corrected many errors in practical geometry, tracing them to their origin, in the refractions occasioned by terrestrial objects. Afterwards he particularly applied himself to study the theory of the moon, its appearances, the question of its atmosphere, and the reciprocal actions of the sun, earth, and moon, upon each other. He then extended his observations to the planet Mars, and the fixed stars; determining with greater exactness than before the places of the latter, and ascertaining that, though commonly denominated fixed, they possess a certain degree of motion relative to their respective systems. He died exhausted and worn out by his labours in 1762, when only 39 years of age. His table of refractions, deduced from his astronomical observations, agrees very nicely with that of Dr. Bradley; and his theory of the moon, and astronomical tables and precepts, were so well received, that they were rewarded by the English Board of Longitude with the premium of 3000*l.* which sum was paid to his widow after his decease. These tables and precepts were published by the board in the year 1770. He published "A New and General Method of resolving all Geometrical Problems, by means of Geometrical Lines," 1741, 8vo. in German. "A Mathematical Atlas, in which all the Mathematical Sciences are comprised in sixty Tables," 1748, folio, in German. "A Description of a Lunar Globe, constructed by the Cosmographical Society of Nuremberg, from new Observations," 1750, 4to. also in German. Several exact "Maps;" and some valuable papers in the Memoirs of the Royal Society of Gottingen.

MAY-LILY. See CONVALLARIA.

MAYNE, a river of France, formed by the union of the Mayenne and the Sarte, three miles N. of Angers. It joins the Loire about four miles below that city.

MAYNE AND LOIRE, a department of France, so named from the junction of the rivers Mayne and Loire. Angers is the capital.

MAYNE, MAIN, or MAINE, a river of Ireland, in Antrim, which runs into Lough Neagh.

MAYO, a county of Ireland, in the province of Connaught, bounded on the N. by Sligo and the sea; E. by Leitrim and Roscommon; S. by Roscommon; and W. by the Atlantic ocean. It is about 57 miles long, from N. to S. and 48 broad. Castlebar is the assizes town.

MAYO, an ancient city in the above county, 9 miles S. E. of Castlebar.

MAYO, one of the Cape de Verd islands, lying in the Atlantic ocean, near 300 miles from Cape Verd in Africa. The soil in general is very barren, and water scarce; however, they have some corn, yams, potatoes, and plantains, with great numbers of beeves, goats, and asses. Lon. 23. 15. W. Lat. 15. 5. N.

MAYO, a province of N. America, in New Mexico.

MAYO, a river in the above province on the W. coast of New Biscay.

MAYOR, anciently wrote MEYR, is derived from the British *miret*, i. e. to keep, or from the old English *maier*, power. King Richard I. in 1189, changed the bailiff of London into a mayor, and King John made the bailiff of King's Lynn a mayor in 1204. Norfolk

Norfolk did not obtain this title for its chief magistrate till 1419, the 7th year of King Henry V. since which there are few towns of note but have had a mayor appointed. Mayors of corporations are justices of peace pro tempore, and they are mentioned in several statutes; but no person shall bear any office of magistracy concerning the government of any town, corporation, &c. who hath not received the sacrament according to the church of England within one year before his election, and who shall not take the oaths of supremacy, &c. If any person intrudes into the office of mayor, a quo warranto lies against him, upon which he shall not only be ousted, but fined. And no mayor, or person holding an annual office in a corporation for one year, is to be elected into the same office for the next; in this case, persons obstructing the choice of a successor are subject to 100*l.* penalty. Where the mayor of a corporation is not chosen on the day appointed by charter, the next officer in place shall the day after hold a court and elect one; and if there be a default or omission that way, the electors may be compelled to choose a mayor, by a writ of mandamus from the king's bench. Mayors, or other magistrates of a corporation, who shall voluntarily absent themselves on the day of election, are liable to be imprisoned, and disqualified from holding any office in the corporation. The office of mayor in England is nearly synonymous with that of Provost in Scotland.

MAYOR'S COURTS. To the lord mayor and city of London belong several courts of judicature. The highest and most ancient is that of the hustings, destined to secure the laws, rights, franchises, and customs of the city. The second is a court of request, or of conscience; see these articles. The third is the court of the lord mayor and aldermen, where also the sheriffs sit: to which may be added two courts of sheriffs and the court of the city-orphans, whereof the lord mayor and aldermen have the custody. Also the court of common council, which is a court or assembly, wherein are made all by-laws which bind the citizens of London. It consists, like the parliament, of two houses: an upper, consisting of the lord mayor and aldermen; and a lower, of a number of common council men, chose by the several wards, as representatives of the body of the citizens. In the court of common council are made laws for the advancement of trade, and committees yearly appointed, &c. But acts made by them are to have the assent of the lord mayor and aldermen, by stat. 11 Geo. I. Also the chamberlain's court, where every thing relative to the rents and revenues of the city, as also the affairs of servants, &c. are transacted. Lastly, to the lord mayor belong the courts of coroner and of escheator; another court for the conservation of the river Thames; another of gaol-delivery, held usually eight times a year, at the Old Bailey, for the trial of criminals, whereof the lord mayor is himself the chief judge. There are other courts called wardmotes or meetings of the wards; and courts of halmote or assemblies of the several guilds and fraternities.

MAY-WEED. See **ANTHEMIS**.

MAZA, among the Athenians a sort of cake made of flour boiled with water and oil, and set, as the common fare, before such as were entertained at the public expence in the prytaneum or common hall.

MAZAGAN, a town of Morocco, on the frontiers of Dugela, 65 miles N. of Morocco. Lon. 7. 45. W. Lat. 33. 5. N.

MAZARA, an ancient town of Sicily, seated on the coast, on the ruins of the ancient Selinuntum. Lon. 12. 59. E. Lat. 37. 42. N.

MEACO, or **KIO**, a city of Japan, in Nippon. Lon. 134. 25. E. Lat. 35. 24. N.

MEAD, RICHARD, M. D. and F. R. S. a celebrated English physician, antiquarian, and naturalist, born in 1672, at Stepney, near London, where his father, the Rev. Matthew Mead, had been minister. In 1689, he was sent to Utrecht, where he studied under Graviius, after which he removed to Leyden, and contracted a close intimacy with Boerhaave. On completing his studies in that celebrated school of physic, he went to Italy, and took his doctor's degree at Padua. In 1696 he returned to his native country, and commenced the practice of physic at Stepney, where he resided seven years. In 1702 he published his treatise on Poisons, which procured him considerable reputation. In 1704 he was admitted a member of the Royal Society, of which, in 1707, he became vice-president. In 1717 the university of Oxford conferred on him his doctor's degree by diploma. In 1727 he was appointed

ed physician to George II. Dr. Mead died in 1754, and was interred in the Temple church, near the remains of his brother, who was a counsellor. The other works of Dr. Mead are a Discourse concerning the Plague; a treatise De Imperio Solis ac Lunæ; De Morbis Biblicis; and Monita Medica; all which were collected into one volume, 4to. 1762. He was a very liberal man, and the greatest patron of literature in his day. During 50 years he was at the head of his profession, which brought him one year above 7000*l.* and for several years between 5 and 6000*l.* yet clergymen, and in general all men of learning, were welcome to his advice. His library consisted of 10,000 volumes, of which his Latin, Greek, and oriental MSS. formed an important part. He had a gallery for his pictures and antiquities, which cost him great sums. His reputation was so universally established, that he corresponded with all the principal literati in Europe. Even the king of Naples sent for a complete collection of his works; and in return made him a present of the two first volumes of Signior Bajardi, which may be considered as the first specimen of the antiquities of Herculaneum. That prince also invited him to his palace, to shew him those valuable monuments of antiquity; and nothing but his great age prevented his accepting of an invitation so suited to his taste. To foreigners of learning his table was always open, and the magnificence of princes was united with the pleasures of philosophers. To him several counties of England, as well as the colonies abroad, applied for advice in the choice of their physicians. He was also consulted by foreign physicians from Russia, Prussia, Denmark, &c. His library, which was one of the finest in Europe, was sold by auction after his death. He was twice married, and left three children; two daughters, married to Drs. Wilmot and Nichols, and a son named Richard, who inherited his fortune.

MEAD, an agreeable liquor prepared of honey and water, with the addition of spices. Various methods are practised in the brewing of mead; which, however, do not essentially differ from each other: the following is one of the most approved:—Let the whites of six eggs be well incorporated with twelve gallons of water, to which thirty pounds of honey are to be added. The ingredients should boil for the space of one hour; when a little ginger, cloves, cinnamon, and mace, together with a small sprig of rosemary, are to be put into the liquor. As soon as it is cool, a spoonful of yeast ought to be added, and the mead poured into a vessel which should be filled up, while it works. When the fermentation ceases, the cask ought to be closed, and deposited for the space of six or eight months in a vault, or cellar, of an equal temperature, and in which the liquor is not liable to be affected by the changes of the weather. At the end of that period, it may be bottled, and is then fit for use. A more simple, and, to some palates, more agreeable method is, to mix the honey in the proportion of one pound to a quart of water, which is to be boiled, scummed, and fermented in the usual manner, without the addition of any aromatic substances. It ought to be preserved in a similar manner, and bottled at the expiration of the same period of time. Mead was formerly the favourite liquor of the ancient Britons and Anglo-Saxons. It still retains its place at country-feasts in the western parts of this island; where considerable quantities are brewed annually. Being a wholesome and pleasant beverage, it is far preferable to brandy, gin, or other pernicious spirits; though it does not always agree with the bilious, asthmatic, or those whose breast and lungs are in the least affected. But, if it be kept for a number of years in proper vessels, and dry cellars, it acquires a flavour and strength equal to the best Madeira or even Tokay wines: in this state, mead is a true medicine to the aged and infirm, when used with moderation.

MEADOW, pasture or grass-land, annually mown for hay, but more particularly applied to low lands too moist for cattle grazing on in winter, without spoiling the sward. The best lands for meadow are those of a rich soil, situated on a gentle declivity, in the vicinity of running water. To form the best meadow six kinds of grass, and two of clover, should be sown, viz. of meadow-fescue-grass, (*festuca pratensis*) four parts: of meadow-fox-tail-grass (*calopogon pratensis*) 2: smooth four-stalked meadow-grass (*poa pratensis*) two: roughish meadow-grass (*poa trivialis*) two: crested dog-tail-grass (*cynosurus cristatus*) one: sweet-scented spring-grass (*anthoxanthum odoratum*) one: white or Dutch clover (*trifolium repens*) two: common, or red clover (*trifolium pratense*) two. Or

these seeds well mixed together sow three bushels on an acre in rows for the convenience of hoeing. Towards the end of August, or early in September, it will be necessary to weed and thin the grasses occasionally, and also to roll them in the spring. If the soil be previously cleared from all noxious weeds and plants, these grasses will in two years form an excellent meadow. But, in case it be required to seed a piece of land immediately, and the valuable grasses cannot be procured, the following seeds are recommended: broad clover, or cow-grass; white clover, trefoil, rye-grass, and if the soil be sufficiently dry, burnet. On clean tilth, they will, in a few years, present a good meadow; as the clover and rye-grass, in the first or second year produce ample swathe for mowing; next they will be succeeded by a luxuriant crop of the white clover and trefoil, united with the natural grasses of the soil. Grass-seeds ought to be sown during moist weather, either in the summer, or in autumn, after turnips, cabbage, or any other hoeing crop; for it is absolutely necessary to prepare for them a fine clean tilth. On the approach of winter the young crop should be slightly covered with long stable-dung, old thatch, or even sand, earth, or any other manure. The land ought, likewise, to be occasionally cleared of the weeds, together with their roots, and the vacant spot fresh-seeded. In laying lands down for meadows, old turf must be uniformly broken up, by paring and burning, when it is to be sown with new grasses; but, such soils as have been completely exhausted by successive crops of corn, should first be laid dry, and diligently cleaned; then sown with proper herbage, top-dressed, and manured for the space of two or three years; in consequence of which they will recover their former fertility. Lastly, the operation of rolling meadows in the spring, especially such as have been watered, ought never to be omitted. The most proper time for this purpose is the beginning or middle of February, after the land has been laid dry for a week. Rolling prepares the grass for being cut close to the surface when mowed, which is a circumstance of considerable importance; because the ant-hills, and other little elevations, are thus pressed closely to the ground, and many inconveniences will be thereby effectually removed. The watering of meadows is an excellent modern improvement in agriculture. See HUSBANDRY.

MEADOW-SAFFRON. See COLCHICUM.

MEADOW-SAXIFRAGE. See PEUCEDANUM.

MEADOW-SWEET. See SPIRÆA.

MEAL, the flour of grain. See FLOUR.

MEAN, a middle state between two extremes; as a mean motion, mean distance, arithmetical mean, geometrical mean, &c.

MEAN, ARITHMETICAL, is half the sum of the extremes. So 4 is an arithmetical mean between 2 and 6, or between 3 and 5, or between 1 and 7; also an arithmetical mean between a and b is $\frac{a+b}{2}$, or $\frac{1}{2}a + \frac{1}{2}b$.

MEAN, GEOMETRICAL, commonly called a mean proportional, is the square root of the product of the two extremes; so that, to find a mean proportional between two given extremes, multiply these together, and extract the square root of the product. Thus, a mean proportional between 1 and 9, is $\sqrt{1 \times 9} = \sqrt{9} = 3$; a mean between 2 and $4\frac{1}{2}$ is $\sqrt{2 \times 4\frac{1}{2}} = \sqrt{9} = 3$; also the mean between 4 and 6 is $\sqrt{4 \times 6} = \sqrt{24}$; and the mean between a and b is $\sqrt{ab}$.

The geometrical mean is always less than the arithmetical mean between the same two extremes. So the arithmetical mean between 2 and $4\frac{1}{2}$ is 3 $\frac{1}{2}$, but the geometrical mean is only 3. To prove this generally, let a and b be any two terms, a the greater, and b the less; then, universally, the arithmetical mean $\frac{a+b}{2}$

shall be greater than the geometrical mean $\sqrt{ab}$, or $a+b$ greater than $2\sqrt{ab}$. For, by squaring both, there are $a^2 + 2ab + b^2 > 4ab$; subtract $4ab$ from each, then $a^2 - 2ab + b^2 > 0$, that is, $(a-b)^2 > 0$.

MEAN PROPORTIONAL GEOMETRICALLY, TO FIND A, between two given lines M and N, Plate CII, fig. 16. Join the two given lines together at C, in one continued line AB; upon the diameter AB describe a semicircle, and erect the perpendicular

lar CD; which will be the mean proportional between AC and CB, or M and N.

MEAN PROPORTIONALS, TO FIND TWO, between two given extremes. Multiply each extreme by the square of the other, viz. the greater extreme by the square of the less, and the less extreme by the square of the greater; then extract the cube root out of each product, and the two roots will be the two mean proportionals sought. That is, $\sqrt[3]{a^2b}$ and $\sqrt[3]{ab^2}$ are the two means between a and b . So, between 2 and 16, the two mean proportionals are 4 and 8; for $\sqrt[3]{2^2 \times 16} = \sqrt[3]{64} = 4$, and $\sqrt[3]{2 \times 16^2} = \sqrt[3]{512} = 8$.

In a similar manner we proceed for three means, or four means, or five means, &c.; from all which it appears, that the series of the several numbers of mean proportionals between a and b will be as follows, viz.

- 1 mean, $\sqrt{ab}$;
- 2 means, $\sqrt[3]{a^2b}$, $\sqrt[3]{ab^2}$;
- 3 means, $\sqrt[4]{a^3b}$, $\sqrt[4]{a^2b^2}$, $\sqrt[4]{ab^3}$;
- 4 means, $\sqrt[5]{a^4b}$, $\sqrt[5]{a^3b^2}$, $\sqrt[5]{a^2b^3}$, $\sqrt[5]{ab^4}$;
- 5 means, $\sqrt[6]{a^5b}$, $\sqrt[6]{a^4b^2}$, $\sqrt[6]{a^3b^3}$, $\sqrt[6]{a^2b^4}$, $\sqrt[6]{ab^5}$; &c. &c.

MEAN, HARMONICAL, is double a fourth proportional to the sum of the extremes, and the two extremes themselves a and b :

thus, as $a + b : a :: 2b : m$, the harmonical mean between a and b . Or it is the reciprocal of the arithmetical mean between the reciprocals of the given extremes; that is, take the reciprocals of the extremes a and b , which will be $\frac{1}{a}$ and $\frac{1}{b}$;

then take the arithmetical mean between these reciprocals, or half their sum, which will be $\frac{1}{2a} + \frac{1}{2b}$, or $\frac{a+b}{2ab}$; lastly, the

reciprocal of this is $\frac{2ab}{a+b} = m$, the harmonical mean: for arith-

meticals and harmonicals are mutually reciprocals of each other; so that if $a, m, b, \&c.$ be arithmeticals,

then shall $\frac{1}{a}, \frac{1}{m}, \frac{1}{b}, \&c.$ be harmonicals;

or if the former be harmonicals, the latter will be arithmeticals.

For example, to find a harmonical mean between 2 and 6: here $a = 2$, and $b = 6$; therefore $\frac{2ab}{a+b} = \frac{2 \times 2 \times 6}{2+6} = \frac{24}{8} = 3 = m$, the harmonical mean sought between 2 and 6.

Pappus has shewn a curious similarity that subsists between the three different sorts of means: a, m, b , being three continued terms, either arithmeticals, geometricals, or harmonicals, then in the

Arithmeticals $a : a :: a - m : m - b$
 Geometricals $a : m :: a - m : m - b$
 Harmonicals $a : b :: a - m : m - b$.

MEANDER. See MÆANDAR.

MEARNS, or KINCARDINSHIRE, a county of Scotland, bounded on the N. and N. W. by Aberdeenshire, on the E. by the British Ocean, and on the S. W. by Angus-shire. The tract of country through which the Dee passes, and the plain along the sea-coast, are well cultivated, and produce much corn and flax. The fields are in many places skreened by woods; and the heaths afford sheep-walks and good pasture for cattle.

MEASLES, a cutaneous disease attended with a fever, in which there is an appearance of eruptions that do not tend to a suppuration. See MEDICINE.

MEASURE, [*mensura*, Lat.] in geometry, denotes any quantity assumed as one, or unity, to which the ratio of other homogeneous or similar quantities is expressed. This definition is somewhat more agreeable to practice than that of Euclid, who defines a measure, a quantity which being repeated any number of times becomes equal to another.

MEASURE OF AN ANGLE, is an arc described from the vertex as a centre, and comprehended between the lines which form the angle. Hence angles are distinguished by the ratio of the arches, described from the vertex between the legs to the peripheries. Angles then are distinguished by those arcs; and the arcs are distinguished by their ratio to the periphery: thus an angle is said to be so many degrees as there are in the said arc. See **ANGLE**.

MEASURE OF A FIGURE, or PLANE SURFACE, is a square whose side is one inch, foot, yard, or some other determinate length. Among geometers, it is usually a rod called a square rod, divided into ten square feet, and the square feet into ten square digits.

MEASURE OF A LINE, any right line taken at pleasure, and considered as unity. The modern geometers use a decempea, or perch, divided into ten equal parts, called feet; the feet they subdivide into ten digits, and the digit into ten lines, &c.

MEASURE OF THE MASS, or QUANTITY OF MATTER, in mechanics, is the weight of the body; it being apparent that all the matter which coheres and moves with a body, gravitates with it, and it being found by experiment, that the gravities of homogeneal bodies are in proportion to their bulks; hence, while the mass continues the same, the weight will be the same, whatever may be its figure. See **MECHANICS**.

MEASURE OF A NUMBER, in arithmetic, such a number as divides another without leaving any fraction: thus nine is a measure of 27.

MEASURE OF A SOLID, is a cube whose side is one inch, foot, yard, or any other determinate length. In geometry, it is a cubic perch, divided into cubic feet, digits, &c. hence cubic measures, or measures of capacity.

MEASURE OF VELOCITY, in mechanics, the space passed over by a moving body in a given time. To measure a velocity, therefore, the space must be divided into as many equal parts as the time is conceived to be divided into; the quantity of space answering to such an article of time is the measure of the velocity. See **MECHANICS**.

MEASURE, in music, the interval or space of time which the person who beats time, takes between the rising and falling of his hand or foot, in order to conduct the movement, sometimes quicker, and sometimes slower, according to the kind of music, or the subject that is sung or played. The measure is that which regulates the time we are to dwell on each note.

MEASURE, BINARY, or DOUBLE, is that wherein the rise and fall of the hand are equal.

MEASURE, TERNARY, or TRIPLE, is that wherein the fall is double to the rise; or where two minims are played during a fall, and but one in the rise.

MEASURE is also used to signify the cadence and time observed in poetry, dancing, and music, to render them regular and agreeable. The different measures or metres in poetry, are the different manners of ordering and combining the quantities, or the long and short syllables. Thus, hexameter, pentameter, iambic, sapphic verses, &c. consist of different measures. In English verses, the measures are extremely various and arbitrary, every poet being at liberty to introduce any new form that he pleases. The most usual are the heroic, generally consisting of five long and five short syllables; and verses of four feet; and of three feet and a cæsura, or single syllable. See **GRAMMAR, LANGUAGE, and POETRY**.

MEASURE, in a legal and commercial sense denotes a certain quantity or proportion of any thing, bought, sold, valued, or the like. It is necessary, for the convenience of commerce, that an uniformity should be observed in weights and measures, and regulated by proper standards. A foot-rule may be used as a standard for measures of length, a bushel for measure of capacity, and a pound for weights. There are several standards of this kind in England and Scotland. See **WEIGHT**. If any one of the standards above-mentioned be justly preserved, it will serve as a foundation for the others, by which they may be corrected if inaccurate, or restored if entirely lost. But it may be desired to hit on some expedient, if possible, for restoring the standards, in case that all of them should ever be forgotten, through length of time, and the vicissitudes of human affairs; which, however, seems not very probable, while printing exists. If the distance of two mountains be accurately measured and recorded, the nature of the measure used

will be preserved in a more permanent manner than by any standard; for if ever that measure fall into disuse and another be substituted in its place, the distance may be measured again, and the proportion of the standard may be ascertained by comparing the new and ancient distances. But the most accurate and unchangeable manner of establishing standards is, by comparing them with the length of pendulums. The longer a pendulum is it vibrates the slower; and it must have one precise length in order to vibrate in a second. The slightest difference in length will occasion a difference in the time; which will become abundantly sensible after a number of vibrations, and will be easily observed if the pendulum be applied to regulate the motion of a clock. The length of a pendulum which vibrates seconds in London is about $39\frac{1}{2}$ inches, is constantly the same at the same place; but it varies a little with the latitude of the place, being shorter as the latitude is less. Therefore, though all standards of weights and measures were lost, the length of a second pendulum might be found by repeated trials; and if the pendulum be properly divided, the just measure of an inch may be obtained; and from this all other standards may be restored. See **Whitehurst on Invariable Measures**. Measures are various according to the various kinds and dimensions of the things measured. Hence arise lineal or longitudinal measures, for lines or lengths; square measures for areas or superficies; and solid or cubic measures for bodies and their capacities; all which again are very different in different countries and different ages, and even many of them for different commodities. Whence arise other divisions of ancient and modern measures, domestic and foreign ones, dry measures, liquid measures, &c.

MEASURE, ITINERARY, is a species of long measure; now the same both in England and Scotland. The length of the chain is 4 poles, or 22 yards; 80 chains make a mile. But the old Scots computed miles were generally about a mile and half English.

MEASURE, LONG, LATE FRENCH STANDARD OF. The English lineal standard is the yard, containing three English feet; equal to 3 Paris feet 1 inch and $3\frac{1}{2}$ lines of an inch, or $7\frac{1}{2}$ ths of a Paris ell. The use of this measure was established by king Henry 1. and the standard taken from the length of his own arm. It is divided into 36 inches, and each inch is supposed equal to 3 barley-corns. When used for measuring cloth, it is divided into 4 quarters, and each quarter subdivided into 4 nails. The English ell is equal to a yard and a quarter, or 45 inches, and is used in measuring linens imported from Germany and the Netherlands.

MEASURE, LONG, LATE FRENCH STANDARD OF. The late French Standard was the aune or ell, containing 3 Paris feet 7 inches 8 lines, or 1 yard $2\frac{7}{8}$ ths English. This ell is divided two ways, viz. into halves, thirds, sixths, and twelfths; and into quarters, half-quarters, and sixteenths. This ell was used throughout the greatest part of France; excepting at Troyes in Champagne, at Arc in the Barrois, and in some parts of Picardy and Burgundy, where the ell contained only 2 feet 5 inches 1 line; in Bretagne, where it contained 4 feet 2 inches 11 lines; and at St. Genoux in Berry, where it exceeded the Paris ell by 8 lines. But in Languedoc, particularly at Marseilles, Montpellier, Thoulouse, in Provence, and in Guienne, they measured by the canna, which at Thoulouse and in Guienne contained 5 Paris feet 5 inches and $\frac{1}{2}$ line; or one Paris ell and a half. At Montpellier, and throughout the Lower Languedoc, as also in Provence and Avignon, and even Dauphiné, the canna was 6 feet and 9 lines, or 1 Paris ell and $\frac{3}{4}$. By accurate comparisons between some of the French weights and measures and those of England, it appears that the Paris toise, of 72 inches as set off on the standard kept in the Royal Society, contains of English inches by the same standard 71.736. The Paris 2 marc, or 16 ounce weight, weighs English Troy grains 7560; whence it appears, that the English Troy pound of 12 ounces, or 5760 grains, is to the Paris 2 marc, or 16 ounce weight, as 16 to 21; that the Paris ounce weighs English Troy grains 4725, and that consequently, the English Troy ounce is to the Paris ounce as 64 is to 63. The English Avoirdupois pound weighs Troy grains 7004; whence the Avoirdupois ounce, whereof 16 make a pound, is found equal to 437.75 Troy grains. And it follows, that the Troy pound is to the Avoirdupois pound as 88 to 107 nearly; for as 88 to 107, so is 5760 to 7003.36: that the Troy ounce is to the Avoirdupois ounce, as 80 to 73 nearly; for as 80 to 73, so is 480 to 438. And, lastly, that the Avoirdupois pound and ounce is to the Paris two marc weight and ounce, as 63 to 68 nearly; for

as 63 to 68, so is 7004 to 7559.873. See WEIGHT. The Paris foot expressed in decimals, is equal to 1.066 of the English foot, or contains 12.792 English inches.

MEASURE, LONG, SCOTS STANDARD OF. The Scots ellwand was established by King David I. and divided into 37 inches. The standard is kept in the council-chamber of Edinburgh, and being compared with the English yard, is found to measure $37\frac{1}{2}$ inches; and therefore the Scots inch and foot are larger than the English, but the difference being so inconsiderable is seldom attended to in practice. The Scots ell, though forbidden by law, is still used for measuring some coarse commodities, and is the foundation of the land-measure of Scotland. The reel for yarn is $2\frac{1}{2}$ yards, or 10 quarters, in circuit; 120 threads make a cut, 12 cuts make a hasp or hank, and 4 hanks make a spindle.

MEASURE, LONG, STANDARDS OF, IN OTHER STATES OF EUROPE. The Standard in Holland, Flanders, Sweden, a considerable part of Germany, Dantzick, Hamburg, Geneva, Frankfort, &c. before the late war, was likewise the ell; but the ell, in all these places, differs from the Paris ell. In Holland, it contained one Paris foot eleven lines, or four-sevenths of the Paris ell. The Flanders ell contained two feet one inch five lines and half a line; or seven-twelfths of the Paris ell. The ell of Germany, Brabant, &c. was equal to that of Flanders. The Italian measure is the braccia, brace, or fathom. This obtained in the states of Modena, Venice, Florence, Lucca, Milan, Mantua, Bologna, &c. but was of different lengths. At Venice, it contains one Paris foot eleven inches three lines, or eight-fifteenths of the Paris ell. At Bologna, Modena, and Mantua, the brace is the same as at Venice. At Lucca it contains one Paris foot nine inches ten lines, or half a Paris ell. At Florence, it contains one foot nine inches four lines, or forty-nine hundredths of a Paris ell. At Milan, the brace for measuring of silks is one Paris foot seven inches four lines, or four-ninths of a Paris ell; that for woollen cloths is the same with the ell of Holland. Lastly, at Bergamo, the brace is one foot seven inches six lines, or five-ninths of a Paris ell. The usual measure at Naples, however, is the canna, containing six feet ten inches and two lines, or one Paris ell and fifteen-eventeenth. The Spanish measure is the vara, or yard, in some places called the barra; containing seventeen-twenty-fourths of the Paris ell. But the measure in Castile and Valencia is the pan, span, or palm; which is used, together with the canna, at Genoa. In Arragon, the vara is equal to a Paris ell and a half, or five feet five inches six lines. The Portuguese measure is the cavedos, containing two feet, eleven lines, or four-sevenths of a Paris ell; and the vara, of which 106 make 100 Paris ells. The Piedmontese measure is the ras, containing one Paris foot nine inches ten lines, or half a Paris ell. In Sicily, their measure is the canna, the same with that of Naples. The Muscovite measures are the cubit, equal to one Paris foot four inches two lines; and the arcin, two whereof are equal to three cubits. The Turkish and Levant measures are the picq, containing two feet two inches and two lines, or three-fifths of the Paris ell. The Chinese measure, the cobre; ten whereof are equal to three Paris ells. In Persia, and some parts of the Indies, the gueze, whereof there are two kinds; the royal gueze, called also the gueze, monkelfer, containing two Paris feet ten inches eleven lines, or four-fifths of the Paris ell; and the shorter gueze, called simply gueze, only two-thirds of the former. At Goa and Ormuz, the measure is the vara, the same with that of the Portuguese, having been introduced by them. In Pegu, and some other parts of the East Indies, the cando or candi is equal to the ell of Venice. At Goa, and other parts, they use a larger cando, equal to seventeen Dutch ells; exceeding that of Babel and Balsora by $\frac{7}{8}$ per centum, and the vara by $\frac{1}{6}$. In Siam, they use the ken, short of three Paris feet by one inch. The ken contains two soks, the sok two keubs, the keub twelve nious or inches, the nious to be equal to eight grains of rice, *i. e.* to about nine lines. At Camboia, they use the haster; in Japan, the tatam; and the span on some of the coasts of Guinea.

The French, acting upon a general system of innovation during the late Revolution in that country, formed new measures, to proceed in a regular decimal scale, which are given by Dr. Young, in some degree amended, as follow:

Millometre.....	English inches.
Centimetre.....	.03937
	.39371

Decimetre.....	3.93710
Metre.....	39.37100
Decametre.....	393.71000
Hecatometre.....	3937.10000
Chiliometre.....	39371.00000
Myriometre.....	393710.00000

The metre is 1.09364 yards, or nearly 1 yard, $1\frac{1}{2}$ nail, or 443.2959 lines French, of .513074 toises.

A decametre is 10 yards, 2 feet, 9.7 inches.

A hecatometre, 109 yards, 1 foot, 1 inch.

A chiliometre, 4 furlongs, 213 yards, 1 foot, 10.2 inches.

A micrometre, 6 miles, 1 furlong, 156 yards, 6 inches.

Eight chiliometres are nearly 5 miles.

An inch is .0254 metre; 2441 inches, 62 metres; 1000 feet, nearly 305 metres.

An arc, a square decametre, is 3.95 perches.

A hecatre, 2 acres, 1 rood, 35.4 perches.

Cubic inches English.

Millilitre.....	.06103
Centilitre.....	.61023
Decilitre.....	6.10280
Litre, a cubic decimetre.....	61.02800
Decalitre.....	610.28000
Hecalitre.....	6102.80000
Chilolitre.....	61028.00000
Myriolitre.....	610280.00000

Two and $\frac{1}{4}$ wine-pints are about a litre; 3 wine-pints are nearly 14 decilitres; a chilolitre is one tun, 12.75 wine-gallons.

3.5317 cubic feet make a decistere, a measure for fire-wood.

A sterc, a cubic metre, 35.3171.

Several ancient and modern measures of length are given in the following table in English feet.

ANCIENT MEASURES.

	English feet.
Arabian foot.....	1.095
Egyptian foot.....	1.421
— stadium.....	7.308
Derahor cubit of Cairo.....	1.82
Greek foot.....	1.009
— phyletarian foot.....	1.167
— stadium.....	504.375
Hebrew foot.....	1.212
— cubit.....	1.817
— sacred cubit.....	2.002
— great cubit = six common cubits.	
Natural foot.....	.814
Roman foot.....	.970
— (from the Cosutian Monument).	.967
— (from the Congius of Vespasian)...	.986
—(after Titus)	.965
—(from rules)	.9672
—(from buildings)	.9681
—(from a stone)	.9696
Roman stadium.....	604.375
— mile of Pliny.....	4840.5
— of Strabo.....	4903.
Sicilian foot of Archimedes.....	.750

MODERN MEASURES.

Amsterdam foot.....	.927
— ell.....	2.233
Antwerp foot.....	.940
— ell.....	2.283
Barcelona foot.....	.992
Basle foot.....	.944
Bavarian foot.....	.968
Berlin foot.....	.992
Bologna foot.....	1.244
Brabant ell in Germany.....	2.268
Brescia foot.....	1.560
Brescian braccio.....	2.092
Brussels foot.....	.902
Brussels greater ell.	

Brussels, greater ell.....	2.278
— less ell.....	1.245
China mathematical foot.....	1.127
— Imperial foot.....	1.051
Chinese li.....	606.
Constantinople foot.....	2.195
Copenhagen foot.....	1.049
Dantzick foot.....	.944
Dresden foot.....	.929
— ell = 2 feet.....	1.857
Florence foot.....	.995
— braccio.....	1.900
Genoa palm.....	.812
— canna.....	7.300
Geneva foot.....	1.919
Hamburgh foot.....	.933
Lisbon foot.....	.952
Madrid foot.....	.915
— vara.....	3.263
Malta palm.....	.915
Moscow foot.....	.928
Naples palm.....	.861
— canna.....	6.908
Paris line.....	.0074
Paris inch.....	.0888
Paris foot.....	1.066
Paris metre.....	3.281
Paris toise.....	6.394
Rome palm.....	.733
— foot.....	.966
— deto.....	($\frac{1}{10}$ foot) .0604
— oncio.....	($\frac{1}{12}$ foot) .0805

Rome, palmo.....	.2515
— palmo di architettura.....	.732
Rome canna di architettura.....	7.3255
— staiolo.....	4.212
— canna dei mercanti (8 palms).....	6.5365
— braccio dei mercanti (4 palms).....	2.7876
— braccio di tessitor di tela.....	2.0868
— braccio di architettura.....	2.561
Russian archine.....	2.3625
— archine.....	2.3333
— verschock, $\frac{1}{16}$ arschin.....	.1458
Stockholm foot.....	1.073
Turin foot.....	1.676
— ras.....	1.958
— trabuco.....	10.085
Tyrol foot.....	1.096
— ell.....	2.639
Venice foot.....	1.137
— braccio of silk.....	2.108
— ell.....	2.089
— braccio of cloth.....	2.250
Vienna foot.....	1.036
— ell.....	2.557
— post mile.....	24888.
Warsaw foot.....	1.169
Also a French league is about $2\frac{3}{4}$ English miles.	
A German mile.....	4
A Dutch mile.....	$3\frac{1}{2}$
An Italian mile.....	$3\frac{1}{2}$
A Spanish league.....	$3\frac{3}{4}$
A Russian verst.....	$\frac{3}{4}$

TABLES OF LONG MEASURE.

1. ENGLISH LONG MEASURE.

Barley-corn										
3	Inch									
9	3	Palm								
27	9	3	Span							
36	12	4	$1\frac{1}{3}$	Foot						
54	18	6	2	$1\frac{1}{2}$	Cubit					
108	36	12	4	3	2	Yard				
180	60	20	$6\frac{2}{3}$	5	$3\frac{1}{3}$	$1\frac{2}{3}$	Pace			
216	72	24	8	6	4	2	$1\frac{1}{5}$	Fathom		
594	198	66	22	$16\frac{1}{2}$	11	$5\frac{1}{2}$	$3\frac{3}{10}$	$2\frac{3}{4}$	Pole	
23760	7920	2640	880	660	440	220	132	110	40	Furlong
190080	63360	21120	7040	5280	3520	1760	1056	880	320	8 Mile
570240	190080	63360	21120	15840	10560	5280	3168	2640	960	24 3 League
13210560	4403520	1467840	489280	366960	244640	122320	73392	61160	22240	556 $69\frac{1}{2}$ $23\frac{1}{2}$ Degree.

2. ANCIENT JEWISH MEASURES REDUCED INTO ENGLISH.										Eng. feet.	In. Dec.
Digit										0	0·912
4	Palm									0	3·648
12	3	Span								0	10·944
24	6	2	Cubit							1	9·888
96	24	8	4	Fathom						7	3·552
144	36	12	6	1½	Ezechiel's reed					10	11·328
192	48	16	8	2	1½	Arabian pole				14	7·104
1920	480	160	80	20	13½	10	Schœnus, or measuring line.....			145	11·04

3. ANCIENT JEWISH ITINERARY MEASURES.										Eng. miles.	Paces.	Feet.
Cubit.....										0	0	1·824
400	Stadium									0	145	4·6
2000	5	Sab. day's journey								0	729	3 000
4000	10	2	Eastern mile							1	403	1·000
12000	30	6	3	Parasan						4	153	3·000
96000	240	48	24	8	A day's journey					33	172	4 000

4. ANCIENT GRECIAN MEASURES.										Paces.	Feet.	Dec.
Dactylus, digit.....										0	0	0·75541½
4	Doron, dochme									0	0	3·0218 ¾
10	2½	Lichas.....								0	0	7·5546 ⅞
11	2⅔	1⅙	Orthodoron							0	0	8·3101 9/16
12	3	1 ⅔	1⅙	Spithame						0	0	9·0656 ¼
16	4	1 6/10	1 5/11	1 1/3	Foot.....					0	1	0·0875
18	4½	1 4/5	1 7/11	1½	1 1/8	Cubit				0	1	1·5984 3/8
20	5	2	1 9/11	1 2/3	1 1/4	1 1/5	Pygon			0	1	3·109 2/8
24	6	2 2/3	2 2/11	2	1½	1 1/3	1 1/4	Cubit larger.....		1	0	6·13125
96	24	9 3/5	8 9/11	8	6	5½	4½	4	Pace	4	6	0·525
9600	2400	960	872 9/11	800	600	533 1/3	480	400	100	Furlong. ...	100	4 4·5
76800	19200	7680	6981 9/11	6400	6800	4266 2/3	3840	3200	800	8	Mile...	805 5 0

5. ANCIENT ROMAN MEASURES.										Paces.	Feet.	Dec.
Digitus transversus										0	0	0·725½
1½	Uncia									0	0	0·967
4	3	Palmus minor.....								0	0	2·001
16	12	4	Pes							0	0	11·640
20	15	5	1¼	Palmipes						0	1	2·505
24	18	6	1½	1½	Cubitus					0	1	5·406
40	30	10	2½	2	1 2/3	Gradus.....				0	2	5·01
80	60	20	5	4	3½	2	Passus			0	4	10·03
10000	7500	2500	625	500	416 2/3	250	125	Stadium.....		129	4	4·5
80000	60000	20000	5000	4000	3333 1/3	2000	1000	8	Milliare	967	0	•

MEASURES OF CAPACITY, OR CUBICAL MEASURES.

English Liquid Measure. The English liquid measures were originally raised from troy-weight: it being enacted by several statutes, that 8 lb. troy of wheat, gathered from the middle of the ear, and well dried, should weigh a gallon of wine-measure, the divisions and multiples whereof were to form the other measures; at the same time it was also ordered, that there should be but one liquid measure in the kingdom: yet custom has prevailed, and there having been introduced a new weight, viz. the avoirdupois, we have now a second standard gallon adjusted thereto, and therefore exceeding the former in the proportion of the avoirdupois-weight to troy-weight. From this latter standard are raised two several measures, the one for ale, the other for beer. The sealed gallon at Guildhall, which is the standard for wines, spirits, oils, &c. is supposed to contain 231 cubic inches; and on this supposition the other measures raised therefrom will contain as in the table underneath: yet, by actual experiment made in 1688, before the lord mayor and the commissioners of excise, this gallon was found to contain only 224 cubic inches: it was however agreed to continue the common supposed contents of 231 cubic inches, so that all computations stand on their own footing. Hence, as 12 is to 231, so is $14\frac{3}{4}$ to 281 $\frac{1}{2}$ the cubic inches in the ale-gallon: but in effect the ale-quart contains $7\frac{1}{2}$ cubic inches, on which principle the ale and beer-gallon will be 282 cubic inches. The several divisions and multiples of these measures, and their proportions, are exhibited in the tables underneath. The barrel for ale in London is 32 gallons, and the barrel for beer 36 gallons. In all other places of England, the barrel, both for ale and beer, is 34 gallons.

Foreign Liquid Measures of Capacity. In foreign nations, their several vessels for wine, vinegar, &c. have also various denominations, according to their different sizes and the places where-in they are used. The wooders of Germany, for holding Rhenish and Moselle wines, are different in their gauges; some containing 14 aunes of Amsterdam measure, and others more or less. The aune is reckoned at Amsterdam for 8 steckans, or 20 verges, or for $\frac{1}{6}$ of a ton of 2 pipes; or 4 barrels of French or Bourdeaux, which $\frac{1}{2}$ at this latter place is called tiercon, because three of them make a pipe or two barrels, and six the said ton. The steckan is 16 mingles, or 32 pints; and the verge is, in respect of the said Rhenish and Moselle, and some other sorts of wine, 6 mingles; but in measuring brandy, it consists of $6\frac{1}{2}$ mingles. The aune is divided into 4 ankens, and the anken into 2 steckans; or 32 mingles. The anken is taken sometimes for $\frac{2}{3}$ of a ton, or 4 barrels; on which footing the Bourdeaux barrel ought to contain at Amsterdam (when the cask is made according to the just gauge) 12 $\frac{1}{2}$ steckans, or 200 mingles, wine and lees; or 12 steckans, or 192 mingles, racked wine; so that the Bourdeaux ton of wine contains 50 steckans, or 800 mingles, wine and lees; and 48 steckans, or 768 mingles of pure wine. The barrels, or poingons, of Nantes, and other places on the Loire, contain only 12 steckans Amsterdam measure. The wine ton of Rochelle, Cognac, Charente, and the Isle of Rhé, differs very little from the ton of Bourdeaux, and consequently from the barrels and pipes. A ton of wine of Chalosse, Bayonne, and the neighbouring places, is reckoned 60 steckans, and the barrel 15, Amsterdam measure. The late muid of Paris contained 150 quarts, or 500 pints, wine and lees; or 280 pints clear wine; of which muids three make a ton; the fractions were,

The muid	} containing	36 setiers
The setier		4 quarts
The quart		2 pints
The pint		2 chopins
The chopin		2 demi-setiers
The demi-setier		2 poissons

The muid is also composed of pipes, or poingons, quarteaux, queves, and demiqueves: those poingons of Paris and Orleans contain about 15 steckans Amsterdam measure, and ought to weigh with the cask 666 pounds, a little more or less. In Provence they reckon by milleroles, and the millerole of Toulon contains 66 Paris pints, or 100 pints of Amsterdam, nearly: and the Paris pint is nearly equal to the English wine-quart. The butts or pipes from Cadiz, Malaga, Alicant, Benecarlo, Saloe, and Mataro, and from the Canaries, from Lisbon, Oporto, and Fayal, are very different in their gauges, though in affreightments, they are all reckoned two to the ton. Vinegar is measured in the same manner as

wine; but the measures for brandies are different: these spirits from France, Spain, Portugal, &c. are generally shipped in large casks, called pipes, butts, and pieces. In France, brandy is shipped in casks, called pieces at Bourdeaux and pipes at Rochelle, Cognac, the Isle of Rhé, and other neighbouring places, which contain some more and some less, even from 60 to 90 Amsterdam verges or veertels, according to the capacity of the vessels, and the places they come from, which being reduced into barrels will stand as follows, viz.

At Rochelle, Cognac, the Isle of Rhé, and the country of Aunis.....	27 Veertels	} per barrel.
At Nantes, and several places of Bretagne and Angou.....	29 Veertels	
At Bourdeaux, and different parts of Guienne.....	32 Verges	
At Amsterdam, and other cities of Holland.....	30 Veertels	
At Hamburgh and Lubeck.....	30 Verges	
At Embden.....	27 Verges	

In the late provinces of Provence and Languedoc, brandy was sold by the quintal, the casks included; and at Bruges in Flanders, the verges are called sesters of sixteen stops each, and the spirit is sold at so much per stop. Olive-oil is also shipped in casks of various sizes, according to the custom of the places where it is embarked and the conveniency of stowage. In England it is sold by the ton of 236 gallons; and at Amsterdam by the ton of 717 mingles, or 1434 pints. In Provence it is sold by milleroles of 66 Paris pints; from Spain and Portugal it is brought in pipes or butts, of different gauges; at the first place it is sold by roves, whereof forty go to the butt; and at the latter place by almoudas, whereof twenty-six make a pipe. Train-oil is sold in England by the ton; at Amsterdam by the barrel.

Scotch Liquid Measures of Capacity. The Scottish liquid measure is founded on the pint. The Scotch pint was formerly regulated by a standard jug of cast metal, the custody of which was committed to the borough of Stirling. This jug was supposed to contain 103 cubic inches; and, though, after several careful trials, it has been found to contain only about 103 inches and a half; yet, in compliance with established custom, founded on that opinion, the pint-stoups are still regulated to contain 105 inches, and the customary ale-measures are about 1-16th above that standard. It was enacted by James I. of Scotland that the pint should contain forty-one ounces Trone weight of the clear water of Tay, and by James VI. that it should contain fifty-five Scots Troy ounces of the clear water of Leith. This affords another method of regulating the pint, and also ascertains the ancient standard of the Trone-weight. As the water of Tay and Leith are alike, the Trone weight must have been to the Scotch Troy weight as 55 to 41; and, therefore, the pound Trone must have contained about 21 ounces and a half Scotch Troy.

4 gills	= 1 mutchkin
2 mutchkins	= 1 chopin
2 chopins	= 1 pint
2 pints	= 1 quart
4 quarts	= 1 gallon

The Scotch quart contains 210 inches; and is, therefore, about 1-10th less than the English wine-gallon, and about 1-4th less than the ale-gallon.

TABLES OF LIQUID MEASURE.

1. ENGLISH.

BEER.

Solid inches					
354	Pint				
282	8	Gallon			
2533	72	9	Firkin		
5076	144	18	2	Kilderkin	
10152	288	36	4	2	Barrel
20304	576	72	8	4	2 Hogshead.

TABLES OF LIQUID MEASURE CONTINUED.

ALE.						
Solid inches						
35 $\frac{1}{4}$	Pint					
282	8	Gallon				
2256	64	8	Firkin			
4412	128	16	2	Kilderkin		
8824	256	32	4	2	Barrel	
17648	512	64	8	4	2	Hogshead.

WINE.									
Solid inches									
28 $\frac{7}{8}$	Pint .								
231	8	Gallon							
4158	144	18	Rundlet						
7276 $\frac{1}{2}$	252	31 $\frac{1}{2}$	1 $\frac{3}{4}$	Barrel					
9702	336	42	2 $\frac{1}{3}$	1 $\frac{1}{3}$	Tierce				
14553	504	63	3 $\frac{1}{2}$	2	1 $\frac{1}{2}$	Hogshead			
19404	672	84	4 $\frac{2}{3}$	2 $\frac{2}{3}$	2	1 $\frac{1}{3}$	Puncheon		
29106	1008	126	7	4	3	2	1 $\frac{1}{2}$	Butt or pipe	
58212	2016	252	14	8	6	4	3	2	Tun.

2. ATTIC REDUCED TO ENGLISH WINE MEASURE.

2. ATTIC REDUCED TO ENGLISH WINE MEASURE.										Gal.	Pints.	Sol. In.	Dec.
Cochliarion										0	$\frac{1}{128}$	0.0356 $\frac{5}{12}$	
2	Cheme									0	$\frac{1}{64}$	0.0712 $\frac{5}{6}$	
$2\frac{1}{2}$	$1\frac{1}{4}$	Mystron.....								0	$\frac{1}{48}$	0.089 $\frac{11}{8}$	
5	$2\frac{1}{2}$	2	Conche							0	$\frac{1}{24}$	0.178 $\frac{11}{24}$	
10	5	4	2	Cyathos.....						0	$\frac{1}{12}$	0.356 $\frac{11}{2}$	
15	$7\frac{1}{2}$	6	3	$1\frac{1}{2}$	Oxybaphon					0	$\frac{1}{8}$	0.535 $\frac{1}{8}$	
60	30	24	12	6	4	Cotyle.....				0	$\frac{1}{2}$	2.141 $\frac{1}{2}$	
120	60	48	24	12	8	2	Xestes			0	1	4.283	
720	360	288	144	72	48	12	6	Chous		0	6	25.698	
8640	4320	3456	1728	864	576	144	72	12	Metetes.....	10	2	19.629	

3. JEWISH REDUCED TO ENGLISH WINE MEASURE.

							Gal.	Pints.	Sol. inch.
Caph.							0	0 $\frac{5}{8}$	0.177
1 $\frac{1}{3}$	Log						0	0 $\frac{5}{8}$	0.211
5 $\frac{1}{3}$	4	Cab					0	3 $\frac{1}{3}$	0.844
16	12	3	Hin				1	2	2.533
32	24	6	2	Seah			2	4	5.067
96	72	18	6	3	Bath, or Ephah		7	4	15.2
960	720	180	60	30	10	Coron, or Chomer	75	5	7.625

4. ROMAN REDUCED TO ENGLISH WINE MEASURE.

4. ROMAN REDUCED TO ENGLISH WINE MEASURE,										Gal.	Pints.	Sol. inch.	
Lingula.....										0	0 $\frac{1}{8}$	0.117 $\frac{1}{2}$	
4	Cyathus									0	0 $\frac{1}{12}$	0.469 $\frac{1}{2}$	
6	1 $\frac{1}{2}$	Acetabulum									0	0 $\frac{1}{8}$	0.704 $\frac{1}{2}$
12	3	2	Quartarius							0	0 $\frac{1}{4}$	1.409	
24	6	4	2	Hemina.....						0	0 $\frac{1}{2}$	2.818	
48	12	8	4	2	Sextarius					0	1	5.636	
288	72	48	24	12	6	Congius				0	7	4.942	
1152	288	192	96	48	24	4	Urna			3	4 $\frac{1}{2}$	5.33	
2304	576	384	192	96	48	8	2	Amphora		7	1	10.66	
46080	11520	7680	3840	1920	960	160	40	20	Culeus.....	143	3	11.093	

English Dry or Corn Measure. The standard for measuring corn, salt, coals, and other dry goods, in England, is the Winchester gallon, which contains 272 $\frac{1}{2}$ cubic inches. The bushel contains 8 gallons, or 2178 inches. A cylindrical vessel, 18 $\frac{1}{2}$ inches diameter, and 8 inches deep, is appointed to be used as a bushel in levying the malt-tax. A vessel of these dimensions is rather less than the Winchester bushel of 8 gallons, for it contains only 2150 inches; though probably there was no difference intended. The denominations of dry measure, commonly used, are given in the second of the subjoined tables. Four quarters of corn make a chaldron, 5 quarters make a wey or load, and 10 quarters make a ton. In measuring sea-coal, 5 pecks make a bushel, 9 bushels make a quarter or vatt, 4 quarters make a chaldron, and 21 chaldrons make a score.

- 40 feet hewn timber make a load.
- 50 feet unhewn timber make a load.
- 32 gallons make a herring barrel.
- 42 gallons make a salmon barrel.
- 1 cwt. gunpowder makes a barrel.
- 256 lb. soap make a barrel.
- 10 dozen candles make a barrel.
- 12 barrels make a last.

Foreign Dry Measure. The late French dry measures were the litron, bushel, minot, septier, muid, and ton. The litron is divided into two demi-litrons, and four quarter-litrons, and contains 36 cubic inches of Paris. By ordonnance the litron is to be 3 inches and a half high, and 3 inches 10 lines broad. The litron for salt is larger, and is divided into two halves, four quarters, eight demi-quarters, and 16 mesurette. The French bushel is different in different jurisdictions. At Paris it is divided into demi-bushels; each demi-bushel into two quarts; the quart into two half-quarts; and the half-quart into two litrons: so that the bushel contains 16 litrons. By ordonnance the Paris bushel is 9 inches 2 lines and a half high, and 19 inches broad, or in diameter within-side. The minot consists of 3 bushels, the mine of 2 minots or 6 bushels, the septier of 2 mines or 12 bushels, and the muid of 12 septiers, or 144 bushels. The bushel of oats is estimated double that of any other grain; so that there go 24 bushels to make the septier, and 288 to make the muid. It is divided into 4 picotins, the picotin containing 2 quarts, or 4 litrons. The bushel for salt is divided into 2 half-bushels, 4 quarters, 8 half-quarters, and 16 litrons; four bushels make a minot, 16 a septier, and 192 a muid. The bushel for wood is divided into halves, quarters, and half-quarters. Eight bushels make the minot, 16 a mine; 20 mines, or 320 bushels, the muid. For plaster, 12 bushels make a sack, and 36 sacks a muid. For lime, 3 bushels make a minot, and 48 minots a muid. The minot is by ordonnance 11 inches 9 lines high, and 14 inches 8 lines in diameter. The minot is composed of 3 bushels, or 16 litrons; 4 minots make a septier, and 48 a muid. The French mine is no real vessel, but an estimation of several others. At Paris the mine contains 6 bushels,

and 24 make the muid; at Rouen the mine is 4 bushels; and at Dieppe 18 mines make a Paris muid. The septiers differ in different places: at Paris it contains 2 mines, or 8 bushels, and 12 septiers the muid. At Rouen the septier contains 2 mines, or 12 bushels. Twelve septiers make a muid at Rouen as well as at Paris; but 12 of the latter are equal to 14 of the former. At Toulon the septier contains a mine and a half; 3 of which mines make the septier of Paris. The muid or muy of Paris consists of 12 septiers, and is divided into mines, minots, bushels, &c. That for oats is double that for other grain, i. e. contains twice the number of bushels. At Orleans the muid is divided into mines; but those mines only contain two Paris septiers and a half. In some places they use the ton in lieu of the muid; particularly at Nantes, where it contains 10 septiers of 16 bushels each and weighs between 2200 and 2250 pounds. Three of these tuns make 28 Paris septiers. At Rochelle, &c. the tun contains 42 bushels, and weighs 2 per cent. less than that of Nantes. At Brest it contains 20 bushels, is equal to 10 Paris septiers, and weighs about 2240 pounds. See TUN, HOLLAND, SWEDEN, POLAND, PRUSSIA, and MUSCOVY. In these places they estimate their dry things on the foot of the last, lest, leth, or lecht; so called, according to the various pronunciation of the people who use it. In Holland the last is equal to 19 Paris septiers or 38 Bourdeaux bushels, and weighs about 4500 pounds; the last they divide into 27 mudes, and the mude into 4 schepels. In Poland the last is 49 Bourdeaux bushels, and weighs about 4800 Paris pounds. In Prussia the last is 133 Paris septiers. In Sweden and Muscovy they measure by the great and little last; the first containing 12 barrels, and the second half as many. In Muscovy they likewise use the chefford, which is different in various places: that of Archangel is equal to 3 Rouen bushels.—*Italy.* At Venice, Leghorn, Lucca, and places adjacent, they estimate their dry things on the foot of the staro, or staio; the staro of Leghorn which weighs 54 pounds, 112 staros, and seven-eighths, are equal to the Amsterdam last. At Lucca 119 staros make the last at Amsterdam. The Venetian staro weighs 120 Paris pounds: the staro is divided into four quarters. Thirty-five staros and one-fifth, or 140 quarters and four-fifths, make the last of Amsterdam. At Naples, and other parts, they use the tomolo, or tomalo, equal to one-third of the Paris septier. Thirty-six tomoli and a half make the carro; and a carro and a half, or 54 tomoli, make the last of Amsterdam. At Palermo, 16 tomoli make the salina, and 1 mendili the tomolo. Ten salmas and three-sevenths make the last of Amsterdam.—*Flanders.* At Antwerp, &c. they measure by the vierdel; whereof 32 and a half make 19 Paris septiers. At Hamburg the schepel; 99 whereof make 19 Paris septiers.—*Spain and Portugal.* At Cadix, Bilbao, and St. Sebastian they use the senega; 23 whereof make the Nantes or Rochelle tun, or 9 Paris septiers and a half; though the Bilbao senega is somewhat larger, inasmuch that 21 senegas make a Nantes tun. At Seville, &c. they use the anagoras, containing a little more than the Paris mine; 35 anagoras make 19 Paris

Paris septiers. At Bayonne, &c. the concha; 30 whereof are equal to 9 Paris septiers and an half. At Lisbon the alquiver, a very small measure, 240 whereof make 19 Paris septiers, 60 the Lisbon muid.

Scotch Dry Measure. The wheat-firlot, used also for rye, pease, beans, salt, and grass-seeds, contains 21 pints 1 mutchkin, measured by the Stirling jug. The barley-firlot, used also for oats, fruit, and potatoes, contains 31 pints. A different method of regulating the firlot was appointed from the dimensions of a cylindrical vessel. The diameter for both measures was fixed at 19 inches and one-sixth, the depth 7 inches and one-eighth for the wheat-firlot, and 10 and a half for the barley-firlot. A standard constructed by these measures is rather less than when regulated by the pint; and as it is difficult to make vessels exactly cylindrical, the regulation by the pint has prevailed, and the other method gone into disuse. If the Stirling jug contains 103 inches and a half, the wheat will contain 2109 inches; which is more than 2 per cent, larger than the legal malt-bushel of England, and about 1 per cent, larger than the Winchester bushel: and the barley-firlot will contain 3208 inches. The barley-boll is nearly equal to the boll: in Invernesshire, 18 pecks: in Ayrshire the boll is the same as the English quarter. And the firlots, in many places, are larger than the Linlithgow standard.

TABLES OF DRY MEASURE.

1. ENGLISH DRY MEASURE.

Solid inches

33.6	Pint				
268.8	8	Gallon			
537.6	16		2	Peck	
2150.4	64		8		4 Bushel
17203.2	512		64	32	8

2. ATTIC MEASURES OF CAPACITY FOR THINGS DRY, REDUCED TO ENGLISH CORN-MEASURE.

					Peck.	Gal.	Pint.	Sol. inch.	Dec.
Cochliarion.....					0	0	0	0.27657	
10 Cyathos.....					0	0	0	2.7631	
15 1½ Oxybaphon.....					0	0	0	4.1443	
60 6 4 Cotyle.....					0	0	0	16.579	
120 12 8 2 Xestes.....					0	0	0	33.158	
180 18 12 3 1½ Choenix.....					0	0	1	15.7051	
8640 864 576 144 72 48 Medimnos.....					4	0	6	3.501	

3. ROMAN MEASURES OF CAPACITY FOR THINGS DRY, REDUCED TO ENGLISH CORN-MEASURE.

					Peck.	Gal.	Pint.	Sol. inch.	Dec.
Ligula.....					0	0	0	0.1	0.01
4 Cyathus.....					0	0	0	0.1	0.04
6 1½ Acetabulum.....					0	0	0	0.1	0.06
24 6 4 Hemina.....					0	0	1	1	0.24
48 12 8 2 Sextarius.....					0	0	1		0.48
384 96 64 16 8 Semimodius...					0	1	0		3.84
768 192 128 32 16 2 Modius....					1	0	0		7.68

4. SCRIPTURE DRY MEASURE, REDUCED TO ENGLISH.

					Peck.	Gal.	Pint.	Sol. inch.	Dec.
Gachal.....					0	0	0	17	0.031
20 Cab.....					0	0	2½		0.073
36 14 Gomor.....					0	0	5 1/8		1.211
120 6 3½ Seah.....					1	0	1		4.036
360 18 10 3 Ephah.....					3	0	3		12.107
1800 90 50 15 5 Leteeh.....					16	0	0		26.500
3600 180 100 30 10 2 Chomer, or coron.					32	0	1		18.969

MEASURES, SQUARE, SUPERFICIAL, OR LAND MEASURE.

1. MEASURES, SQUARE, ENGLISH, are raised from the yard of 36 inches multiplied into itself, and thus producing 1296 square inches in the square yard; the divisions of this are square feet and inches; and the multiples, poles, roods, and acres. Because the length of a pole is 5½ yards, the square of the same contains 30¼ square yards. A square mile contains 640 square acres. In measuring fens and woodlands, 18 feet are generally allowed to the pole, and 21 feet in forest-lands. A hide of land, frequently mentioned in the earlier parts of the English history, contained about 100 arable acres; and five hides were esteemed a knight's fee. At the time of the Norman conquest there were 243,600 hides in England.

2. MEASURES, SQUARE, FRENCH, were regulated by 12 square lines in the inch square; 12 inches in the foot, 22 feet in the perch, and 100 perches in the arpent or acre.

3. MEASURES, SQUARE, GRECIAN, were the plethron or acre, by some said to contain 1444, by others 10,000, square feet; and the aroura the half of the plethron. The aroura of the Egyptians was the square 100 cubits.

4. MEASURES, SQUARE, ROMAN, reduced to English. The integer was the jugerum or acre, which the Romans divided like the libra or as: thus the jugerum contained

	sq. feet.	scruples.	English rods.	sq. poles.	sq. feet.
As	28800	288	2	18	250.05
Deunx	26400	264	2	10	183.85
Dextans	24000	240	2	2	117.64
Dodrans	21600	216	1	34	51.42
Bes	19200	192	1	25	257.46
Septunx	16800	168	1	17	191.25
Semis	14400	144	1	9	125.03
Quincunx	12000	120	1	1	58.82
Triens	9600	96	0	32	264.85
Quadran	7200	72	0	24	198.64
Sextans	4800	48	0	16	132.43
Uncia	2400	24	0	8	66.21

Note, Actus major was 14,400 square-feet, equal to a semis; clima, 3600 square feet, equal to sescuntia, and actus minimus equal to a sextans.

5. MEASURE, SQUARE, SCOTS, OR LAND MEASURE, is regulated by the Scotch ell: 36 square ells = 1 fall, 40 falls = 1 rood, 4 roods = 1 acre. The proportion between the Scotch and English acre, supposing the feet in both measures alike, is as 1369 to 1089, or nearly as five to four. If the difference of the feet be regarded, the proportion is as 10,000 to 7869. The length of the chain for measuring land in Scotland is 24 ells, or 74 feet. A husband-land contains 6 acres of sock and scythe land, that is, of land that may be tilled with a plough, or mown with a scythe: 13 acres.

acres of arable land make one ox-gang, and four ox-gangs make a pound-land of old extent.

6. MEASURE, SQUARE, TABLE OF ENGLISH.

Inches	Foot	Yard	Pace	Pole	Rood	Acre
144						
1296	9					
3600	25	2 $\frac{2}{3}$				
39204	272 $\frac{1}{2}$	30 $\frac{1}{2}$	10.69			
1568160	10890	1210	435.6	40		
6272640	43560	4840	1742.6	160	4	

For the common tables of English measure in general use, see ARITHMETIC.

MEASURING, in general, makes the practical part of geometry. From the various subjects whereon it is employed, it acquires various names, and constitutes various arts. See GEOMETRY, LEVELLING, MENSURATION, TRIGONOMETRY, &c.

MEATH, or **EAST MEATH**, so named to distinguish it from West Meath; a county of Ireland, in the province of Leinster, bounded on the N. by those of Cavan and Louth; E. by the Irish channel; S. by Kildare and Dublin, and W. by West Meath and Longford. It is a fine champaign country, abounding with corn, and well inhabited. Trim is the capital.

MEATH, or **WEST MEATH**, a county of Ireland, situated on the west and north-west boundaries of East Meath. Mullengar is the capital.

MEAUX, a town of France, in the department of Seine and Marne, late province of the Isle of France, and district of Brie; twenty-five miles N. E. of Paris. Lon. 2. 58. E. Lat. 48. 58. N.

MECCA, an ancient and celebrated town of Asia, in Arabia Felix; famous for being the birth-place of Mohammed. The Mohammedans have so high an opinion of the sanctity of Mecca, that the surrounding territory is held sacred to certain distances, which are indicated by particular marks. Every caravan finds in its road a mark, which gives notice to the pilgrims when they are to put on the modest garb in which they must appear in those sacred regions. Every mussulman is obliged to go once in his life, at least, to Mecca, to perform his devotions there. If that law were rigorously enforced, the concourse of pilgrims would be prodigious, and the city would never be able to contain the multitudes from all the countries where the Mohammedan religion prevails. Devotees alone, therefore, perform this duty, and others dispense with it. Those, whose circumstances do not permit a long absence, go to Mecca by a substitute. A hired pilgrim, however, cannot go for more than one person at a time; and he must, to prevent frauds, bring an attestation in proper form, from an Imam of Mecca, that he has performed the requisite devotions on behalf of such a person, either alive or dead; for, after the decease of a person who has not obeyed the law during his life, he is obliged to perform the journey by proxy. It is 220 miles S. E. of Medina. Lon. 40. 55. E. Lat. 21. 45. N.

MECHANICAL, **MECHANIC**, [from *μηχανή*, an engine,], a term applied to whatever relates to mechanics; as mechanical powers, causes, &c. See CAUSE, POWER, &c.

MECHANICAL, in mathematics, denotes a construction of some problem, by the assistance of instruments, as the duplicature of the cube and quadrature of the circle, in contradistinction to that which is done in an accurate and geometrical manner.

MECHANICAL CURVE, is a curve, according to Descartes, which cannot be defined by any algebraic equation; and thus contradistinguished from algebraic or geometrical curves. Leibnitz and others call these mechanical curves transcendental, and dissent from Descartes, in excluding them out of geometry. Leibnitz found a new kind of transcendental equations, whereby these curves are defined: but they do not continue constantly the same in all points of the curve, as algebraic ones do.

MECHANICAL PHILOSOPHY, the same with the corpuscular philosophy. See CORPUSCULARIAN.

MECHANICS.

(1.) **MECHANICS**, [*μηχανική*, from *μηχανή*, act or invention,] a mixed mathematical science, which relates to motion and moving powers, their nature and laws with their effects in machines, engines, &c. Mechanics has two branches; statics and dynamics. The object of statics is quantity considered in bodies that are in equilibrium, and have only a tendency to motion; and the object of dynamics is quantity considered in bodies actually moving. Statics and dynamics have each two parts. Statics is divided into statics proper, and hydrostatics. Statics has for its object solid bodies in equilibrium barely tending to motion; the object of hydrostatics is quantity considered in equipollent fluids tending to motion. Dynamics is divided into dynamics proper, which has for its object quantity considered in solid bodies, actually moved; and hydrodynamics, whose object is quantity considered in fluids actually moved. When quantity is considered in water actually moved, hydrodynamics takes the name of hydraulics. For hydrostatics and hydrodynamics, see HYDROSTATICS, and PNEUMATICS. Sir Isaac Newton divides this science into practical and rational mechanics; the former of which treats of the mechanical powers, viz. the lever, balance, axis and wheel, pulley, wedge, screw, and inclined plane. Rational mechanics comprehend the whole theory of motion; shew, when the powers or forces are given, how to determine the motions that are produced by them; and, conversely, when the phenomena of the motions are given, how to trace the powers or forces from which they arise. Thus it appears, that the whole of natural philosophy, besides describing the phenomena of nature, is little more than the proper application of rational mechanics to those phenomena: in tracing the powers that operate in nature from the phenomena, we proceed by ana-

lysis; and in deducing the phenomena from the powers or causes that produce them, we proceed by synthesis. The knowledge of mechanics is one of those things, says Mr. Mac Laurin, that serves to distinguish civilized nations from barbarians. It is by this science that the utmost improvement is made of every power and force in nature; and the motions of natural bodies, as water, air, fire, &c. are made subservient to the various purposes of life; for however weak the force of man appears to be, when unassisted by this art; yet, with its aid, he is capable of producing wonderful effects. As this science is closely connected with the arts of life, and particularly with those which existed even in the rudest ages of society; the construction of machines must have been practised long before the theory upon which their principles depend could have been understood. Hence we find in use among the ancients, the lever, the pulley, the crane, the capstan, and many other simple machines, at a period when mechanics, as a science, were unknown. In the remains of Egyptian architecture are beheld the most surprising marks of mechanical genius. The elevation of immense and ponderous masses of stone to the tops of their stupendous fabrics, must have required an accumulation of mechanical power, which is not in the possession of modern architects. We are indebted to Archimedes for the foundation of this science, for before his time it had scarcely been considered as a science: he demonstrated, that when a balance with unequal arms is in equilibrium, by means of two weights in its opposite scales, these weights must be reciprocally proportional to the arms of the balance. From this general principle the mathematician can easily deduce all the other properties of the lever. Archimedes likewise invented and improved several machines, and explained their properties

and powers. It is, however, of comparatively modern date, that mechanics have emerged from that feeble state in which they were transmitted to us by the ancients. Confined then to the equilibrium of bodies, they only included that part called statics, whereas now this science treats of motion in general; hence it comprehends the phenomena resulting from the impact, concurrence, and collision, of bodies, the forces acting on them, the paths they describe, the velocities with which they move, &c.

DEFINITIONS.

(2.) Matter or body is that substance which is the object of our senses, and has for its most distinguishing properties, extension, and impenetrability. See PHYSICS.

Quantity of matter is the aggregate of its particles, for here body is to be considered as a mass of atoms divisible ad infinitum; the bulk or substance of a mass is considered as having density; which relates directly to the quantity of the matter, and inversely refers to the magnitude. And since bodies are, more or less, porous, their quantity of matter is not, in every instance, found to correspond with the bulk they exhibit; but since each particle or atom is acted upon by gravity, the weight of the body will be the just measure of its quantity of matter.

Density is measured by the quantity of matter in a given bulk. Motion is a continual and successive change of place.

Velocity or celerity is the rate of motion measured by the space uniformly passed through in a given time. The motion of a body is said to be uniform when its velocity is continually the same, accelerated when its velocity increases, and retarded when its velocity diminishes. When the increase or diminution of velocity is equal, the motion is said to be uniformly accelerated or retarded.

Momentum, or quantity of motion, is measured by the quantity of matter and velocity jointly.

Force is whatever produces, or tends to produce, motion in bodies, and is measured by its effects. The force is impulsive when it acts instantaneously, constant when it acts incessantly. A force, when measured by the velocity produced in the body moved, is called an accelerating force; when measured by the momentum of the body moved, it is called a moving force.

Equable or uniform motion is generated by a single impetus or stroke; thus the motion of a ball from a cannon is produced by the single action of the powder in the first moment, and, therefore, the velocity it first sets out with would always continue the same, were it void of gravity, and to move in an unresisting medium; which, therefore, would be always equable, or such as would carry it through the same length of space in every equal part of time.

Accelerated motion is produced by a constant impulse of power, which keeps continually acting upon the body, as that of gravity which produces the motion of falling bodies; which sort of motion is constantly accelerated, because gravity every moment adds a new impulse, which generates a new degree of velocity; and, the velocity thus increasing, the motion must be quickened each moment, or fall faster and faster, the lower it falls. In like manner a body thrown perpendicularly upward, as a ball from a cannon, will have its motion continually retarded, because gravity acts constantly upon it in a direction contrary to that given it by the powder; so that its velocity upwards must be continually diminished, and its motion as continually retarded, till at last it be all destroyed. The body has then attained its utmost height, and is for a moment motionless, after which it begins to descend with a velocity in the same manner accelerated, till it meet the surface of the earth. All motion may be considered absolutely or relatively. Absolute or real motion, is when a body changes its place in absolute space; and relative motion, is when a body changes its place only with relation to other bodies. On this subject Mr. Martin observes, that space is nothing but an absolute and infinite void, and that the place of a body is that part of the immense void which it takes up or possesses: and this place may be considered absolutely, or in-itself, in which case it is called the absolute place of the body; or else with regard to the place of some other body, and then it is called the relative or apparent place of the body. Now as a motion is only the change of place in bodies, it is evident that it will come under the same distinction of absolute and relative or apparent. All motion is in itself absolute, or the change of absolute space; but, when the motions of bodies are considered and compared with each other, then are

they relative and apparent only: they are relative, as they are compared to each other; and they are apparent only, inasmuch that not their true or absolute motion, but the sum or difference of the motions only is perceivable to us. In comparing the motions of bodies we may consider them as moving both the same way, or towards contrary parts; in the first case, the difference of motion is only perceived by us; in the latter, the sum of the motions. Thus, for example, suppose two ships, A and B, set sail from the same port upon the same rhumb, and that A sails at the rate of five miles per hour, and B at the rate of three; here the difference of the velocity (viz. two miles per hour) is that by which the ship A will appear to go from the ship B forwards, or the ship B will appear at A to go with the same velocity backwards, to a spectator in either respectively. If the two ships, A and B, move with the same degree of velocity, then will the difference be nothing, and so neither ship will appear to the other to move at all. Hence it is, that though the earth is continually revolving about its axis, yet, as all objects on its surface partake of the same common motion, they appear not to move at all, but are relatively at rest. If two ships, A and B, with the degrees of velocity as above, meet each other, the one will appear to the other to move with the sum of both velocities, viz. at the rate of eight miles per hour; so that in this case the apparent motion exceeds the true, as in the other it fell short of it. Hence the reason why a person riding against the wind, finds the force of it much greater than it really is, whereas, if he rides with it, he finds it less. The reason of all these phenomena of motion will be evident, if we consider we must be absolutely at rest, if we would discern the true or real motions of bodies about us. Thus a person on the strand will observe the ships sailing with their real velocity; a person standing still will experience the true strength and velocity of the wind; and a person placed in the regions between the planets, will view all their true motions, which he cannot otherwise do, because in all other cases the spectator's own motion must be added to, or subtracted from, that of the moving body, and the sum or difference is therefore the apparent or relative motion, and not the true.

(3.) The general laws of motion, or laws of nature, as stated by Sir Isaac Newton, are the following:

LAW I.

Every body will persevere in its state of rest or moving uniformly in a right line, unless it be compelled to change its state by forces impressed.

Thus a bullet would continue at rest in the gun for ever, if it were not expelled by the force of powder; but being thereby put into motion, it would for ever move on in the direction of the axis of the barrel, if not retarded by the resistance of the medium, and carried downwards from that right line by the power of gravity. We shew by experiment, that the less the friction is of the axis of a moving wheel, the longer its motion continues. And we observe the vast bodies of the comets and planets preserve their motions undiminished (as to sense) for many 100 years in unresisting mediums. Since by reason of the inactivity of matter, there is nothing in any body that can augment, diminish, or any ways alter or vary the action or effect of any force impressed, we thence deduce the second general law of motion, viz.

LAW II.

The change of motion is proportional to the moving force impressed, and is made according to the right line in which that force is impressed.

If any force generate any motion, a double or triple force will generate twice or thrice as much. But the alteration in respect of the direction of the motion, is a complicated affair, which we shall farther consider hereafter. When bodies act upon each other, they do it by contact or collision, and since in this case, the action itself is but one and the same between both; the effects which it produces must of course be equally divided between both bodies, and thence an equal mutation of their state previous to the stroke must needs follow. From this consideration is deduced the third general law of nature, viz.

LAW III.

Re action is always equal and contrary to action; or the actions of two bodies mutually upon each other are always equal, and directed towards contrary parts.

The truth of this is abundantly confirmed by experiments. If the finger press a stone, the stone re-acts and presses the finger. The hammer striking the anvil, receives the same stroke from it, and is thereby made to rebound. The loadstone, if fixed, attracts the moveable iron; and the fixed iron equally attracts the moveable magnet. The horse draws the stone, and the stone equally draws the horse, because the action or force in the rope which connects them is one and the same, and must act equally at each end, viz. upon the horse and stone.

(4.) From what we have advanced the principal theorems relating to uniform motions may be easily deduced, thus: let,

Q = the quantity of matter or body moved.
F = the moving force or impulse.
A = the accelerating force.
M = the momentum.
V = the velocity generated.
S = the space described.
T = the time.

Then by the above definitions $M \propto QV$, $S \propto V$, when the time is given, and $S \propto T$ when the velocity is given; and therefore $S \propto TV$. Also $F \propto M$, and $A \propto V$. By the help of these general propositions, the relation of the spaces, times, velocities, &c. may be found upon all suppositions. And hence all the laws and proportions belonging to uniform motion, may be determined; expunging such quantities as are not concerned in the question; also those which are given or constant, and those which are found on both sides of the equation.

(5.) Thus we have, in general,

$$\begin{aligned} F \propto M &\propto QV \propto \frac{QS}{T} \propto QA. \\ M &\propto F \propto QV \propto \frac{QS}{T} \propto QA. \\ S &\propto TV \propto \frac{TM}{Q} \propto \frac{TF}{Q} \propto TA. \\ V &\propto A \propto \frac{M}{Q} \propto \frac{S}{T} \propto \frac{F}{Q} \\ T &\propto \frac{S}{V} \propto \frac{M}{F} \propto \frac{SQ}{F} \propto \frac{SQ}{MT} \\ Q &\propto \frac{F}{V} \propto \frac{M}{S} \propto \frac{FT}{S} \propto \frac{F}{A} \propto \frac{M}{A} \\ A &\propto V \propto \frac{M}{Q} \propto \frac{S}{T} \propto \frac{F}{Q} \end{aligned}$$

Or, because $M \propto F$ and $A \propto V$ the letters M and A may be left out, and the proportions will be more easily remembered; thus,

$$\begin{aligned} F &\propto QV \propto \frac{QS}{T} \\ S &\propto TV \propto \frac{TF}{Q} \\ V &\propto \frac{S}{T} \propto \frac{F}{Q} \\ T &\propto \frac{S}{V} \propto \frac{SQ}{F} \\ Q &\propto \frac{F}{V} \propto \frac{FT}{S} \end{aligned}$$

And when M or A is required in the proportion, it may be had by putting M for F, or A for V, and thus all the foregoing terms may be supplied.

(6.) The theorems for uniformly accelerated motions are also obtained with like facility, as we now proceed to shew.

The velocity of a body acted on by a constant uniform accelerating force, is proportional to the time. Because since the action

is uniform, whatever velocity is generated in one particle of time a double velocity will be generated in twice that time, a triple velocity in thrice that time; and so on continually; therefore it will be always $V \propto T$. The space described will, in equal times, be greater as the velocity is so; and therefore in this case, we have $S \propto V$. Also the velocity remaining the same, the space will be as the time of describing it. Therefore in this case $S \propto T$. Consequently, when neither the velocity nor time is given, the space will be in the compound ratio of both, viz. $S \propto TV$. Put $T \propto V$. Therefore $S \propto T^2$, or $S \propto V^2$; that is, the spaces described by bodies urged by uniform constant forces, are as the squares of the time, or of the velocity. To illustrate this matter in the case of falling bodies, which are urged by the constant force of gravity; let AB, Plate CVI, fig. 1, represent the time of the fall, and BC the velocity acquired at the end of that time; and draw AC. Then if we conceive the whole time AB, to be divided into an indefinite number of equal moments, the velocity in each of those moments will be as the right line drawn from AB parallel to BC, corresponding to the given moment. Now for a single moment the velocity may be esteemed as uniform, and so the space described that moment will be as the velocity; therefore the sum of the spaces described in all the moments (or whole time AB) will be as the sum of all the momentary velocities, or right lines which represent them, but the sum of these lines makes the area of the triangle ABC; this area, therefore, is as the whole space described in the time AB. And because this area is as AB^2 , or BC^2 , therefore also the space (S) is as T^2 , or V^2 , as above. Complete the parallelogram ABCD. Then if we suppose another body (A) to commence motion at the same time with the falling body (B,) and the velocity of the body (A) to be uniform and equal to the velocity BC acquired at the end of the fall; then it is evident the space described by the body (A) in the time AB will be represented by the parallelogram ABCD; which space is therefore double of that (ACB) described by the falling body B. What has been said of descending bodies is in the same manner applicable to ascending bodies. For the motion in the latter case will be retarded equally by the contrary action of gravity, as it was in the former case accelerated. Thus let BC be the velocity with which any body is projected upwards from the point B, then in every moment of time there will be an equal decrement of this velocity, so that at the end of the time BA it will be all destroyed, and the space it will describe in that time will be as the area of the triangle ABC. Therefore, &c. Hence it follows, 1. That the velocity every where, at equal intervals of time from the moments B and A, in the ascent and descent is the same. 2. That the time of the ascent and descent is the same, or half the whole time of the flight of the projectile. 3. That the body by descending acquired a velocity equal to that (BC) by which it was projected. The body is considered moving in vacuo, or in a medium without resistance. From what has been said, it is evident, that if the space a body describes in any given time in vacuo be known, the space through which it will fall in any proposed time, will from thence be known also. Thus, by experiments very accurately made, it has been found, that, a body by the force of gravity falls through $16\frac{1}{2}$ feet in one second $16\frac{1}{2} \times T^2 = S$ = the number of feet described in the seconds denoted by T. Hence $T = \sqrt{\frac{S}{16\frac{1}{2}}}$ = the time of describing the space S. In uniform constant forces, the accelerating force, (A) will be as the velocity (V) generated in the same time, because that velocity is the whole effect of the power, and effects are always as their causes; therefore $A \propto V$; also the force V will always be inversely as the time (T) in which the same velocity is generated; for it is evident, a double force will generate the same velocity in half the time ($\frac{1}{2}T$); or the greater the force, the less will be the time for producing the same effect; therefore $A \propto \frac{1}{T}$: therefore

when neither the velocity nor time is given, we have $A \propto \frac{V}{T}$, or

$AT \propto V$, and $T \propto V \times \frac{1}{A}$. Since when the time T is given, A is as V, and in that case V is as S, therefore also A will be as S; or the accelerating force will be as the space described in the given time.

given time. Since $AT \propto V \propto \frac{M}{Q}$, we have $ATQ \propto M$; and when the time T is given, it is $AQ \propto M$; that is, the whole quantity of motion, or the momentum, is compounded of the accelerating force A , and the quantity of matter (Q) in the body. Since $A \propto \frac{F}{Q}$, and $A \propto S$ when the time is given, therefore $S \propto \frac{F}{Q}$, the time being given: but $S \propto T^2$, when F and Q are given; therefore when T , F , and Q , are all variable, $S \propto \frac{FT^2}{Q}$. Also since $ATQ \propto M$, and $AQ \propto F$, we shall have $TF \propto M$, and from these proportions $M \propto TF$, $M \propto QV$, $S \propto TV$, and $V \propto TA$, various general proportions may be deduced, some of which are here set down.

$$\begin{aligned}
 (7.) \quad M &\propto QV \propto FT \propto \frac{QS}{T} \propto \frac{FT^2V}{S} \propto AQF \propto \sqrt{QFS}. \\
 Q &\propto \frac{M}{V} \propto \frac{FT}{V} \propto \frac{MT}{S} \propto \frac{FT^2}{S} \propto \frac{M}{AF} \propto \frac{M^2}{FS} \\
 F &\propto \frac{M}{T} \propto \frac{QV}{T} \propto \frac{MV}{S} \propto \frac{MS}{T^2V} \propto \frac{M}{AQ} \propto \frac{QS}{FS} \\
 V &\propto \frac{FT}{Q} \propto \frac{S}{T} \propto \frac{M}{Q} \propto \frac{MS}{FT^2} \propto \frac{AF}{Q} \propto \sqrt{\frac{FS}{Q}} \\
 S &\propto TV \propto \frac{FT^2}{Q} \propto \frac{MT}{Q} \propto \frac{MV}{F} \propto \frac{M^2}{QF} \\
 T &\propto \frac{S}{V} \propto \frac{M}{F} \propto \frac{QV}{F} \propto \sqrt{\frac{QS}{F}} \propto \frac{AQ}{QF} \propto \frac{M^2}{QFV} \\
 A &\propto \frac{F}{Q} \propto \frac{M}{QF} \propto \frac{V}{F} \propto \frac{S}{FT} \propto \frac{S}{VQ} \propto \frac{M^2}{Q^2FV}
 \end{aligned}$$

And here those quantities which are given may be left out; also when the denominator and numerator of any of the fractions are constantly proportional they may be left out. It is evident that various other theorems may be easily formed from these.

(8.) The collision of bodies, moving in the same straight line. Since the momentum (M) of a body is compounded of the quantity of matter (Q), and the velocity (V), we have this general expression $M \propto QV$, for the force of any body, A ; and suppose the force of another body, B , be represented by the same letters in Italics, viz. $M \propto 2V$. Let the two bodies, A , and B , in motion, impinge on each other directly; if they tend both the same way, the sum of their motions towards the same part will be $QV + 2V$. But if they tend towards contrary parts, or meet, then the sum of their motions towards the same part will be $QV - 2V$; for since the motion of one of the bodies is contrary to what it was before, it must be connected by a contrary sign. Or thus: because when the motion of B conspires with that of A , it is added to it; so, when it is contrary, it is subtracted from it, and the sum or difference of the absolute motions is the whole relative motion, or that which is made towards the same part. Again, this total motion towards the same parts, is the same both before and after the stroke, in case the two bodies, A and B , impinge on each other; because, whatever change or motion is made in one of those bodies by the stroke, the same is produced in the other body towards the same part; that is, as much as the motion of B is increased or decreased towards the same part by the action of A , just so much is the motion of A diminished or augmented towards the same part by the equal re-action of B , by the third law of motion. In bodies not elastic, let x be the velocity of the bodies after the stroke (for, since we suppose them not elastic, there can be nothing to separate them after collision; they must therefore both go on together, or with the same celerity.) Then the sum of the motions after collision will be $Qx + 2x$; whence if the bodies tend the same way, we have $QV + 2V = Qx + 2x$, or if they meet,

$$QV - 2V = Qx + 2x; \text{ and accordingly, } \frac{QV + 2V}{Q + 2} = x,$$

$$\text{or } \frac{QV - 2V}{Q + 2} = x.$$

If the body (B) Plate CVII. fig. 1, be at rest, then $V = 0$, and the velocities of the bodies after the stroke will be $\frac{QV}{Q + 2}$

$= x$. Thus if the bodies be equal (viz. $Q = 2$, fig. 1,) and A with 10 degrees of velocity impinge on B at rest; then $\frac{QV}{Q + 2} = \frac{10}{2} = 5 = x$. If $Q = 2$, and $V : V' : 10 : 6$, (fig. 2,) we have $\frac{QV + 2V'}{Q + 2} = \frac{16}{2} = 8 = x$, the velocity after the stroke.

If the bodies are both in motion, and tend the contrary way; then when $Q = 2$ (fig. 3) and $V = V'$, it is plain $\frac{QV - 2V'}{Q + 2} =$

$0 = x$; that is, equal bodies which meet with equal velocities, will destroy each other's motion after the stroke, and remain at rest. If $Q = 2$, (fig. 4,) but $V : V' : 6 : 14$, then $\frac{QV - 2V'}{Q + 2} =$

$\frac{-8}{2} = -4 = x$; which shews that equal bodies meeting with unequal velocities, will, after the stroke, both go on the same way which the most prevalent body moved before.

If the velocity $\frac{QV \pm 2V'}{Q + 2}$ be multiplied by the quantities of

matter Q and 2 , we shall have $\frac{Q^2V \pm Q2V'}{Q + 2} =$ the momentum

of A after the stroke; and $\frac{Q^2V \pm Q2V'}{Q + 2} =$ the momentum of B :

therefore $QV - \frac{Q^2V \pm Q2V'}{Q + 2} = \frac{Q2V \pm 2QV'}{Q + 2} = \frac{Q2}{Q + 2}$

$\times V \pm V' =$ the quantity of the motion lost in A after the stroke, and consequently is equal to what is gained in B , as may be shewn in the same manner.

But since a part of this expression (viz. $\frac{Q2}{Q + 2}$) is constant,

the loss of motion will ever be proportional to the other part $V \pm V'$. But this loss or change of motion in either body is the whole effect, and so measures the magnitude or energy of the stroke. Wherefore any two bodies, not elastic, strike each other with a stroke always proportionable to the sum of their velocities ($V + V'$) if they meet, or to the difference of their velocities ($V - V'$) if they tend the same way.

Hence, if one body (B) be at rest before the stroke, then $V' = 0$; and the magnitude of the stroke will be as V ; that is, as the velocity of the moving body A ; and not as the square of its velocity, as many philosophers were accustomed to maintain.

In bodies perfectly elastic, the restituent power or spring by which the parts displaced by the stroke restore themselves to their first situation, is equal to the force impressed, because it produces an equal effect; therefore, in this sort of bodies, there is a power of action twice as great as in the former non-elastic bodies, for these bodies not only strike each other by impulse, but likewise by repulse, they always repelling each other after the stroke. But we have shewn that the force with which non-elastic bodies strike each other is as $V \pm V'$; therefore the re-action of elastic bodies is the same; that is, the velocity with which elastic bodies recede from each other after the stroke, is equal to the velocity with which they approached each other before the stroke. Whence if x and y be the velocities of two bodies A and B , tending the same way, after the stroke, since $V - V' = y - x$, we have $x + V - V' = y$; whence the motion of A after the stroke will be Qx , and that of B will

B will be $2x + 2V - 2V$; and the sum of these motions will be equal to the sum of the motions before the stroke, viz. $Qx + 2x + 2V - 2V = QV + 2V$. Whence, by reducing the equation, it will be $Qx + 2x = QV - 2V + 22V$; and $x = \frac{QV - 2V + 22V}{Q + 2}$

= the velocity of the body A.

$$Q + 2 \quad \frac{QV - 2V + 22V}{Q + 2}$$

Again, the velocity of B is $x + V - V = \frac{QV - 2V + 22V}{Q + 2}$

$$+ V - V = \frac{2QV - QV + 2V}{Q + 2}. \text{ Here we suppose the bodies tend}$$

the same way before the stroke; and it is evident from the equation above, that so long as $QV + 22V$ is greater than $2V$, the velocity of (x) of A after the stroke will be affirmative, or the body A will move the same way after the stroke as before; but when $2V$ is greater than $QV + 22V$, the velocity (x) will be negative, or the body A will be reflected back.

$$\text{If the body B be at rest, then } V = 0; \text{ and } x = \frac{QV - 2V}{Q + 2},$$

which shews the body A will go forwards or backwards, as QV is greater or less than $2V$, or A greater or less than B.

If $Q = 3$, $2 = 2$, $V = 10$, (fig. 5,) $V = 0$, then after the stroke the velocity of A will be $x = \frac{Q + 2}{2QV} = \frac{5}{60} = \frac{1}{12}$

$$\frac{10}{5} = 2, \text{ and the velocity of B will be } y = \frac{Q + 2}{2QV} = \frac{5}{60} = \frac{1}{12}.$$

If the bodies are both in motion, and $V = 5$, the rest is the same as before; then $\frac{QV - 2V + 22V}{Q + 2} = 6 = \text{velocity of A (fig. 6.)}$

$$\text{after the stroke, and } \frac{2QV - QV + 2V}{Q + 2} = 11 = \text{velocity of B}$$

after the stroke.

If the bodies A and B move towards contrary parts, or meet each other, then will the relative velocity, to which the force of the stroke is proportional, be $V + V$; and so the velocities of A and B after the stroke will be $x + V + V$; and so the motion of A and B will be Qx and $2x + 2V + 2V$: the sum of these motions is $Qx + 2x + 2V + 2V = QV - 2V = \text{the motion towards the same part before the stroke. Whence we have } x = \frac{QV - 2V - 22V}{Q + 2}$, and therefore the velocity of B will be

$$\frac{QV - 2V - 22V}{Q + 2} + V + V = \frac{2QV = QV - 2V}{Q + 2}.$$

If $QV + 22V$ be greater than QV , the motion of the body A will be backwards; otherwise it will go on forwards as before.

If $Q = 3$, $2 = 2$, $V = 10$, and $V = 5$, then will the velocity of A (fig. 7,) be $\frac{QV - 2V - 22V}{Q + 2} = \frac{-10}{5} = -2$, and so the body A will go back with two degrees of velocity. The velocity

$$\text{of B, after the stroke, will be } \frac{2QV + QV - 2V}{Q + 2} = 13.$$

If the bodies are equal, that is, if $Q = 2$, (fig. 8,) then $x = -22V$

$22 = -V$; which shews, that when equal bodies meet each other, they are reflected back with interchanged velocities;

$$\text{for in that case also the velocity of B becomes } \frac{2QV}{2Q} = V.$$

If the bodies are equal, and one of them at rest, as B (fig. 9,) then since $Q = 2$, and $V = 0$, we have the velocity of A after the stroke $x = 0$; or the body of A will abide at rest, and the velocity of B will be $= V$, the velocity of A before the impulse, as appears by the example in the figure referred to.

If several bodies, B, C, D, E, F, (fig. 10,) are contiguous in a right line, and another equal body A strike B with any given velocity, it shall lose all its motion, or be quiescent after the stroke; the body B which receives it will communicate it to C, and C to D, and D to E, and E to F; and because action and re-action between the bodies B, C, D, E, are equal, as they were quiescent before, they must continue so; but the body F, having no other body to re-act upon it, has nothing to obstruct its motion; it will therefore, move on with the same velocity which A had at first, because it has all the motion of A, and the same quantity of matter by hypothesis.

Let there be three bodies A, B, C, (ibid. No. 11,) and let A strike B at rest; the velocity generated in B by the stroke will

$$\text{be } y = \frac{2QV}{Q + 2}, \text{ and so the momentum of B will be } \frac{2QV}{Q + 2}$$

= Qy . With this momentum B will strike C at rest and contiguous to it; the velocity generated in C will be $\frac{22y}{2 + C}$; and its

$$\text{momentum will be } \frac{22yC}{2 + C} = \frac{2QC}{2 + C} \times \frac{2QV}{Q + 2} =$$

$$\frac{4QV2C}{2 + C}.$$

If now we suppose B a variable quantity, while A and C remain the same, we shall find what proportion it must have to each of them, in order that the momentum of C may be a maximum, or the greatest possible, by putting the fluxion thereof equal to

$$4Q^2C^2V^2 - 4QC^2V^2 = 0; \text{ whence we}$$

get $QC - 22 = 0$, and so $QC = 22$; consequently $Q : 2 :: 2 : C$, or $A : B :: B : C$; that is, the body B is a geometrical mean between A and C. Hence if there be any number (n) of bodies in a geometrical ratio (r) to each other, and the first be A; the second will be rA, the third r^2A , and so on to the last,

which will be $r^{n-1}A$.

Also, the velocity of the first being V, that of the second will be $\frac{2V}{1+r}$ (for $\frac{2QV}{Q+2}$ is here $= \frac{2AV}{A+rA} = \frac{2V}{1+r}$) that of the

$$\text{third } \frac{4V}{1+r^2}, \text{ that of the fourth } \frac{8V}{1+r^3}, \text{ and so on to the last,}$$

$$\text{which will be } \frac{2^{n-1}V}{1+r^{n-1}}.$$

The momentum of the first will be AV, that of the second $\frac{2rAV}{1+r}$, that of the third $\frac{4r^2AV}{1+r^2}$, that of the fourth $\frac{8r^3AV}{1+r^3}$

$$\text{and so on to the last, which will be } \frac{2^{n-1}r^{n-1}AV}{1+r^{n-1}}.$$

To give an example of this theorem; if $n = 100$, and $r = 2$, then will the first body A be to the last $r^{n-1}A$, as 1 to 633825300000000000000000000000, nearly; and its velocity to that of the last nearly as 271022000000000000000000000000 to 1: lastly, the momentum of the first to that of the last will be nearly as 1 to 2338480000000000. If the number (n) of bodies be required, and the ratio of the momenta of the first and last be given as 1 to

$$\frac{2r}{1+r}, \text{ M, and the ratio of the series } r \text{ given also; then putting } \frac{2r}{1+r}$$

$$= R, \text{ we have the momentum of the last body expressed by } \frac{2r}{1+r}^{n-1} = M = R^{n-1}; \text{ therefore the logarithm of M (l. M)}$$

$$\text{is equal to the logarithm of R (l. R) multiplied by the power } n-1$$

$n - 1$; that is, $l. M = (n - 1) \times l. R$; consequently $\frac{l. M}{l. R} + 1$

$= n$, the number of bodies required.

(9.) Composition and resolution of forces, and the collision of bodies acting obliquely.

PROP. If any force acting on a body at A (Plate CVI, fig. 2,) in the direction AB cause the body to pass through the space AB in any time; and another similar force acting in the direction AC, would move it through the space AC in the same time: by both forces acting together, in their proper directions, the body will, in the same time; be moved through the space AD, the diagonal of the parallelogram ABDC.

Case 1. Let the forces at A cause the body to move uniformly along the lines AB, AC. Suppose the line AC to move parallel to itself into the place BD, whilst A moves from A to C. And since this line and the body are both equally moved towards BD, it is evident, the body must be always in the moveable line AC. Therefore when AC comes to the position bg , let the body be arrived at d : then since, both the line AC moves uniformly along AB, and the body A along AC; therefore it will be as $Ab : bd :: AB : BD$, therefore Ad is a right line.

Case 2. Let the body be carried through AB, AC, by an accelerative force. Then (Art. 7.) the space described will be as the time and velocity, and therefore the velocity will be as the space directly and time reciprocally. Also (Art. 4.) when the force and the body is given; the velocity is as the time. Whence the time will be as the space directly and time reciprocally, and the space as the square of the time. That is the same body acted on by the same force will describe spaces which are as the squares of the times. Now let the time of describing AB or AC be 1; and let the line AC move along with the body, always parallel to itself, and in the time t , let it arrive at bg , and the body at d , moving towards g . Then, from what has been said, it is as $1 : tt :: AB : Ab$, and also as $1 : tt :: bg$ or $BD : bd$; whence $AB : Ab :: BD : bd$; therefore Ad is a right line. And if you suppose the space to be as the n th power of the time, it will still be, $1 : t^2 :: AB : Ab :: BD : bd$; and Ad is still a right line for any similar forces.

Case 3. But if the body A (fig. 7.) be carried through AD by a uniform force, in the same time it would be carried through AM by an accelerative force; then by both forces acting together, it will at the end of that time be found in the point H, of the parallelogram MADH; but the line it describes, AGH, will not be a right line.

Cor. 1. The forces, in the directions AB, AC, AD, fig. 2, are respectively proportional to the lines AB, AC, AD; and in those directions.

Cor. 2. The two oblique forces AB, AC, are equivalent to the single force AD, which may be compounded of these two, by drawing the diagonal of the parallelogram AD.

Cor. 3. Any single direct force AD, may be resolved into the two oblique forces whose quantities and directions are AB, AC, having the same effect; by describing any parallelogram whose diagonal is AD.

Cor. 4. A body being agitated by two forces at once, will pass through the same point, as it would do if the two forces were to act separately and successively. And if any other motion be impressed on a body already in motion, it does not alter its motion in lines parallel to its former direction.

Cor. 5. If two forces as AB, AC, (fig. 3,) act in the directions AB, AC, respectively; draw AR to the middle of the right line BC, and 2AR is the force compounded out of these, and AR its direction.

(10.) PROP. Let there be three forces A, B, C, (fig. 4,) of the same kind, acting against one another, at the point D, and whose directions are all in one plane; and if they keep one another in equilibrio, these forces will be to each other respectively, as the three sides of a triangle drawn parallel to their lines of direction, DI, CI, CD.—Let DC represent the force C, and produce AD, BD, and complete the parallelogram DICH: and by the last Prop. the force DC is equivalent to the two forces DH, DI; put, therefore, the forces DH, DI, instead of DC, and all the forces will still be in equilibrio. Therefore DI is equal to its opposite force A, and DH or CI equal to its opposite force B. Therefore the three forces A, B, C, are respectively as DI, CI, CD.

Cor. 1. Hence the forces A, B, C, are as the three sides of a triangle, drawn perpendicular to their lines of direction, or in any given angles to them, on the same side. For such a triangle will be similar to the former triangle.

Cor. 2. The three forces A, B, C, will be to each other as the sines of the angles through which their respective lines of direction do pass when produced.

For DI : CI :: S. DCI or CDB : S. CDI or CDA.

And CI : CD :: S. CDI or CDA : S. CHD or HDI or ADB.

Cor. 3. If there be never so many forces acting against any point in one plane, and keep one another in equilibrio; they may be all reduced to the action of three, or even of two equal and opposite ones. For if HD, ID, be two forces, they are equivalent to the single force DC, and in like manner A and B may be reduced to a single force.

Cor. 4. And if ever so many forces in different planes, acting against one point, keep one another in equilibrio; they may be all reduced to the actions of several forces in one plane, and consequently to two equal and opposite ones. For if the four forces A, B, H, I, act against the point D; and H, I, be out of the plane ABD: let DC be the common section of the planes ABD, HDI; then the forces H, I, are reduced to the force C in the plane ABD.

Schol. This Prop. holds true of all forces whatever; whether of impulse or percussion, thrusting, pulling, pressing; or whether instantaneous or continual; provided they be all of the same kind. Hence if three forces act in one plane, their proportions are had; and if one force be given, the rest may be found. And if four forces act, and two be given, the other two may be found; but if only one be given, the rest cannot be found; for in the three forces A, B, C, the force C may be divided into other two, an infinite number of ways, by drawing any parallelogram DICH about the diagonal DC. And in general, if there be any number of forces acting at D, and all be given but two, these two may be found; otherwise not, though the positions of them all be given.

(11.) PROP. If one body acts against another body by any kind of force whatever; it exerts that force in the direction of a line perpendicular to the surface whereon it acts. Let the body B (fig. 5,) be acted on by the force AB in the direction AB. Let the body C, and the obstacle O, hinder the body B from moving; divide the force AB into the two forces AD, AE; or EB, DB, (by Cor. 3. Art. 9.) the one perpendicular, the other parallel to the surface DB, then the surface DB receives the perpendicular force EB, and the obstacle O the parallel force DB; take away the obstacle O, and the force DB will move the body B in a direction parallel to the surface, with no other effect than what arises from the friction of B against that surface, occasioned by the pressure of B against it by the force EB; which, if the surface be perfectly smooth and void of tenacity, will be nothing. The force DB therefore having no effect, the remaining force EB will be the only one, whereby the body B acts against the surface DB, and that in the direction EB perpendicular to it.

Cor. 1. If a given body B strike another body C obliquely, at any angle ABD, the magnitude of the stroke will be directly as the velocity and the sine of the angle of incidence ABD; and the body C receives that stroke in the direction EB perpendicular to the surface DB. For if the angle ABD be given; the stroke will be greater in proportion to the velocity; and if the velocity AB be given, the stroke will be as AD, or S. $\angle ABD$. Or the magnitude of the stroke is as the velocity wherewith the body approaches the plane.

Cor. 2. If a perfectly elastic body A (fig. 6,) impinges on a hard or elastic body, CB, at B it will be reflected from it, so that the angle of reflection will be equal to the angle of incidence. For the motion at B parallel to the surface is not at all changed by the stroke. And because the bodies are elastic they recover their figure in the same time they lose it by the stroke; therefore the velocity in the direction BE is the same after as before the stroke; let AE, BE, represent the velocities before the stroke, and ED (= AE) and BE the respective velocities after the stroke; then in the two similar and equal triangles AEB, BED, $\angle ABE$ is equal to EBD. But since no bodies in nature are perfectly elastic, they are something longer in regaining their figure; and therefore the angle DBF will be something more acute than the $\angle ABG$.

Cor. 3. If one given body impinges upon another given body, the

the magnitude of the stroke will be as the relative velocity between the bodies. For the magnitude of the stroke is as the line BE, (fig. 5,) or the velocity wherewith the bodies approach each other; that is, as the relative velocity.

Cor. 4. And in any bodies whatever, if a body in motion strike against another, the magnitude of the stroke will be as the motion lost by the striking body.

Cor. 5. A non-elastic body striking another non-elastic body, only loses half as much motion as if the bodies were perfectly elastic.

Cor. 6. Hence also it follows, that if one body acts upon another, by striking, pressing, &c. the other re-acts upon this in the direction of a line perpendicular to the surface whereon they act.

Schol. Though the momentum or quantity of motion in a moving body is a quite distinct thing from the force that generates it; yet when it strikes another body and puts it into motion, it may, with respect to that other body, be considered as a certain quantity of force proportional to the motion it generates in the other body. Also, although the motion generated by the impulse of another body is considered as generated in an instant, upon account of the very small time it is performed in; yet in mathematical strictness it is absolutely impossible that any motion can be generated in an instant, by impulse or any sort of finite force whatever. For when we consider that the parts of the body which yield to the stroke, are forced into a new position; there will be required some time for the yielding parts to be moved through a certain space into this new position. Now, during this time, the two bodies are acting upon each other with a certain accelerative force, which in that time generates that motion which is the effect of their mutual impulse. So that it is evident that this is an effect produced in time; and the less the time the greater the force; and if the time be infinitely small, the force ought to be infinitely great, which is impossible. But because this effect is produced in an imperceptible space of time, the time is entirely neglected, and the whole effect imputed to the force only, which is therefore supposed to act but for a moment. The quantity of motion in bodies has been proved to be as the velocity and quantity of matter. But the momentum or quantity of motion may be the same in different bodies, and yet may have very different effects upon other bodies on which they impinge. For if a small body with a great velocity impinge upon another body; and if, by reason of its great velocity, it act more strongly upon the small part of the body upon which it impinges, than the force of cohesion of the parts of that body; then the part acted on will, by this vigorous action, be separated from the rest; whilst, by reason of the very small time of acting, little or no motion is communicated to the rest of the body. But if a great body with a small velocity strike another body; and if, by reason of its slow motion, it does not act so vigorously as to exceed the force of cohesion; the part struck will communicate the motion to the rest of the body, and the whole body will be moved together. Thus if a bullet be shot out of a gun, the momentum of the bullet and piece are equal; but the bullet will shoot through a board, and the gun will only jump a little against him that discharges it. Therefore small bodies with great velocity, are more proper to tear in pieces: and great bodies with small velocity, to shake or move the whole.

OF THE MECHANICAL POWERS.

(12.) By these we understand such simple machines as are useful for comparing the velocity of various bodies together, and impressing them with greater or smaller degrees of it at pleasure; by which means we may either cause a small weight to overcome a great one, or by means of a great one we may make a small weight move through a space proportionably great. Thus by means of some of these powers, indeed by any of them, we may cause a weight of one pound, by moving through the space of ten feet, raise another of ten pounds through one foot; or vice versa, by a weight of ten pounds moving through the space of one foot, we may make a single pound move through the space of ten feet; but we cannot, by any of the powers, by moving a weight of ten pounds through one foot, move a single pound through eleven feet; nor by a single pound moving through a space of nine feet, can we raise a weight of ten pounds through the space of one foot. None of the mechanic powers, as they are called, therefore, can make any absolute increase of the power applied; all that they

can do is to alter the velocity of the power applied, and thus transfer it either to a larger or smaller body at pleasure; and upon this principle depends the whole practical part of mechanics. The mechanical powers are six in number, viz. the lever, wheel and axis, or axis in peritrochio, the pulley, inclined plane, wedge, and screw, of all which we shall now treat particularly.

OF THE LEVER.

(13.) The lever is the simplest of all machines, and is a straight bar of iron, wood, or other material, supported on, and moveable about, a prop called the fulcrum. In the lever, there are three circumstances to be principally attended to: 1. The fulcrum, or prop, by which it is supported, or on which it turns as a centre of motion: 2. The power to raise and support the weight: 3. The resistance or weight to be raised or sustained. The points of suspension are those points where the weights really are, or from which they hang freely. The power and the weight are always supposed to act at right angles at the lever, except it be otherwise expressed. The lever is distinguished into three sorts, according to the different situations of the fulcrum, or prop, and the power, with respect to each other. 1. When the prop is placed between the power and the weight, as in steel-yards, scissars, pincers, &c. 2. When the prop is at one end of the lever, the power at the other, and the weight between them, as in cutting knives fastened at, or near, the point of the blade; also in oars moving a boat, the water being the fulcrum. 3. When the prop is at one end, the weight at the other, and the power applied between them, as in tongs, sheers, &c. To these may be added the bended lever, which is only a variation of the first kind. A lever of the first kind is represented in Plate CVI. fig. 8, one of the second kind in fig. 9, and one of the third kind in fig. 10; also fig. 11, represents the bended lever, and in all these P is the power, W the weight, and C the fulcrum or prop. When the arms of the lever are equal it is denominated a balance, and in this case, two equal weights suspended from its extremities will be in equilibrio: thus if $AC = CB$, fig. 12, and at A and B equal weight be placed, they will evidently counter-balance each other; for if motion be communicated to the machine, the bodies will move with equal velocities in contrary directions, and the quantities of matter being equal, the momenta will be equal and opposite, and therefore the one cannot communicate motion to the other. Hence equal forces at equal distances from the centre of motion will have the same effect in turning the machine.

PROP. In any straight lever, if the power P be to the weight W, as the distance of the weight from the fulcrum C, to the distance of the power from the fulcrum; the power and weight (acting perpendicularly on the lever) will be in equilibrio.

Case 1. In the lever of the first kind WCP, fig. 13, instead of the power P apply a weight P to act at the end CP. And let the lever WCP be moved into the position aCb , then will the arches Wa , Pb , be as the radii, CW , CP ; that is, as the velocities of the weight and power. Whence since $P : W :: CW : CP$, therefore $P : W :: \text{velocity of } W : \text{velocity of } P$: therefore $P \times \text{velocity of } P = W \times \text{velocity of } W$, consequently the momenta or motions of P and W are equal. And since they act in contrary directions, neither of them can move the other, but they will remain in equilibrio.

Case 2. The levers of the second and third kind may be reduced to the first, thus: make $Cp = CP$, fig. 14 and 15, and instead of the power P, apply a weight equal to it at p, then by Case 1, the weight W and power p will keep one another in equilibrio; and, from the nature of the balance, the weight p and power P will have the same effect in turning the lever, therefore the power P and weight W will be in equilibrio.

Cor. 1. Hence in any sort of lever whether straight or bended, and whether moveable about a single point C, as above; or in axis AB, fig. 16, 17; or whether the lever be fixed to the axis, and both together move about two centres A, B, or whatever form the levers have. If AB be a right line, and from the ends P, W, there be drawn lines to the centre C, or perpendicular to the axis AB; and if the power and weight act perpendicular to these lines, and be always reciprocally as these distances drawn to the centre C or axis AB; then they will be in equilibrio.

Cor. 2. In any sort of lever WCP, fig. 18, 19, and in whatever directions the power and weight act on it; if their quantities

be reciprocally as the perpendiculars on their several directions, let fall from the centre of motion; they will be in equilibrio. For the power and weight will be in equilibrio if they be supposed to act at E and D; and it is the same thing whether they act at E and D, or at P and W.

Cor. 3. Hence universally, if any force be applied to a lever; its effect in moving the lever will be as that force multiplied by the distance of its line of direction from the centre of motion.

Cor. 4. If two bodies be in equilibrio on the lever, each weight is reciprocally as its distance from the centre.

Cor. 5. In the straight lever when the weight and power are in equilibrio, and act perpendicularly on the lever or in parallel directions; then of these three the power, weight, and pressure, upon the fulcrum, any one of them is as the distance of the other two. For if CP represent the weight W, then CW will represent the power P, and in fig. 13, C sustains both the weights, and therefore the pressure is WP; and fig. 14, 15, C sustains the difference of the weights, and therefore the pressure will be WP.

Cor. 6. If several weights be suspended on a straight lever AB, fig. 20; and if the sum of the products of each weight multiplied by its distance from the centre of motion C on one side be equal to the sum of the products on the other side; then they will be in equilibrio, and the contrary. For the force of each weight to move the lever is as the weight multiplied by the distance (by *Cor. 3*;) and the sum of the products is as the whole forces; which, if they be equal, the forces on both sides are equal, and the lever remains at rest.

Cor. 7. If several levers are combined together in such a manner, as that a weight being appended to the first lever, may be supported by a power applied to the last, as in fig. 21, (which consists of three levers of the first kind, and is so contrived that a power applied at the point L of the lever C, may sustain a weight at the point S of the lever A), the power must here be to the weight, in a ratio, or proportion, compounded of the several ratios, which the distance between the fulcrum and point where the weight acts, has to the distance between the fulcrum and point where the weight acts in each lever. For instance, if those distances in the lever A, be as 1 to 5; in the lever B as 1 to 4; and in the lever C as 1 to 5; then the power which will sustain the weight by the help of the three levers joined together, will be to the weight in a proportion consisting of the several proportions multiplied together, of 1 to 5, 1 to 4, and 1 to 5; that is, of 1 to 100. For, as shewn above, if on the lever C a power of one act at P or L, it will act with the force of five at S; and if, on the lever B, one act at L, it will be equivalent to four at S, hence five at L, on the lever B, or one on the lever C, is equivalent to 20 on B at S; and thus it may be shewn that 20 on A at L, or one on C at L, will counterbalance 100 at S on the lever A.

OF THE WHEEL AND AXLE.

(14.) The wheel and axle, or axis in peritrochio, is a machine much used, and is made in a variety of forms. It consists of a wheel with an axle fixed to it, so as to turn round with it; the power being applied at the circumference of the wheel, the weight to be raised is fastened to a rope which coils round the axle.

PROP. In the wheel and axle, if the power P, fig. 22, be to the weight W, as the diameter of the axle EF, where the weight acts to the diameter of the wheel AB, where the power acts; then the power and weight will be in equilibrio, and the contrary. —For let AB be the wheel, CD the axle; and suppose the wheel and axle to turn once round; then the power P will have descended a space equal to the circumference of the wheel; and the weight W will have risen a height equal to the circumference of the axle. Therefore velocity of P. to velocity of W :: as circumference of the wheel, to circumference of the axle :: or as diameter of the wheel, to diameter of the axle :: that is (by supposition) as W to P. Therefore the momenta of P and W are equal; and have equal forces to move each other, and therefore will remain in equilibrio. This prop. will appear otherwise. For the wheel and axle may be reduced to a lever of the first kind. For the fulcrum will be in the middle of the axis CD, therefore drawing lines from the middle of the axis to the power and weight, parallel to the horizon; and the radius of the wheel will be the distance of the power, and the radius of the axle the distance of the weight. And as these radii are reciprocally as the weight and

power, therefore, by the properties of the lever, they will be in equilibrio. Hence the wheel and axle is sometimes called a perpetual lever.

Cor. 1. If the rope have any sensible thickness; then if the power P : weight W :: diameter of the axle + the diameter of the rope : diameter of the wheel where the power acts; they will be in equilibrio. For the weight really hangs half the thickness of the rope, beyond the axle.

Cor. 2. If the direction of the power is not a tangent to the wheel; suppose it to act at D or d, fig. 23, and let CA be perpendicular to the line of direction; then if P : W :: CB : CA, then they will be in equilibrio.

Cor. 3. If the wheel and axle one or both have teeth; then if the power P, fig. 24, acting on the teeth at B, be to the weight W acting on the teeth at A; as the diameter of the axle at A, to the diameter of the wheel at B, then the wheel is in equilibrio.

Cor. 4. And it is the same thing, if instead of a wheel, there be only spokes fixed in the axis, whose length is equal to the radius of the wheel; and any other equal force be applied for a power instead of the weight P.

Cor. 5. The force of the weight is increased when one or more spires of the rope is folded about the axle. For that, in effect, augments the diameter of the axle.

Cor. 6. It matters not how low the weight hangs. For whilst the axle remains the same, the resistance of the weight remains the same, setting aside the weight of the rope.

Cor. 7. In a combination of wheels with teeth; if the power P, fig. 25, be to the weight W; as the product of the diameters of all the axles, to the product of the diameters of all the wheels, they will be in equilibrio. For this may be considered as a compound lever.

Cor. 8. In a combination of wheels going by cords; if the power P, fig. 26, be to the weight W; as the product of all the diameters of the axles B, D, F, to the product of all the diameters of the wheels A, C, they will be in equilibrio. For the cords supply the place of teeth.

Cor. 9. In any combination of wheels with teeth; if the power P, fig. 25, be to the weight W; as the diameter of the axle F where the weight acts, multiplied into the product of the teeth in each pinion or spindle; is to the diameter of the wheel A, where the power acts, multiplied by the product of the teeth in each of the wheels (that the pinions act against); the weight and power will be in equilibrio. For the number of teeth in each wheel and pinion acting against one another, are as the circumferences, or as the diameters, of that wheel and pinion.

Cor. 10. In a combination of wheels, the number of revolutions of the first wheel F, to the number of revolutions of the last wheel A, in the same time; is as the product of the teeth in the pinions, to the product of the teeth in the wheels which act in them: or as the product of the diameters of the pinions, to the product of the diameters of the wheels.

Schol. In wheels, whose teeth work together, they should not encounter before they come to the line joining their centres; because the rubbing is greater on that side; but being past the line, the teeth slip easily along one another, in making their escape, so that the friction is very inconsiderable.

OF THE PULLEY.

(15.) The pulley is a single wheel of wood, brass, or iron, moveable upon an axis, and inclosed in a kind of case called its block, which admits of a rope to pass freely over the circumference of the pulley, in which also there is usually a groove to keep the rope from sliding, the axis being generally fixed in the block. In some pulleys the block is fixed; in others moveable, and rises with the weight.

PROP. If a power sustain a weight by means of a rope going over a fixed pulley; then the power is equal to the weight. But if the pulley be moveable together with the weight, and the other end of the rope fixed; then the power will be half the weight. For suppose a horizontal line AB drawn through the centre of the pulley C, then that line will represent a lever, and (in Plate CVII. fig. 12,) where the pulley is fixed, the centre C being kept immoveable represents the fulcrum; whilst the weight acts at B, and the power at A, and because BC = CA, therefore the power P is equal to the weight W. And (in fig. 13,) the fixed point A

is the fulcrum, and the weight acts at C, and the power at B; and since BC is half AB; therefore the power P is half the weight W.

Cor. Hence all fixed pulleys are equivalent to levers of the first kind. And they add no new force to the power, but only serve to change the direction, and facilitate the motion of the rope; but a moveable pulley doubles the force. And if a rope go over several pulleys, A, B, C, fig. 14, whose blocks are all fixed; the power is neither increased nor diminished.

PROP. In a combination of pulleys, all drawn by one running rope; if the power P be to the weight W; as 1 to the number of parts of the rope at the moveable block; they will be in equilibrium. For all the parts of the rope are equally stretched, and the weight W is sustained by the number of ropes that act against the moveable block; and the power P acts with the force of one. Therefore the power is to the weight; as 1 to the number of ropes pulling at the moveable block. Hence, in fig. 15, the power is to the weight as 1 to 4, and in fig. 16 as 1 to 5.

Cor. If, instead of one rope going round all the pulleys, the rope belonging to each pulley be made fast at top, as in fig. 17, a different proportion between the power and the weight will take place. Here it is evident that each pulley doubles the power; thus, if there are two pulleys, the power will sustain four times the weight; if three pulleys, eight times the weight; if four pulleys, sixteen times; and so on: that is, the power P of one pound, will sustain a weight W of sixteen pound. When pulleys in blocks are placed perpendicularly under each other, on separate pins, they occupy considerable space, and would not in general answer; it is, therefore, common to place all the pulleys in each block on the same pin, by the side of each other, as in fig. 18, but the advantage and rule for the power are the same. A pair of blocks with the rope fastened round it, is commonly called a tackle. A very considerable improvement in the construction of pulleys has been made by Mr. James White, who obtained a patent for his invention. Fig. 19 shews the machine consisting of two pulleys Q and R, one fixed and the other moveable. Each of these has concentric grooves, capable of having a line put round them, and thus acting like as many different pulleys, having diameters equal to those of the grooves. In the present case there are twelve lines, b, d, f, &c. hanging between the two pulleys, formed by its revolution about the six upper, and six lower, grooves. If a proportionate size, allowing for the thickness of the rope, be allotted to the diameter of each groove, this kind of pulley will be found a considerable improvement. Its principal advantage is, that it destroys lateral friction, and that kind of shaking motion which are so inconvenient in the common pulley. In the pulley here represented the advantage gained is twelve, that is, a power of twelve pound, will balance a weight of 144.

OF THE INCLINED PLANE.

(16.) This mechanical power is of very great use in rolling up heavy bodies, such as casks, wheelbarrows, &c. It is formed by placing boards, or earth, in a sloping direction. The force where-with a body descends upon an inclined plane, is to the force of its absolute gravity, by which it would descend perpendicularly in free space, as the height of the plane is to its length. Thus let AB, Plate CVI. fig. 27, be a plane parallel to the horizon, and CD a plane inclined to it: suppose also the whole length CD to be three times as great as the perpendicular height GF; in this case, the cylinder E will be supported upon the plane CD, and kept from rolling down upon it, by one-third part of its weight. Were the length of the plane four times its height, it would be prevented from rolling down by one-fourth part of its weight. Again suppose the plane AB, fig. 28, to be parallel to the horizon, the cylinder C will keep at rest upon any part of the plane on which it is laid. If the plane be so elevated, as in fig. 29, that its perpendicular height D be equal to one-half of its length AB, then the cylinder will roll down with half its weight: for it would require a power (acting in the direction AB) equal to half its weight to keep it from rolling. If the plane be elevated so as to be perpendicular to the horizon, as in fig. 30, the cylinder C will descend with its whole force of gravity, because the plane contributes nothing to the support or hindrance of it; for which reason, it must require a power equal to the whole force of its gravity to keep it from descending. If, as in fig. 31, the cylinder C be made to turn upon the slender pivots in the frame D, which is furnished with a

hook, with a line G fastened to it; if this line go over the fixed pulley H, and have its other end tied to the hook in the weight I; if the weight of the body I be to the weight of the cylinder C, added to that of its frame D, as the perpendicular height of the plane LM is to its length AB; the weight will just support the cylinder, and a small force will make it either ascend or descend. In the time that the cylinder moves from A to B, it must rise through the whole height of the plane, ML, and the weight will descend from H to K, through a space equal to the whole length of the plane AB. If the plane be now made to move upon rollers or wheels, as in fig. 32, and the cylinder be supported upon it, the same power will draw the cylinder up the plane, provided the pivots of the wheels be small, and the wheels themselves pretty large. The figures sufficiently shew how the experiments may be made: and it is evident that the velocity of the weight is to the velocity of the power, estimated in opposite directions, as the height of the plane to its length; hence when the power has to the weight the same ratio, they will have equal and contrary momenta, and there will, therefore, be an equilibrium. The inclined plane, considered as a mechanical power, may easily be reduced to the lever; for the power acquired by it is always in the proportion of the length to the height, in the same manner as the power acquired by a lever is in the proportion of the long arm to the short one. To compute, or shew the reason of the power of an inclined plane, therefore, we have only to construct a lever, the long arm of which is equal to the length of the plane, and the short arm to the height of it; then, whatever weight put upon the long arm counterpoises another put upon the short one, will also keep the same weight from rolling down the inclined plane. To the inclined plane belong also the wedge, and all cutting instruments which act as wedges, as knives, hatchets, &c. From the theory of the inclined plane also combined with that of falling bodies, we deduce some of the most remarkable properties of the pendulum.

OF THE WEDGE.

(17.) This may be considered as two equally inclined planes DEO and CEO, fig. 33, joined together at their bases EFO; DC is the whole thickness of the wedge at its back ABCD, where the power is applied; EO, is the depth or height of the wedge; DO the length of one of its sides, equal to CO the length of the other side; and OF is its sharp edge, which is entered into the wood or other matter to be split, by the force of a hammer or mallet striking perpendicularly upon its back. Thus, AB, fig. 34, is a wedge driven into the cleft CED of the wood FG.

PROP. Let EFG, fig. 35, be the base of a wedge in form of an isosceles triangle; then if the power acting perpendicular to the base FG, is to the force acting against either side perpendicular to that side; as the base of the wedge FG, to either of the sides EF, EG: then the wedge is in equilibrium. For draw the axis ED perpendicular to the base FG; and CA, CB, perpendicular to the sides EF, EG. Then DC is the direction of the power. And the impediment to be removed acts against the wedge in the directions AC, BC; and therefore (by Cor. 1, art. 10,) the power, and the actions of the impediment, are as FG, FE, EG, respectively, when they are in equilibrium.

Cor. 1. The power acting perpendicular to the base, is to the force acting against either side, in direction parallel to the base FG, or perpendicular to the axis DE; as the base FG, to the height ED: when the wedge is in equilibrium. For the force EG may be divided into the two ED, DG, (by Cor. 3, art. 9.) Then since EG is the force acting in direction CB; ED will be the force acting in direction DG.

Cor. 2. In the cleaving of wood when the wood splits, as it commonly does, before the wedge, the power impelling the latter will not be to the resistance of the wood as half the thickness of the wedge is to one of its sides, but as half its thickness is to the length of the other side of the cleft, estimated from the top or acting part of the wedge; for if we suppose the wedges to be lengthened down to the bottom of the cleft at E, the same proportion will hold; namely, that the power will be to the resistance, as half the thickness of the wedge is to the length of either of its sides; or, as the whole thickness of the wedge is to the length of both its sides. To prove this, let us suppose the wedge is divided lengthwise into two equal parts; in which case it will become two equally inclined planes, one of which, as *abc*, fig. 36, may be made use of for separating

rating the moulding Cd from the wainscot AB . It is evident, that when this half-wedge has been driven its whole length ac between the wainscot and mouldings, its inside aC will be at Cd , and the moulding will be separated to fg from the wainscot. But, from what has been already shewn concerning the inclined plane, it appears, that, to have an equilibrium between the power impelling the half-wedge and the resistance of the moulding, the former must be to the latter as ab to aC , that is, as the thickness of the back which receives the stroke is to the length of the side against which the moulding acts. Since, therefore, the power upon the half-wedge is to the resistance against its side, as the half-back ab is to the whole side aC , it is plain that the power upon the whole wedge, where the whole thickness is double the half-back, must be to the resistance of both its sides as the thickness of the whole back is to the length of both sides of the cleft, when the wood splits at any distance before the wedge. For when the wedge is driven quite into the wood, and the latter splits at ever so small a distance before it, the top of the wedge then becomes the acting part, because the wood does not touch it any where else. And as the bottom of the cleft is the place where the whole resistance is accumulated, it is plain from the nature of the lever, that the farther the power is from the resistance, the greater advantage it acts with. The power of the wedge is exceedingly great, inasmuch that not only wood but rocks may be split by it, which would scarce be done by any of the other powers: but in this it is assisted by percussion of the hammer which drives it, and shatters the stone in a manner that could scarcely be done by any simple pressure.

OF THE SCREW.

(18.) This is the strongest of all the mechanical powers, though it cannot be accounted a simple one, as no screw can be made use of without a lever or winch to assist in turning it. We may suppose it made by cutting a piece of paper into the form of an inclined plane or half-wedge, and then wrapping it round a cylinder, as in Plate CVII. fig. 20. From this figure it is evident, that the cylinder must move once round in the time that the paper describes one spiral.

PROP. In the screw, if the power P , fig. 21, be to the weight W ; as the height of one thread (reckoned according to the length of the screw) to the circumference described by one revolution of the power; then they will be in equilibrio.—For the weight W rises the height of one thread, whilst the power describes the circumference whose radius is PC . Therefore the velocities of the power and weight are reciprocally as their quantities. Therefore their momenta are equal, and they are in equilibrio. Fig. 22 represents a machine for exhibiting the force of the screw. Let the wheel C have upon its axis a screw working in the teeth of the wheel D , which suppose to be 48 in number. It is plain that every time the screw and wheel C are turned round by the winch A , the wheel D will be moved one tooth by the screw; and therefore in 48 revolutions of the winch, the wheel D will be turned once round. If then the circumference of a circle described by the handle of the winch A be equal to the circumference of a groove round the wheel D , the velocity of the handle will be 48 times as great as the velocity of any given point in the groove. Consequently if the line G goes round the groove, and has a weight of 48lb. hung to it below the pedestal EF , a power of 1lb. at the handle will balance that weight. If the line G goes round the axle I instead of the groove of the wheel D , the force of the machine will be as much increased as the circumference of the groove is greater than that of the axle; which, supposing to be six times, then 1lb. at I will balance 288lb. suspended by the line at the axle. The screw is of very extensive use in mechanics, its great power rendering it more eligible for compressing bodies together than any of the rest, and the great disparity betwixt the velocity of the handle and that of the threads of the screw, rendering it proper for dividing space into an almost infinite number of parts. Hence, in the construction of many mathematical instruments, such as telescopes, where it is necessary to adjust the focus to eyes of different people, the screw is always made use of in order to move the eye-glass a very little nearer or farther away from the object-glass. The theory of the screw is easily deduced from that of the inclined plane and lever; for the threads of the screw in fact form a continued inclined plane, the height of which is the distance betwixt the two threads, and the length is the circumference of the cylin-

der. Hence, without any lever, the screw would have a considerable power, were it not for the great friction of the parts upon one another; and this friction would be much more increased by the perpendicular action of a weight on the top of the cylinder than by the horizontal action of a lever. When a power acting by means of any of the machines above described, or by any combination of them, varies in its intensity, either from a variation of the power itself, or of the direction in which it acts; methods have been used to gain a regulating power. One of the methods of accumulating a great power is by suspending a very heavy body by a chain or strong rope of considerable length. This body may be put in motion by a very small degree of power more than is requisite for bending the rope, and will acquire a vibratory motion like a pendulum: by continuing the impulse as the body returns, it will continually acquire greater and greater force, the arches through which it moves becoming continually larger, until at last it might be made to overcome almost any obstacle: and upon this principle the battering rams of old were constructed, the power of which has been mentioned: nevertheless the power of one stroke of this engine never could exceed the accumulated power of the impulses given to it in order to produce that stroke, or even quite equal it, because the stiffness of the rope, and the resistance of the air, must always take off something from it. Another method of accumulating force is by means of a very heavy wheel or cylinder, moveable about an axis. A small force will be sufficient to put this wheel in motion; and, if long continued, will accumulate in such a manner, as to produce such effects in raising weights and overcoming resistances, as could not by any means be accomplished by the application of the original moving force. On this subject Mr. Atwood has demonstrated, that a force of 20lb. applied for 37 seconds to the circumference of a cylinder of 10 feet radius, and weighing 4,713lb. would, at the distance of one foot from the centre, give an impulse to a musket-ball equivalent to what it receives from a full charge of gunpowder. The same effect would be produced in six minutes and 10 seconds by a man turning the cylinder with a winch one foot long, in which he constantly exerted a force of 20lb. In this case, however, as well as the former, there is not any absolute accumulation of power; for the cylinder has no principle of motion in itself, and cannot have more than it receives. This accumulation of motion, however, in heavy wheels, is of great service in the construction of machines for various purposes, rendering them greatly more powerful and easy to be worked by animals, as well as more regular and steady, when set in motion by water, or any inanimate power. Hence the use of flies, ballast-wheels, &c. which are commonly supposed to increase the power of a machine, though in reality they take something from it, and act upon a quite different principle. In all machines in which flies are used, a considerably greater force must at first be applied than what is necessary to move the machine without it, or the fly must have been set in motion some time before it is applied to the machine. It is this superfluous power which is collected by the fly; and serves as a kind of reservoir from which the machine may be supplied when the animal slackens his efforts. This will always be the case with animals, for none are able to exert a great power with absolute constancy; some intervals of rest, even though almost imperceptible, are requisite, otherwise the creature's strength would in a short time be entirely exhausted. When he begins to move the machine he is vigorous, and exerts a great power; in consequence of which he overcomes not only the resistance of the machine itself, but communicates a considerable degree of power to the fly. The machine, when moving, yields for a time to a smaller impulse; during which time the fly itself acts as a moving power, and the animal recovers the strength he had lost. By degrees, however, the motion of the machine decreases, and the animal is obliged to renew his efforts. The velocity of the machine would now be considerably increased, were it not that the fly now acts as a resisting power, and the greatest part of the superfluous motion is lodged in it, so that the increase of velocity in the machine is scarcely perceptible. Thus the animal has time to rest himself until the machine again requires an increased impulse, and so on alternately. The case is the same with a machine moved by water, or by a weight; for though the strength of these does not exhaust itself like that of an animal, yet the yielding of the parts of the machine renders the impulse much less after it begins

gins to move: hence its velocity is accelerated for some time, until the impulse becomes so small that the machine requires an increase of power to keep up the necessary motion. Hence the machine slackens its pace, the water meets with more resistance, and of consequence exerts its power more fully, and the machine recovers its velocity. But when a fly is added to the other parts, this acts first as a power of resistance, so that the machine cannot acquire the velocity it would otherwise do. When it next begins to yield to the pressure of the water, and the impulse of course to slacken, the fly communicates part of its motion to the other parts; so that if the machine be well made, there is very little difference in the velocity perceptible. The truth of what is here advanced will easily be seen, from considering the inequality of motion in a clock when the pendulum is off, and how very regularly it goes when regulated by the pendulum, which here acts as a fly. Flies are particularly useful in any kind of work which is done by alternate strokes, as the lifting of large pestles, pumping of water, &c. In this case the weight of the wheel employed is a principal object; and the method of calculating this is to compare it with the weight to be raised at each stroke of the machine. Thus, suppose it required a pestle 30lb. weight to the height of one foot 60 times in a minute. Let the diameter of the fly be seven feet, and suppose the pestle to be lifted once at every revolution of the fly; we must then consider what weight passing through 22 feet in a second will be equivalent to 30lb. moving through one foot in a second. This will be $3) \div 22$ or $1\frac{1}{2}$ pounds. Were a fly of this kind to be applied, therefore, and the machine set a going, the fly would just be able to lift the pestle once after the moving power was withdrawn; but by increasing the weight of the fly to 10, 12, or 20lb. the machine when left to itself would make a considerable number of strokes, and be worked with much less labour, than if no fly had been used, though at the first it would be found a considerable incumbrance to the motion. In what has been advanced we have considered the machines as moving without friction; in order to determine the theory of their operation this was necessary; but, as the motion of every machine is obstructed by this impediment, the subject should be considered attentively. The doctrine of friction, according to Mr. Ferguson, may be summed up thus: 1. When one body insists on another upon a horizontal plane, it presses it with its whole weight; which being equally reacted on, and consequently the whole effect of its gravity destroyed by the plane, it will be absolutely free to move in any horizontal direction by any the least power applied thereto, provided both the touching surfaces be perfectly smooth. 2. But since we find no such thing as perfect smoothness in the surfaces of bodies, but an evident roughness or unevenness of the parts in their surface, arising from their porosity and peculiar texture, it is easy to understand, that, when two such surfaces come together, the prominent parts of one will in some measure fall into the concave parts of the other; and therefore, when an horizontal motion is attempted in one, the fixed prominent parts of the other will give more or less resistance to the moving surface, by holding and detaining its parts; and this is what we call friction. 3. Now since any body will require a force proportional to its weight to draw it over a given obstacle, it follows, that the friction arising to the moving body will always be in proportion to its weight only, and not the quantity of the surface by which it bears upon the resisting plane or surface. Thus, if a piece of wood, four inches wide and one thick, be laid upon another fixed piece of the same wood, it will require the same weight to draw it along, whether it be laid on its broad or narrow side. 4. For though there be four times the number of touching particles on the broad side, (*ceteris paribus*), yet each particle is pressed with but $\frac{1}{4}$ of the weight that those are on the narrow side; and as four times the number, multiplied by $\frac{1}{4}$ th of the weight, is equal to $\frac{1}{4}$ th of the number multiplied by four times the weight, the resistance is equal in both cases, and so requires the same force to overcome it. 5. The reason why friction is proportional to the weight of the moving body is, because the power applied to move the body must raise it over the prominent parts of the surface on which it is drawn; and this motion of the body, as it is not upright, so it will not require a power equal to its whole weight; but being in the nature of the motion on an inclined plane, it will require only a part of its whole weight which will vary with the various degrees of smoothness and asperity. 6. Experiments prove, that a body will be drawn along by nearly $\frac{1}{3}$ d of its weight; and if the surfaces be

hard and well polished, by less than $\frac{1}{3}$ d; whereas if the parts be soft or ragged, it will require a much greater weight. Thus also the cylinder of wood AB, Plate CII, fig. 17, if very smooth and laid on two well polished supporters CD (having been first oiled or greased), and then charged with the weight of 2lb. in the two equal balls CH, it will require an additional weight x , equal to about a third part of the 2lb. to give motion to, or overcome the friction of the said cylinder. 7. Now this additional weight, as it causes a greater weight of the cylinder, will likewise increase the friction; and therefore require the addition of another weight y , equal to the 3d part of its own weight; for the same reason, the weight y will require another z , a third part less; and so on ad infinitum. Hence, supposing the friction to be precisely a third of the weight, the first weight with all the additional ones, viz. $\frac{2}{3}$, $\frac{2}{9}$, $\frac{2}{27}$, &c. will be a series of numbers in geometrical progression decreasing. Now the sum of all these terms, except the first, is founded, by a well known theorem in arithmetic, to be equal to 1lb. So that if the weight of the cylinder be inconsiderable, the readiest way to overcome the friction would be to double the power G, or H, at once. 8. But though we may, at a medium allow a third part of the weight with which any simple machine is charged for the friction arising from thence, yet this is very precarious, and seldom is the case: for if ABCD, fig. 18, be a piece of brass 6 oz. and EFGH be also a plate of brass, and both the surfaces well ground and polished, the weight P of near 2 oz. will be required to draw along the body AC alone; but if AC be loaded with 6, 8, or 10lb. then a 6th part of the weight will be sufficient to draw it along the plane. On the other hand, if the plane be covered with a linen or woollen cloth, then a third or half part, and sometimes more, will be requisite to draw it along on the plane. 9. Yet notwithstanding the difficulty and uncertainty attending the estimation of the quantity of friction, it is still a most useful and necessary inquiry, how, and by what means, the friction of any machine may be diminished? In this, we must consider friction mechanically, as a force acting against a power applied to overcome it. Thus suppose AB, fig. 19, an upright stem or shaft, turning freely in the socket B, fixed in the table or plane IKLM; and AC, DE, two arms fixed in the said shaft, the latter of which, DE, has three pins going into a socket in the middle of the heavy weights, F, G, or H, in such a manner, that when a power applied at C moves the lever AC, it causes the lever DE to protrude or thrust along the weights at F, G, or H, in a circular manner upon the table. 10. Now as we suppose the weight, all the while it is in motion, is freely and wholly supported by the plane, it follows, that all the resistance it can give to the power applied to C, is only what arises from its friction on the plane. What this friction is, will be found by applying the weight at G, so that BG be equal to AC; for then the power applied to C, acting in a tangent to the circle CRS, that shall just move the weight G, will be equal to its friction. But if the weight be applied at F, because BF is greater than AC, the same power at C, as before, will not move it, by reason its force is here increased, by having a greater velocity than the power; as, on the other hand, if placed at H, a less power at C shall move it, because of its having there less velocity than the power; as is evident from the properties of the lever. 11. Hence we understand, that though the weight of a machine remains the same, yet the friction may be diminished, by contriving that the parts on which it moves and rubs shall have less velocity than the power which moves it: thus, if the cylinder AB (fig. 17,) were to move on the two small pins or gudgeons, E, F, the friction would be abated in the proportion of the diameter of the cylinder to that of the pins. 12. The friction on these gudgeons is still farther diminished by causing them to move on the circumference of a wheel: thus, let F be the gudgeon of the cylinder, revolving on the wheel CDE, fig. 20, the velocity of the wheel's circumference will be the same with that of the gudgeon; but the velocity of the wheel's axis AB (which is now to be considered as its rubbing part) is less than that of the wheel in proportion as its diameter is less than that of the wheel: e. gr. if the friction of the cylinder moving on its surface be one-third part of the weight, and the gudgeon be to the cylinder as 1:10, they will reduce the friction to one-30th part; and if again, the axis of the wheel be to the wheel as 1:10, the wheel will reduce the friction to one-300th part; and if the axis of this wheel be laid on the perimeter of another wheel, the friction will be reduced to a still less part of the weight; so that

we may proceed in this manner to diminish the friction ad infinitum; and wheels applied in this manner are called friction-wheels. 13. Besides all this, somewhat farther is necessary to diminish the friction of wheel-carriages. As the friction arises chiefly by lifting the body over the prominent parts of the plane on which it is moved, if we can contrive to move the body along without lifting or sustaining its weight, we shall move it without much friction; and this may be done by laying the body on any moveable circular subject, as rollers, wheels, &c.; because the asperities of its surface will lay hold on those of the roller, and move it likewise; and it is as evident, that when the body is drawn against the prominent parts of the roller, they immediately give way, and make no resistance. By this circular motion of the roller, its prominent parts below do only descend and move upon or over, and are not drawn against, the fixed prominent parts of the plane, and so receive no resistance from them. Hence the body is conveyed along, without being lifted up, in the same manner as a wheel is moved by a pinion without any considerable resistance.

OF COMPOUND MACHINES.

(19.) From what has been laid down concerning the mechanical powers in particular, we see that none of them is capable of augmenting the absolute force of any acting substance; whence we may justly conclude, that no combination of them can do so. In fact, these combinations are very often detrimental, and occasion a great loss of power by friction. This is the great obstacle in mechanics, and must always be greater in complex than in simple machines; and therefore the latter are always to be preferred, excepting where conveniency requires some degree of complication. The lever being the simplest machine, and attended with least friction, is always to be used where it is requisite to raise weights for a small way. In all cases where it is necessary to have a considerable weight raised to some height, the pulley is the most useful power, but the friction is extremely great; the axis in peritrochio combined with a single pulley will answer the purpose extremely well, and with less friction than any machine composed of pulleys alone. The machines called Cranes are generally combinations of these two; and are very much used, especially by commercial people, for raising goods out of ships, drawing them up into warehouses, and lowering them down. In these operations we must observe that lowering goods is much more dangerous than raising them, on account of the vast increase of velocity which bodies acquire every moment by the power of gravity. In the construction of cranes, therefore, it is absolutely necessary to attend to this circumstance, and to guard against accidents. Plate CVIII. fig. 1, shews a crane well calculated for the purposes just mentioned. When the rope *II* is hooked to the weight *K*, a man turns the winch *A*, on the axis whereof is the trundle *B*, which turns the wheel *C*, on whose axis *D* is the trundle *E*, which turns the wheel *F* with its upright axis *G*, on which the great rope *HH* winds as the wheel turns; and going over a pulley *I*, at the end of the arm *d* of the gib *cde*, it draws up the heavy burden *K*; which being raised to a proper height, as from a ship to the quay, is then brought over the quay by pulling the wheel *Z* round by the handles, *z, z*, which turns the gib by means of the half-wheel *b* fixed on the gib-post *cc*, and the strong pinion *a* fixed on the axis of the wheel *Z*. This wheel gives the man that turns it an absolute command over the gib, so as to prevent it from taking any unlucky swing, such as often happens when it is only guided by a rope tied to its arm *d*; and people are frequently hurt, sometimes killed, by such accidents. The great rope goes between two upright rollers *i* and *k*, which turn upon gudgeons in the fixed beams *j* and *g*; and as the gib is turned towards either side, the rope bends upon the roller next that side. Were it not for these rollers, the gib would be quite unmanageable; for the moment it were turned ever so little towards any side, the weight *K* would begin to descend, because the rope would be shortened between the pulley *I* and axis *G*; and so the gib would be pulled violently to that side, and either be broken to pieces or break every thing that came in its way. These rollers must be placed so that the sides of them round which the rope bends may keep the middle of the bended part directly even with the centre of the hole in which the upper gudgeon of the gib turns in the beam *f*. The truer these rollers are placed, the easier the gib is managed, and

the less apt to swing either way by the force of the weight *K*. A ratchet-wheel *Q* is fixed upon the axis *D*, near the trundle *E*; and into this wheel falls the catch or clink *R*. This hinders the machine from running by the weight of the burden *K*, if the man who raises it should happen to be careless, and to leave off working at the winch *A* sooner than he ought to do. When the burden *K* is raised to its proper height from the ship, and brought over the quay by turning the gib about, it is let down gently upon the quay, or into a cart standing thereon, in the following manner: A man takes hold of the rope *tt* (which goes over the pulley *v*, and is tied to a hook at *S* in the catch *R*), and so disengages the catch from the ratchet-wheel *Q*; and then, the man at the winch *A* turns it backward, and lets down the weight *K*. But if the weight pulls too hard against this man, another lays hold of the handle *V*, and by pulling it downwards draws the gripe *U* close to the wheel *Y*, which, by rubbing hard against the gripe, hinders the too quick descent of the weight, and even stops it at any time if required. Heavy goods may thus be either raised or let down at pleasure, without any danger of hurting the men who work the engine. When part of the goods are craned up, and the rope is to be let down for more, the catch *R* is first disengaged from the ratchet wheel *Q*, by pulling the cord *t*; then the handle *q* is turned half round backward, which, by the crank *nn* in the piece *o*, pulls down the frame *h* between the guides *m* and *m* (in which it slides in a groove), and so disengages the trundle *B* from the wheel *C*: then the heavy hook *β* at the end of the rope *H* descends by its own weight, and turns back the great wheel *F* with its trundle *E* and the wheel *C*; and this last wheel acts like a fly against the wheel *F* and hook *β*, and so hinders it from going down too quick; whilst the weight *X* keeps up the gripe *U* from rubbing against the wheel *Y*, by a cord going from the weight over the pulley *v* to the hook *W* in the gripe; so that the gripe never touches the wheel unless it be pulled down by the handle *V*. When the crane is to be set at work again for drawing up another burden, the handle *q* is turned half round forwards; which, by the crank *m*, raises up the frame *h*, and causes the trundle *B* to lay hold of the wheel *C*; and then, by turning the winch *A*, the burden of goods *K* is drawn up as before. The crank *m* turns pretty stiff in the mortise near *o*, and stops against the farther end of it, when it has got a little beyond the perpendicular; so that it can never come back of itself: and therefore the trundle *B* can never come away from the wheel *C*, until the handle *q* be turned half round. The great rope runs upon rollers *pp* in the lever *LM*, which keep it from bending between the axle at *G* and the pulley *I*. This lever turns upon the axis *N* by means of the weight *O*, which is just sufficient to keep its end *L* up to the rope; so that, as the great axle turns, and the rope coils round it, the lever rises with the rope, and prevents the coilings from going over one another. The power of this crane may be estimated thus: suppose the trundle *B* to have 13 staves or rounds, and the wheel *C* to have 78 spur-cogs; the trundle *E* to have 14 staves, and the wheel *F* 56 cogs: then, by multiplying the staves of the trundles, 13 and 14, into one another, their product will be 182; and by multiplying the cogs of the wheels, 78 and 56, into one another, their product will be 4368; and dividing 4368 by 182, the quotient will be 24: which shews that the winch *A* makes 24 turns for one turn of the wheel *F* and its axle *G*, on which the great rope or chain *HH* winds. So that if the length or radius of the winch *A* were only equal to half the diameter of the great axle *G*, added to half the thickness of the rope *II*, the power of the crane would be as 24 to 1: but the radius of the winch being double the above length, it doubles the said power, and so makes it as 48 to 1: in which case a man may raise 48 times as much weight by this engine as he could do by his natural strength without it, making proper allowance for the friction of the working parts. Two men may work at once, by having another winch on the opposite end of the axis of the trundle under *B*, and so make the power still double. If this power be thought greater than what may be generally wanted, the wheels may be made with fewer cogs in proportion to the staves in the trundles; and so the power may be of whatever degree is judged to be requisite. But if the weight be so great as will require yet more power to raise it (suppose a double quantity), then the rope *H* may be put under a moveable pulley, as *z*, and the end of it tied to a hook in the gib at *t*; which will give a double power to the machine, and so raise a double weight hooked to the

the block of the moveable pulley. When only small burdens are so raised, this may be quickly done by men pushing the axle G round by the handspokes *y, y, y, y*; having first disengaged the trundle B from the wheel C; and then, this wheel will only act as a fly upon the wheel F; and the catch R will prevent its running back, if the men should inadvertently leave off pushing before the burden be unhooked from *β*. When very heavy burdens are to be raised, which might endanger the breaking of the cogs in the wheel F; their force against these cogs may be much abated by men pushing round the handspokes *y, y, y, y*, whilst the man at A turns the winch. These are only the working parts of this crane. The beams which support them can be easily supposed. If they had been engraven, they would have hid a great deal of the working parts from sight, and confused the figure. Another very good crane is made in the following manner: AA (fig. 2.) is a great wheel turned by men walking within it at H. On the part C, of its axle BC, the great rope D is wound as the wheel turns; and this rope draws up goods in the same way as the rope III does in the above-mentioned crane, the gib-work here being supposed to be of the same sort. But these cranes are very dangerous to the men in the wheel; for if any of the men should chance to fall, the burden will make the wheel run back and throw them all about within it; which often breaks their limbs, and sometimes kills them. The late ingenious Mr. Padmore of Bristol, the inventor of the above crane, observing this dangerous construction, contrived a method for remedying it, by putting cogs all around the outside of the wheel, and applying a trundle E to turn it; which increases the power as much as the number of cogs in the wheel is greater than the number of staves in the trundle; and by putting a ratchet-wheel F on the axis of the trundle (as in the above-mentioned crane), with a catch to fall into it, the great wheel is stopped from running back by the force of the weight, even if all the men in it should leave off walking. And by one man working at the winch I, or two men at the opposite winches when needful, the men in the wheel are much assisted, and much greater weights are raised, than could be by men only within the wheel. Mr. Padmore put also a gripe-wheel G upon the axis of the trundle, which, being pinched in the same manner as described in the former crane, heavy burdens may be let down without the least danger. Before this contrivance, the lowering of goods was always attended with the utmost danger to the men in the wheel; as every one must be sensible of who has seen such engines at work. A new portable cellar-crane is represented in fig. 3, which is very useful to wine-merchants, brewers, &c. in drawing up and letting down casks full of wine, beer, &c. It saves the trouble and inconvenience of horses, and in many places can be used where horses could not. AA are two wooden props about six feet in height, jointed together like a ruler at E. They are connected to each other by an iron round bar C and wooden bar at the bottom D. The iron-prongs EE fasten the uprights steadily to the edge of the cellar; F is the axis round which two ropes are coiled, the ends of which are fastened to the two clamps GG. On the axis F is fixed the iron-wheel H of three feet in diameter: in the teeth of this works the pinion I of about six or seven inches in diameter, and is turned by the handle at K. It is evident, by a bare inspection of the figure, that when the two ropes are slipped over the ends upon the barrel, either at the top or bottom of the cellar, that by turning the winch K towards or from you, the barrel can be safely and expeditiously taken out or lowered down. When the crane is done with, it shuts up by unscrewing the nut at B, taking the wheel and axis away out of the loops at L, and folding the sides at A together like a jointed rule; it may then be removed at pleasure.

(20.) Mills are compound machines, of very general use. They are distinguished by particular names, sometimes taken from the powers by which they are moved, and sometimes from the uses to which they are applied. Hence they are called hand-mills, horse-mills, water-mills, fulling-mills, wind-mills, corn-mills, levigating-mills, boring-mills, &c. The most simple of these is the hand-mill, represented fig. 4, where A and B represent the two stones between which the corn is ground, and of which the upper one, A, turns round, but the lower one, B, remains fixed and immoveable. The upper stone is five inches thick, and twenty-one inches broad; the lower one somewhat broader. C is a cog-wheel, having sixteen or eighteen cogs, which go into the trundle

F, having nine spokes fixed to the axis G, the latter being firmly inserted into the upper stone A, by means of a piece of iron. H is the hopper into which the corn is put; I the shoe to carry it by little and little through a hole at K, in betwixt the stones, where, being ground into meal, it comes out through the eye at L. Both stones are inclosed in a circular wooden case, of such a size as will admit the upper one to run freely within it. The under surface of the upper stone is cut into grooves, as represented at Q, which enable it to throw the meal out at the eye L more perfectly than could be done if it was quite plain. Neither of them are entirely flat, the upper one being somewhat concave, and the under one convex. They nearly touch at the edges, but are at some distance in the middle, in order to let the corn go in between them. The under-stone is supported by strong beams, not represented in the figure; the spindle G stands on the beam MN, which lies upon the bearer O. One end of this bearer rests upon a fixed beam, and the other has a string fixed to it, and going round the pin P, by the turning of which the timbers O and MN may be raised or lowered, and thus the stones put nearer, or removed farther from, each other, in order to grind fine or coarse. When the corn is to be ground, it must be put into the hopper by little at a time. A man turns the handle D, and thus the cog-wheel and trundle are carried round together with the stone A. The axis G is angular at K; and as it goes round, shakes the shoe I, and makes the corn fall gradually through the hole K. The upper stone going round grinds it, throwing out the meal, as already said, at the eye L. Another handle, if thought proper, may be put at the other end of the handle E. The spindle must go through both stones, in order to reach the beam MN, and the hole through which it passes is fastened with leather or wood, so that no meal can pass through. Mr. Emerson, from whom this account is taken, observes, that "it is a pity some such mills are not made at a cheap rate, for the sake of the poor, who are much distressed by the roguery of the millers." This has since been effected by Mr. Thomas Rustall, who calls the machine a parish, or family-mill and bolter. It is represented in figures 5, 6, 7, 8, Plate CVIII. Fig. 5. A the handle of the mill. B, one of the mill-stones, which is about thirty inches in diameter, and five inches in thickness, moving with its axis C. D, is the other mill-stone, which, when in use, is stationary; but which may be placed nearer to, or at a distance from, the moveable stone B, by means of three screws passing through the wooden block E, that supports one end of the axis C; after it has been put through a hole or perforation in the bed-stone. The grain likewise passes through this perforation from the hopper F, into the mill. F represents the hopper, which is agitated by two iron-pins on the axis C, that alternately raise the vessel containing the grain, which again sinks by its own weight. In consequence of this motion, the corn is conveyed through a spout, that passes from such hopper into the centre of the mill behind, and through the bed-stone D. G, a paddle, regulating the quantity of corn to be delivered to the mill; and, by raising or lowering which, a larger or smaller proportion of grain may be furnished. H, the receptacle for the flour, into which it falls from the mill-stones, when ground. I, represents one of the two wooden supporters on which the bed-stone D, rests. These are screwed to the block E, and likewise morticed into the lower frame-work of the mill at K, which is connected by means of the pins or wedges L, L, L, that admit the whole mill to be easily taken to pieces. M, a fly-wheel, placed at the farthest extremity of the axis C, and on which another handle may be occasionally fixed. N, a small rail, serving to keep the hopper in its place; the farthest part of such hopper resting on a small pin, which admits of sufficient motion for that vessel, to shake forward the corn. O, a spur-rail, for strengthening the frame-work of the mill. P, the front upright, that is morticed into the frame-work, and serves as a rest for the end of the iron-axis C, which is next to the handle. On each extremity of such axis, there is a shoulder, which keeps it steady in its place. Lastly, there is a cloth-hood fixed to a broad wooden hoop, and which is placed over the stones while working, to prevent the finer particles of flour from escaping. Such is the outline of Mr. Rustall's useful mill; but, as a bolter, or sifter, becomes necessary for separating the flour from the bran; he has contrived a machine upon a simple and excellent construction. Fig. 6, represents this bolter, with its front removed, in order to display its interior structure;

ture; the machine being three feet ten inches in length, nineteen inches and a half in breadth, and eighteen inches in depth. A, is a moveable partition, sliding about four feet backwards or forwards, from the centre of the box, upon two wooden ribs, which are fixed to the back and front of the box, and one of which is delineated at the letter B. C, the lid of the bolter represented open. D, a slider, which is moveable in a groove made in the lid, by means of two handles on the back of such lid. E, a forked iron, fixed in the slider D; and which, when the lid is shut, takes hold of the edge of the sieve F, and moves it backwards and forwards on the wooden ribs B, according to the agitation of the slider. G, represents a fixed partition in the lower centre of the box, which it divides into two parts, in order to separate the fine from the coarse flour: from this partition, the slider A, moves each way about four inches, and thus affords room for working the sieve. H, a board that is parallel to the bottom of the bolter, and forms part of the slider A. This board serves to prevent any of the sifted matter from falling into the other partition. I, represents two of the back feet which support the bolter. Fig. 7, is a view of the top, or upper part, of the lid of the bolter. K, the slider that moves the lengthwise of the bolter. L, L, the handles by which the slider is worked. M, a screw, serving to hold the fork, which imparts motion to the sieve. Fig. 8, represents the forked iron, E, separately from the lid. Mr. Rustall's inventions are equally ingenious and economical: they bid fair to be of very general utility; as both the mill and bolter may be constructed at a moderate expence, and occupy only a small space of ground. The former may even be worked in a public kitchen, or within a room in a farm-house, without occasioning any great incumbrance. The particular excellence of the mill consists in this circumstance, that, from the vertical position of its stones, it may be put in action without the intervention of cogs or wheels. It may be employed in the grinding of malt, the bruising of oats for horses, and for making flour, or for all these purposes: it may likewise be easily altered, so as to grind either of those articles to a greater or less degree of fineness. Another advantage peculiar to Mr. Rustall's contrivance is, that one man is sufficient to work it; though, if two persons, namely, a man and a boy, be employed, they will be able to produce, in the course of two hours, a quantity of flour sufficient to serve a family, consisting of six or eight persons, for a whole week: repeated satisfactory trials have proved, that this mill grinds the corn completely, and at the rate of one bushel of wheat within the hour. Besides, the industrious farmer will thus be enabled to make comparative experiments, on the quality of his grain, and may furnish himself, at a trifling expence, with flour from his own wheat; without apprehending any adulteration; or without being exposed to the impositions, or caprice, of fraudulent and avaricious millers. The construction of the horse-mill, water-mill, wind-mill, &c. differs very little from that of the hand-mill, except in the parts requisite for applying and regulating the power. To cut and grind the corn, both the upper and under stones have furrows cut in them, as is observed in the hand-mill. These are cut perpendicularly on one side, and obliquely upon the other, by which means each furrow has a sharp edge, and by the turning of the stones, the furrows meet like a pair of scissars, and by cutting the corn, make it grind the more easily. They are cut the same way in both stones when they lie upon their backs, by which means they run crosswise to each other when the upper one is inverted and turned round; and this greatly promotes the grinding of the corn, great part of which would be driven onward in the lower furrows, without being ground at all, if both lay the same way. When the furrow becomes blunt and shallow by wearing, the running stone must be taken off, and the furrows cut deeper in both by means of a chisel and hammer. To change the direction of the axes of wheels particularly useful in the construction of mills, the bevel-geer is applied. Its principle consists in two cones, rolling on the surface of each other, as the cone A and B, Plate CVII. fig. 23, revolving on their centres *ab*, *ac*; if their bases are equal, they will perform their revolutions in one and the same time, or any other two points equally distant from the centre *a*, as *d1*, *d2*, *d3*, &c. will revolve in the same time as *f1*, *f2*, *f3*, &c. In like manner, if the diameter of the base of the cone *ade* be double, fig. 24, the diameter of the base of the cone *qfd*; then if they turn about their centres, when the cone *qfd* has made one revolution, the cone *ade* will have made but half a

revolution; or when *qfd* has made two revolutions, *ade* will have made but one, and every part equally distant from the centre *a*, as *f1*, *f2*, *f3*, &c. will have made two revolutions to *e1*, *e2*, *e3*, &c. and if the cones were fluted, or had teeth cut in them, diverging from the centre *a* to the bases *de*, *df*, they would then become bevel-geer. The teeth at the point of the cone being small and of little use, may be cut off at E and F, fig. 25, as seen by fig. 26, where the upright shaft *ab*, with the bevel-wheel *cd*, turns the bevel-wheel *ef* with its shaft *bg*, and the teeth work freely into each other. The teeth may be made of any dimension, according to the strength required. The method of conveying motion in any direction, and proportioning or shaping the wheels thereto, is as follows: let the line *ab*, Plate CVIII. fig. 9, represent a shaft coming from a wheel; draw the line *ed* to intersect the line *ab*, in the direction that the motion to be conveyed is intended, which will now represent a shaft to the intended motion. Again, suppose the shaft *ed* is to revolve thrice, while the shaft *ab* revolves once, draw the parallel line *ii*, at any distance not too great, suppose one foot by a scale; then draw the parallel line *kk* at three times that distance, after which draw the dotted line *wx*, through the intersection of the shafts *ab* and *ed*, and likewise through the intersection of the parallel lines *ii* and *kk*, in the points *x* and *y*; which will be the pitch-line of the two bevel-wheels, or the line where the teeth of the two wheels act on each other, as may be seen in fig. 10, where the motion may be conveyed in any direction. The universal joint, as represented fig. 11, may be applied to communicate motion instead of bevel-geer, where the speed is to be continued the same, and where the angle does not exceed 30° or 40°, and the equality of motion is not regarded; for as it recedes from a right line, its motion becomes more irregular. This joint may be constructed by a cross, as represented in the figure; or with four pins fastened at right angles upon the circumference of a hoop or solid ball. It is of great use in cotton-mills, where the tumbling shafts are continued to a great distance from the moving power. But by applying this joint, the shafts may be cut in convenient lengths, by which it will be enabled to overcome greater resistance.

(21.) The pile-engine, which was used in the building of Westminster Bridge, exhibits a curious combination of the mechanic powers; it was invented by Mr. Vauloue, and is represented in Plate CIX. fig. 1. A the great cog-wheel fixed to the great shaft D. MO, a trundle and fly turned by the cog-wheel, this is to prevent the horses from falling when the ram is discharged. B the drum or barrel on which the great rope is wound. C a less barrel on which the rope L is wound, carrying the weight N. The use of this is to hinder the follower from falling too fast. The barrels B, C, are moveable about the great axis D. The cog-wheel and barrel B are fixed together by the bolt F going through the cog-wheel into the barrel. EI is a lever moveable about 1, going through the great shaft D; this lifts up the bolt F, the end E being made heavier by a weight; by which means it locks the barrel B to the great wheel A. KI the forcing-bar going into the hollow axis of the great shaft D; this rests upon the lever EI, XY, a great lever, moveable about 3, the end X being heavier, which, with the end Y, presses down the bar KI, thrusts down the end of the lever at F, and lets the bolt F descend, to unlock the barrel C. Z a rope fixed at X, and going up through the guides at R. GK, a crooked lever, moveable about 2, the roller at the end G being pressed with the great rope, forces the end K against the catch at K, and hinders the bar KI from ascending. When the rope H slackens, the spring 7 forces the end K from the catch, and the bar KI ascends. If the great rope going round the barrel B, over the pulley P, up to the top, and over the pulley Q, then down to the follower where it is fixed. T the ram that drives the piles. S the follower in which is fixed the tongs W, moveable about the centre. VV the guides between which the ram falls. At the inside of the guides at R, where they are fastened together, there are two inclined planes. At the bottom of the follower is a slit, to receive the handle 6 of the ram T, to be taken up by the tongs W. *a*, *b*, *c*, *d*, timbers for horse. To draw it, in direction *abcd*. As the horses go round, the great rope H is wound about the barrel B, and the follower S, and ram T, are drawn up, till the tongs come between the inclined planes, which, squeezing the ends 4, 4, together, opens the end 5, and lets the ram fall down. Then the follower S taking hold of the rope Z, raises the

the end X, and depresses the end Y, of the lever XY, which thrusts down the bar KI, which thrusts down the end P of the lever EI, with the bolt F, and unlocks the barrel B, which, turning about the axis, the follower S descends by its weight, till it comes to the ram T; and the end 5 of the tongs slips over the handle 6 of the ram. Then the rope H slackens, and the spring 7 forces the end K from off the catch at top of the bar KI, and lets the bar rise, and the weight E raises the bolt F, and locks the barrel B to the wheel A: and the horses still going about, the end 5 of the tongs takes hold of the handle 6, and the ram T is drawn up as before. All this machine is placed upon a boat which swims upon the water; and so is easily conveyed to any place desired. This description and the figure are taken from Mr. Emerson's treatise on mechanics; others have made some variations in it. A more simple and a superior pile-driver, has been invented by Mr. S. Bunce. See PILE-ENGINE.

OF THE CENTRE OF GRAVITY.

(22.) The centre of gravity of any body, or system of bodies, is that point upon which the body or system, acted upon only by the force of gravity, will balance itself in all positions. Hence, if a line be drawn from the centre of gravity of a body perpendicular to the horizon; if this perpendicular falls within the base upon which the body rests, the body will stand; but if it falls without the base, it will fall down. Hence also, if the centre of gravity of a body be supported, the whole body is supported. And the centre of gravity of the body must be esteemed the place of the body. And if it be sustained by any lever or beam, its place is at the point where the beam is cut by a line drawn from the centre of gravity perpendicular to the horizon. All the gravity of a body, or the force it endeavours to descend with, is collected into the centre of gravity: and, therefore, whatever sustains the centre of gravity, sustains the whole weight. And the descent of a body must be estimated by the descent of its centre of gravity. Hence also the larger the base is, upon which a body stands, and the further within it the centre of gravity lies, the firmer the body will stand; and the more difficult to be removed. On the contrary, the less the base, or the less the centre of gravity falls within it, so much the easier it is to be moved out of its place. If a body be laid upon a plane GF, Plate CIX. fig. 2, and one end F gradually raised up; the body will slide down the plane, if the perpendicular CD fall within the base; but if it fall without, it will roll down.

PROP. 1. The common centre of gravity C, fig. 3, of two bodies A, B, is in the right line joining their centres of gravity, and the distance of either body from the common centre of gravity, is reciprocally as the quantity of matter in it.—Let A, B, be the centres of gravity of A and B, and suppose AB to be an inflexible right line, or lever, and C the fulcrum. Then if C be the centre of gravity of the bodies A, B, these bodies will be in equilibrio. And consequently (by art. 13,) $AC : CB :: B : A$.

COR. If there be never so many bodies, the common centre of gravity of them all is in the right line drawn from the centre of gravity of any one to the centre of gravity of all the rest; and it divides this line into two parts, reciprocally as that body to the sum of all the rest of the bodies.—For let D be another body; and let B and A be placed in C, then will $C : D :: DE : CE$; and so on for more bodies.

PROP. 2. If there be several bodies A, B, D, E, F, fig. 4, and if any plane, PQ, be drawn perpendicular to the horizon, the sum of the products of each body multiplied by its distance from that plane, if they are all on one side, or their difference, if on different sides, is equal to the sum of all the bodies multiplied by the distance of their centre of gravity from that plane.—Draw lines perpendicular and parallel to the plane PQ, as in the fig. and let c be the centre of gravity, then (by article 13,) the force of all the bodies to move the plane PQ about R, will be $mD \times D + oE \times E + rF \times F - Ak \times A - Bl \times B$, that is $d \times R c \times D + e \times R c \times E + f \times R c \times F - a \times R c \times A - b \times R c \times B$, or $d \times c \times D + e \times c \times E - f \times c \times F - a \times c \times A - b \times c \times B + R c \times D + E + F + A + B$; but because c is the centre of gravity of the bodies, therefore (by art. 13,) $d \times c \times D + e \times c \times E = f \times c \times F + a \times c \times A + b \times c \times B$; therefore we have $mD \times D + oE \times E + rF \times F - Ak \times A - Bl \times B = R c \times A + B + D + E + F$.

COR. 1. This prop. is equally true for any plane whatever. For suppose the plane and the bodies to be put in any oblique position, all the distances will remain the same as before.

COR. 2. If any plane be drawn through the common centre of gravity C, of any number of bodies A, B, D, &c. and each body be multiplied by the distance of its centre of gravity, from that plane; the sum of the products on each side are equal; $A \times aC + B \times bC + D \times dC = D \times dC + E \times eC$. For the distance of a body must be estimated by the distance of its centre of gravity.

COR. 3. Hence also, the sum (or difference) of the products of each particle of a body, multiplied by its distance from any plane whatever, is equal to the whole body multiplied by the distance of its centre of gravity from that plane. And if the plane pass through the centre of gravity; the sums of the products on each side are equal.

COR. 4. The sum of the forces of a system of bodies is the very same, as if all the bodies were collected into their common centre of gravity, and exerted their several forces there. For the sum of all the forces are $mD \times D + oE \times E$, &c. or $RC \times A + B + D + E + F$.

COR. 5. And the same is true of any forces whatever with regard to the centre of gravity of these forces. And, therefore, if several forces act in parallel directions; the sum of all these forces will be equivalent to one single force; and their common centre of gravity, the place where it acts.

COR. 6. If a circle be described about the centre of gravity G, of a system of bodies A, B, C; fig. 5, and any point S be taken at pleasure in the circumference; then $SA^2 \times A + SB^2 \times B + SC^2 \times C$ is a given quantity. For draw SG, on which let fall the perpendiculars Aa, Bb, Cc. Then (by Eucl. II. 12, 13,) $SA^2 \times A + SB^2 \times B + SC^2 \times C = SG^2 \times A + B + C + 2SG \times Ga \times A + 2SG \times Gb \times B + 2SG \times Gc \times C$; but (by Cor. 2,) $Ga \times A - Gb \times B + Gc \times C = 0$, and all the rest are given quantities.

PROP. 3. To find the centre of gravity of a system of bodies A, B, C. Draw any plane ST, fig. 6, and from the centres of gravity of all the bodies, draw perpendiculars to this plane, Aa, Bb, Cc; then (by Cor. 3, Art. 13,) the forces of A, B, C, at the distances Aa, Bb, Cc, from the plane, will be $A \times Aa$, $B \times Bb$, $C \times Cc$, let G be the centre of gravity, then the sum of the forces $A \times Aa + B \times Bb + C \times Cc$ must be $= A + B + C \times Gg$, the power of all the bodies situated in G (by Pr. 2,) whence the distance of the centre of gravity from the plane, that is,

$$Gg = \frac{Aa \times A + Bb \times B + Cc \times C}{A + B + C}, \text{ where, if any of the bo-}$$

dies be situate on the other side of the plane, the correspondent rectangles will be negative. And if the distance be in like manner found from the plane TV, and likewise from another plane perpendicular to ST, TV; the point G will be determined.

COR. 1. To find the centre of gravity of an irregular plain figure, suspend it by the string AEB, (fig. 7,) at E; and draw the plumb-line ECF; then suspend it by another point of the string as D, and draw another plumb-line through E, to intersect CF, and the point of intersection is the centre of gravity.

COR. 2. To find the centre of gravity of a flexible body: lay it upon a board whose centre of gravity is known, lay the centre of gravity of the board upon the edge of a prism; and lay the body upon it, and remove it back or forwards till it be in equilibrio upon the board.

SCHOL. The centres of gravity of several planes and solids have been determined to be as follows:

1. If two lines be drawn from two angles of a triangle to the middle of the opposite sides, the point of intersection is the centre of gravity. Therefore the distance of the centre of gravity from the vertex is two-thirds of the line bisecting the opposite side.

2. In a trapezium ABCD, (fig. 8,) the centre of gravity is found by dividing it into triangles. Find E, G, the centres of gravity of the triangles ADB, CDB; and F, H, the centres of gravity of ABC, ADC. Then draw EG, FH, to intersect in O, the centre of gravity of the trapezium. A similar method will find the centre of gravity of any rectilineal plane figure.

3. The centre of gravity of a right line, parallelogram, cylinder, and prism, is in the middle.

4. For the arch of a circle, as half-arch : sine of half-arch :: radius : distance of its centre of gravity from the centre.

5. For the sector of a circle, as arch : cord :: two-thirds radius : distance of its centre of gravity from the centre.

6. For the parabolic space, the distance of the centre of gravity from the vertex is three-fifths of the axis.

7. In the cone and pyramid the distance of the centre of gravity from the vertex is three-fourths of the axis.

8. In the paraboloid, the distance of the centre of gravity from the vertex is two-thirds of the axis.

9. For the segment of a sphere, let r = radius, x = height of the segment ; then the distance of the centre of gravity from the

$$8r - 3r$$

vertex is $\frac{8r - 3r}{4r}$.

$$12r - 4r$$

PROP. 4. If two or more bodies move uniformly in any given directions ; their common centre of gravity will either be at rest, or move uniformly in a right line.—For, if the two bodies move in the same straight line, their distance will vary uniformly, and their centre of gravity always divides the distance in a given ratio ; therefore it will be at rest or move uniformly in that line. Next let the two bodies move in any straight lines AC, DE, fig. 9, so that while one moves from A to C, the other moves from D to F ; to which take AB, DE proportional ; join AD, BE, and CF, and let M be the centre of gravity when the bodies are at A and D, draw CH and BG parallel to AD ; and DH, MKL to AC, join FH and EG, and make LO and KN parallel to FH, to which EG is also parallel, because of the proportionals DG, GH, and DE, EF ; and, because of the uniform motions, when one body is in B, the other is in E ; join MN, and produce it, then from the principles of geometry it will meet FC in O. Now DM : MA :: GK : KB :: EN : NB :: FO : OC ; therefore the centre of gravity is always in the straight line MO, and it moves uniformly in this line, for AB : BC :: MK : KL :: MN : NO. If the line DE be not in the plane AH, the demonstration will be the same ; for because of the parallel planes DHF, MLO ; and FHIC, EGB, the lines CF, BE, and MO, are cut in the ratio above-mentioned. The common centre of gravity of two bodies, and a third is either at rest or moves uniformly in a right line ; for these two may be put into the place of their centre of gravity, which before moved uniformly, and then the centre of gravity of the three will move uniformly ; likewise the common centre of gravity of three bodies and a fourth, will move uniformly in a right line. And so on.

PROP. 5. The common centre of gravity of two or more bodies, does not change its state of motion or rest, by any actions of the bodies among themselves, or by any forces they exert upon one another.—Suppose any space in which the bodies are inclosed to move uniformly along with the centre of gravity of the bodies, before the actions of the bodies upon one another ; then the centre of gravity is at rest in that space. Now if two bodies mutually act upon one another, since their distances from their centre of gravity are reciprocally as the bodies ; and as action and reaction are equal ; the bodies will approach or recede from that centre by spaces which are in the same ratio ; therefore the centre of gravity will still remain at rest. And in a system of several bodies, because the common centre of gravity of any two acting mutually upon each other, is at rest : and the actions of all the bodies being the sum of the actions of every two ; it is evident the centre of gravity of all the bodies remains the same as if they did not act at all upon one another, and therefore is at rest in this space, or moves uniformly forward along with it.

COR. 1. Hence if a body be projected into free space ; if it have any circular motion, this motion will be performed uniformly about an axis passing through the centre of gravity.

COR. 2. And if a body be hurled into the air, its centre of gravity will either move in a right line, or describe a parabola, whilst that body revolves about an axis passing through the centre of gravity, if it have any circular motion.

PROP. 6. The sum of the motions of several bodies in any given direction, is the same as the motion of all the bodies in the same direction, moved with the velocity of the common centre of gravity.—Let the bodies A, B, (fig. 10,) move round the centre of

gravity C at rest, to the planes ab ; draw BCA, bCa. Then since A : B :: BC : AC :: bc : ac ; therefore the triangles ACa, BCb, are similar, and $\angle BBc = \angle CAa$, therefore Bb is parallel to Aa, and the bodies move in contrary directions. Also since Aa : Bb :: AC : CB :: B : A, or $Aa \times A = Bb \times B$; therefore the motions of A, B, in contrary directions are equal, or their motion the same way is 0. Now let the space and bodies moving in it be moved in any direction with any velocity v ; it is manifest, the motion in each body in that direction will be greater than before, by the quantity of matter $\times$ velocity. Therefore the sum of the motions is now $vA + vB$, or $v \times A + B$, that is, equal to the sum of the bodies $\times$ velocity of the centre of gravity. After the same manner the motion of three bodies is the same as the motion of two of them, moved with the velocity of their common centre of gravity, together with the motion of the third ; that is, (by what has been shown) equal to the sum of all the three, moved with the velocity of the centre of gravity of all the three. And so for more bodies.

COR. The centre of gravity of a body must be taken for the place of the body. And the motion of any body, or of any system of bodies, must be estimated by the motion of the centre of gravity.

OF THE DESCENT OF BODIES UPON INCLINED PLANES ; AND OF PENDULUMS.

(23.) PROP. 1. If a heavy body W, be sustained upon an inclined plane AC, (fig. 11,) by a power acting in a direction parallel to that plane. Then, the weight of the body, the power that sustains it, and its pressure against the plane, are respectively, as the length AC, the height CB, and the base AB, of the plane.—Draw BD perpendicular to AC ; then the force of gravity tends perpendicular to the horizon, or parallel to CB ; and the direction of the power is parallel to DC ; and the pressure against the plane is (by Prop. art. 11,) parallel to DB. And therefore their quantities are respectively as the three lines CB, CD, BD. (by Prop. art. 10) ; that is, by similar triangles, as AC, CB, and AB.

COR. 1. The weight, power, and pressure, are respectively, as radius, the sine, and cosine, of the plane's elevation.—For the sides are as the sines of the opposite angles.

COR. 2. The relative weight of a body, to make it run down an inclined plane, is as the height directly, and length reciprocally, BC

— ; or it is as the sine of the plane's elevation.

AC

COR. 3. If a cylinder be sustained upon an inclined plane, as in fig. 12, by a power drawing one end of a rope parallel to the plane, whilst the other end is fixed. This power is to the weight of the cylinder ; as half the height, to the length of the plane.—For half the relative weight of the cylinder is sustained by the other end of the rope which is fixed.

PROP. 2. If a heavy body W be sustained upon an inclined plane AC, (fig. 11,) by a power acting parallel to the horizon. Then, the weight of the body, the power that sustains it, the pressure against the plane, are respectively, as the base AB, the height CB, and the length AC, of the plane.—For the body is sustained by three forces, the power, the gravity, and reaction, of the plane. The weight is perpendicular to AB, the power is perpendicular to CB, and the pressure is perpendicular to AC. Therefore (by Cor. 1, Prop. art. 10,) these forces are as AB, CB, AC.

COR. Hence the pressure on the plane, the power and the weight ; are respectively, as radius, the sine, and cosine of the plane's elevation.

PROP. 3. If a heavy body W be sustained upon an inclined plane AC, (fig. 13, 14,) by a power P acting in any given direction WP. And if BED be let fall perpendicular on WP. Then, power P, weight of the body W, pressure upon the plane, will be respectively, as DB, AB, and AD.—For since BD is perpendicular to the direction of the power, AB to the direction of gravity, and AD to the direction of the pressure on the plane ; therefore (by Cor. 1, Pr. art. 10,) these forces will be respectively as BD, AB, AD ; when they are in equilibrio.

COR. 1. The power, weight, and pressure, against the plane ; are respectively as the sine of the plane's elevation, cosine of the angle of traction CWP, and the cosine of the direction of the power above the horizon.—The angle of traction is the angle that the

the direction of the power makes with the plane. And in the triangle ABD, the sides are as the sines of the opposite angles, where $\angle D = \text{complement of DWP}$.

Cor. 2. Hence whether the line of direction of the power be elevated above, or below the plane; if the angles of traction be equal, equal powers will sustain the weight. But the pressure is greater when the line of direction runs below the plane.

Cor. 3. The power P is least when the line of direction is parallel to the plane. And infinite when perpendicular to it. And equal to the weight, when perpendicular to the horizon.

PROP. 4. The space which a body (descending from rest) describes upon an inclined plane, is to the space which a body falling perpendicularly, describes in the same time; as the height of the plane CB, (fig. 15,) to its length AC.—The force wherewith a body endeavours to descend upon an inclined plane is equal to the power that sustains it; and that power is to the weight of the body as CB to CA. Therefore the body is urged upon the plane, by a uniformly accelerating force which is to the force of gravity as CB to CA. And therefore (since the body and the time are given) the spaces are as the force; (art. 7,) that is as CB to CA.

Cor. 1. Hence if BD be let fall perpendicular to AC; then in the time a body falls through the height CB; another body, descending along the inclined plane, will run through the space CD.—For these spaces are as CA to CB, that is, as CB to CD, by similar triangles.

Cor. 2. The velocity acquired upon an inclined plane, is to the velocity acquired in the same time by falling perpendicularly; as CB to CA, or as CD to CB.

Cor. 3. The space described by a body falling down any plane in a given time, is as the sine of the plane's elevation.

Cor. 4. The spaces described by a body descending on any given plane, are as the squares of the times.

Cor. 5. The time of a body's descending through the plane CD, is to the time of falling through the perpendicular height CE; as the length of the plane DC, to the height CE.—For DE, AB, being perpendicular to CB, and BD to AC. The time of descending through CD or the perpendicular CB: time of descending through CE:: (by art. 7,) $\sqrt{CB} : \sqrt{CE} :: CD : CE$.

Cor. 6. A body acquires the same velocity in descending down an inclined plane CD, as by falling perpendicularly through the height of that plane CE.—For (Cor. 2,) velocity in D: velocity in B:: CE: CD, and (art. 7,) velocity in B: velocity in E:: $\sqrt{CB} : \sqrt{CE} :: CD : CE$. Therefore velocity in D: velocity in E:: CE: CE, and therefore the velocities in D and E are equal.

Cor. 7. A body acquires the same velocity in falling from any height, whether it falls perpendicularly, or down an inclined plane of equal height.

Cor. 8. Hence the velocities acquired by heavy bodies falling from the same height to the same horizontal right line, on any planes whatever, are equal among themselves.

Cor. 9. If the velocities be equal at any two equal altitudes D, E; they will be equal at any other two equal altitudes A, B: and acquire equal increases of velocity, in passing through EB, DA, of equal heights.

Cor. 10. The velocities acquired by descending down any planes whatever, are as the square roots of the heights.

PROP. 5. In a circle whose diameter CB, (fig. 16,) is perpendicular to the horizon, a body will descend through any cord CD or DB in the same time as it will descend perpendicularly through the diameter CB.—For the angle at D is right, therefore (by Cor. 1, Pr. 4,) the time of descending through CD will be equal to the time of descending perpendicularly through CB. Draw CE parallel to DB, then will CE be equal to DB; and a body will descend through the cords CE, DB, in the same time. But the time of descending through CE is the same as falling through the diameter. Therefore the time of descending through any cord CD, DB, is the same as falling through the diameter CB.

Cor. 1. The times of descending through all the cords of a circle, drawn from any point C or B, are equal among themselves.

Cor. 2. The velocity acquired by descending through any cord CD, or DB, is as the length of the cord.—For draw DF perpen-

dicular to CB; then $CD = \sqrt{CB \times CF}$, therefore $CD \propto \sqrt{CF}$ and the velocity at D or F $\propto \sqrt{CF}$, that is as CD. Also a body acquires the same velocity through DB as FB, and that is as $\sqrt{BF}$, or as DB.

Cor. 3. But a body will descend sooner through the small arch of a circle, than through its cord TB.—For if BG, TG, be two tangents; then the relative gravity at T in the arch and cord will (Cor. 1, Pr. 1,) be as the sines of the angles TGO, TBO, or as BT, and TG or BG, that is, nearly as two to one when the arch is very small. And the accelerative force in the circle being double to that in the cord; therefore the velocity will be greater in the arch, and the time of description shorter; though their lengths are nearly the same.

PROP. 6. If a body descends freely along any curve-surface, and another body descends from the same height in a perpendicular right line; their velocities will be equal at all equal altitudes.—Let a body descend from A, (fig. 17,) towards C perpendicular to the horizon BC; and another descend through the curve-surface AKB. Divide AC into an infinite number of equal parts, at the points D, E, F, &c. to which draw lines parallel to BC, intersecting the curve in I, K, G, &c. then the curve-line AKB will be divided into an infinite number of parts, IK, KG, &c. which may be taken for right lines; or the curve-surface into an infinite number of planes, joining at I, K, G, &c. Now if the velocities be supposed to be equal in any correspondent points as I and D; then (by Cor. 9, Pr. 4,) they will be equal in K and E, after the descent through IK; and being equal in K and E, they will also be equal in G and F, after the descent through KG, and so on. Therefore since the motion begins in A, they will acquire equal velocities in descending through equal altitudes, that is in all correspondent points I and D, K and E, G and F, &c. and at B and C.

Cor. 1. Therefore if a body be suspended by a string, and by oscillating describes any curve AB; or it it is any way forced to move in any polished and perfectly smooth surface AB; whilst another body ascends or descends in a right line. Then if their velocities be equal at any one equal altitude; they will be equal at all other equal altitudes.—For the same thing is effected by the string of the pendulous body, as by the smooth surface of a polished body.

Cor. 2. Hence a body oscillating in any curve-line whatever, acquires the same velocity in the curve; as if it had fallen perpendicularly from the same height. And therefore the velocity in any point of the curve, is as the square root of the height descended.

Cor. 3. And a body after its descent through any curve, will ascend to the same height in a similar and equal curve, or even in any curve whatever. And the velocities will be equal at all equal altitudes. And the ascent and descent will be in the same time, if the curves are the same.—For the forces that generated the motion in descending will equally destroy it in ascending, and therefore they will lose equal velocities by ascending equal heights. And if the curves are similar and equal, every particle of the curve will be described with the same velocity, and therefore in the same time, whether ascending or descending.

Cor. 4. This Prop. is equally true, whether the curve AKB be in one plane perpendicular to the horizon, or in several planes IK, KG, &c. winding about in nature of a spiral.

PROP. 7. The times of descent through two similar parts of similar curves, are in the subduplicate ratio of their lengths *ab*, AB, fig. 18.—Divide both curves into an equal number of infinitely small parts, similar to each other; and let *bc*, BC, be two of them, similarly posited. And draw *rb*, RB, perpendicular to *ah*, AH. By art. 7, the space described is as the time and velocity, and the time of describing any space is as the space directly and velocity reciprocally. By Cor. 2, Pr. 6, the velocities in *b* and B are as $\sqrt{rb}$ and $\sqrt{RB}$, that is, because *arb*, ARB are similar, as $\sqrt{ab}$ and $\sqrt{AB}$, therefore the time of describing *bc*: to time of describing

ing BC:: $\frac{bc}{\sqrt{ab}} : \frac{BC}{\sqrt{AB}} :: \frac{ab}{\sqrt{ab}} : \frac{AB}{\sqrt{AB}} :: \sqrt{ab} : \sqrt{AB} :: \sqrt{ad} : \sqrt{AD}$, because the curves are similarly divided. Whence, by composition, the whole time of describing *ab*: whole time of describing AB:: $\sqrt{ab} : \sqrt{AB}$, or $\sqrt{ad} : \sqrt{AD}$.

Cor.

Cor. 1. Hence if two pendulums describe similar arches; the times of their vibrations, are as the square roots of their lengths, or the lengths as the squares of the times of vibration. For let hd , HD , be the lengths of the pendulums; then because the figures are similar, it is $ad : AD :: hd : HD$.

Cor. 2. If a pendulum vibrates in a circle, the velocity in the lowest point is as the chord of the arch it described in descending.

Cor. 3. The length of pendulums vibrating similar arches, are reciprocally proportional to the squares of the number of their vibrations, in a given time.

PROP. 8. If a pendulum vibrates in a cycloid, the time of one vibration, is to the time of a body's falling perpendicularly through half the length of the pendulum; as the circumference of a circle to the diameter. Let ADa , Plate CX. fig. 1, be the cycloid, FD its axis, FGD the generating circle. Let the body descend from H , and in vibrating describe the arch HDh . Divide HD into innumerable small parts, and let Bb be one of them. Through H , B , b , draw HMh , BL , bl , perpendicular to the axis FD , about the diameter MD describe the semi-circle MLD ; and from its centre Q , draw QL , also draw LP parallel to MD , and DE , DG , GE . The triangles CDG , GDE , are similar, and $CD \times DE = GD^2$; also the triangles QLN and ILP are similar, and $NL : PL :: QL : LL$, and $2NL : Nn :: MD : LL$. And since by the nature of the cycloid, the tangent in B is parallel to the arch GD , therefore Gg is equal and parallel to Bb . Now suppose a body to descend from E through the inclined plane ED ; since this is a motion uniformly accelerated, therefore (Art. 7,) it would, in the time of its fall, describe $2ED$, with the velocity acquired in D . And since (Art. 6,) the times are as the spaces directly, and velocities reciprocally; and (by Cor. 2, Prop. 6,) the velocities are as the square roots of the heights; therefore it will be, as time

of describing ED : time in $Cc :: \frac{2ED}{\sqrt{MD}} : \frac{Cc}{\sqrt{MN}} :: \frac{2MD}{\sqrt{MD}} ;$ or

$2\sqrt{MD} : \frac{Nn}{\sqrt{MN}} :: 2\sqrt{MD} \times MN : Nn$, by similar triangles.

Again, when the velocity is given, the time is as the space described, therefore it will be as time in Cc : time in $Bb :: Cc : Bb$; or $Gg :: CD : GD$, or $\sqrt{CD \times DE} :: \sqrt{CD} : \sqrt{DE} :: \sqrt{DN} : \sqrt{DM}$; by similar triangles, therefore ex equo, time in ED : time in $Bb :: 2\sqrt{MD} \times MN \times DN : Nn \sqrt{DM} :: 2\sqrt{MN} \times \overline{DN}$, or $2NL : Nn :: MD : LL$, therefore, by composition, it is as time in ED : time in the arch $Hb :: MD : arch ML$. And as the time in ED : whole time in $HD :: MD : semi-circumference MLD$. And since the time of descending through HD is equal to the time of ascending through Dh : And (by Prop. 5,) the time of descending through ED is equal to the time in the diameter FD , and $2FD = DV$ the length of the pendulum (being the radius of curvature in D); therefore as the time of falling through half the length of the pendulum FD : time in HDh , or time of one vibration :: diameter MD : circumference $2MLD$.

Cor. 1. Hence all vibrations great and small, are performed in the same time. For the descent through HD is always the same, wherever the point H is taken.

Cor. 2. The time of descent in HB , to the time of descent in HD ; is as the arch ML , to the semi-circumference MLD .

Cor. 3. The velocity of the pendulum in any point B , is as $\sqrt{DH^2 - DB^2}$, or $\sqrt{HB \times BDF}$.

Cor. 4. If the length of the pendulum VD , fig. 2, be made double the axis FD ; and ARV , arv , be two semi-cycloids equal to AHD , and so placed that the vertex as D be at A and a , then the pendulum VH vibrating between the cycloidal cheeks ARV , arv ; the point H will describe the cycloid $AHDha$; and $3,141592653589793238462643383279502884197169399375105821 \times$ time of falling through FD , half the length of the pendulum, will be the time of its vibration.

Cor. 5. Hence also it appears from experiments on pendulums, that at the surface of the earth, a heavy body will descend through a space of $16\frac{1}{2}$ English feet nearly, in one second of time. For

a seconds pendulum is 39.13 inches long; therefore $\frac{1}{3.1416} =$

time of a body's falling through FD or $\frac{39.13}{2}$ inches. And con-

sequently the space fallen through in one second will be $\frac{39.13}{2}$

$\times 3.1416^2 = 193,096$ inches $= 16.0913$ feet.

Cor. 6. Hence also if pendulums of the same quantity of matter, and unequal lengths be acted on by different forces of gravity; their lengths will be as the forces of gravity, and the squares of the times of vibration.

Cor. 7. From the motion of pendulums it also follows that in any one place, the quantity of matter in any body is proportional to its weight. For it is certain from experience that pendulums of equal length, whatever quantities of matter they contain, vibrate in the same time. Therefore they will descend through half the length of the pendulum in the same time; and consequently would acquire equal velocities in the same time. Therefore (by Art. 7,) the velocity and time being given, the quantity of matter is as the force of gravity.

OF THE CENTRES OF GYRATION, PERCUSSION, AND OSCILLATION.

(24.) *Def. 1.* The centre of gyration is that point of a body, revolving on an axis, into which, if the matter of the whole body were collected, the same angular velocity would be generated by the same moving force.

2. The centre of percussion is that point of a revolving body, which, striking against an immovable obstacle, the body will be in a state of equilibrium.

3. The centre of oscillation is that point in a vibrating body, into which, if the whole matter were collected, it would vibrate in the same time.

4. The angular motion of a body, or system of bodies, is the motion of a line connecting any point of the system, and the axis of motion, and is the same in all parts of the body.

Cor. 1. Hence the absolute velocities of the different parts of a body, or system of bodies, are as the distances from the axis of motion.

Cor. 2. When the angular velocities of bodies are different, they vary as the absolute velocities directly, and the distances inversely.

PROP. Let there be any system of bodies, A, B, C , Plate CX. fig. 3, considered without weight, and moveable about an axis passing through S ; and if any force f can generate the momentum m in a given time; if the same force act at P perpendicular to PS , the momentum generated in the system, in the same time, revolving about the axis at S , will be $\frac{A \times SA + B \times SB + C \times SC}{A \times SA^2 + B \times SB^2 + C \times SC^2} \times SP \times m$. For suppose PS perpendicular to the axis at

S , and to the line of direction PQ . And SA, SB, SC , perpendicular to the axis S . And suppose the force f divided into the parts p, q, r , acting separately at P to move A, B, C , then (by Cor. 3, Pr. Art. 13,) the bodies A, B, C , will be acted on respectively with the forces $\frac{SP}{SA}p, \frac{SP}{SB}q, \frac{SP}{SC}r$. Since the angu-

lar motion of the whole system is the same; the velocities of A, B, C , are as SA, SB, SC ; and their momenta as $A \times SA, B \times SB, C \times SC$; and these momenta are as their generating forces $\frac{SP}{SA}p, \frac{SP}{SB}q, \frac{SP}{SC}r$. Whence p, q, r , are as $\frac{A \times SA^2}{SP}, \frac{B \times SB^2}{SP}, \frac{C \times SC^2}{SP}$; put the sum of these $= s$, and since $p + q + r = f$, therefore $s : f :: \frac{A \times SA^2}{SP} : \frac{f \times A \times SA^2}{s \times SP} = p$. And $\frac{SP}{SA}p =$

$\frac{f \times A \times SA}{s} =$ force acting at A . Then $f : m :: \frac{f \times A \times SA}{s} : m \times A \times SA$

$\frac{m \times A \times SA}{s}$ = momentum of A. After the same manner

$\frac{m \times B \times SB}{s}, \frac{m \times C \times SC}{s}$ are the momenta of B and C. There-

fore the whole momentum generated in the system is,

$$\frac{A \times SA + B \times SB + C \times SC}{s} \times m.$$

Cor. 1. If you make $SO = \frac{A \times SA^2 + B \times SB^2 + C \times SC^2}{A \times SA + B \times SB + C \times SC}$,

then if all the bodies be placed in O, the momentum generated in the system, will be the same as before. But the angular velocity will be different. For the motion generated in these two cases will be

$$\frac{A \times SA + B \times SB + C \times SC}{A \times SA^2 + B \times SB^2 + C \times SC^2} \times SP \times m, \text{ and}$$

$$\frac{A + B + C \times SO}{A + B + C \times SO^2} \times SP \times m; \text{ and if these be supposed to be}$$

$$\text{equal, there comes out } SO = \frac{A \times SA^2 + B \times SB^2 + C \times SC^2}{A \times SA + B \times SB + C \times SC}.$$

Cor. 2. The angular velocity of any system A, B, C, generated in a given time, by any force f , acting at P, perpendicular to PS,

is as $\frac{SP \times f}{A \times SA^2 + B \times SB^2 + C \times SC^2}$. For the angular velocity of

the whole system is the same as of one of the bodies A. But the momentum of A is $= \frac{m \times A \times SA}{s}$, and the absolute velocity

of A $= \frac{m \times SA}{s}$; but the angular velocity is as the absolute ve-

locity directly, and the radius or distance reciprocally; therefore the angular velocity of A, and consequently of the whole system,

is as $\frac{m}{s}$, or $\frac{m \times SP}{A \times SA^2 + \&c.}$ that is (because m is as the force f) as

$$\frac{f \times SP}{A \times SA^2 + B \times SB^2 + \&c.}$$

Cor. 3. Hence there will be the same angular velocity generated in the system, and with the same force, as there would be in a single body placed at P, and whose quantity of matter is

$$\frac{A \times SA^2 + B \times SB^2 + C \times SC^2}{SP^2} \text{ For let P = that body, then (by}$$

Cor. 2.) since f and SP are given; the angular velocities of the system and body P, will be to one another as,

$$\frac{1}{A \times SA^2 + B \times SB^2 + \&c.} \text{ to } \frac{1}{P \times SP^2}, \text{ which, being supposed}$$

$$\text{equal, we shall have } P = \frac{A \times SA^2 + B \times SB^2 + C \times SC^2}{SP^2}$$

Cor. 4. The angular motion of any system generated by an uniform force, will be a motion uniformly accelerated.

(25.) PROP. To find the centre of gyration of a body, or system of bodies. Let R, fig. 4, be the centre of gyration, and let the force f act at P. Then (Cor. 2, Pr. Art. 24.) the angular velocity generated in the system by the force f will be as,

$$\frac{SP \times f}{A \times SA^2 + B \times SB^2 + C \times SC^2, \&c.}, \text{ and in the system placed in}$$

R, it will be $\frac{SP \times f}{A + B + C \times SR^2}$; and if these velocities be made

equal, we shall have the distance of the centre of gyration R, from the axis of motion at S, that is, $SR =$

$$\sqrt{\frac{A \times SA^2 + B \times SB^2 + C \times SC^2}{A + B + C}}.$$

Cor. If each of the particles, A, B, C, &c. be denoted by p , and the several distances AS, BS, &c. by Sp , as in fig. 5, then

$$SR^2 = \frac{\text{sum of all the } p \times Sp^2}{\text{body } b}, \text{ that is, } SR^2 = \frac{sp \times Sp^2}{\text{body } b}, \text{ where } s$$

denotes the sum of all the products of the quantity subjoined, that is, of all the $p \times Sp^2$.

(26.) To find the centre of percussion of a body or system of bodies. Let the body revolve on an axis SB, fig. 6, and let MN be a section of the body passing through the axis SB, and the centre of gravity G, from any particle of the body let a perpendicular be drawn to this plane, and meet it in n , and suppose P the centre of percussion to be determined. Draw SG, Cn, and BP, perpendicular, and PO parallel to SB; also draw pn perpendicular to Cn, and equal to the distance of the particle from the plane MN; join Cp, and make pm perpendicular to it; produce pn to a . Then Cp will be the distance of the particle from the axis of motion, and will be therefore as its velocity; hence its momentum will be as $p \times Cp$, and if the plane Cpm be conceived at right angles to the plane MN, pm will be the direction of this force; but, by the resolution of forces, this force will be to that part of it, which acts on the plane, MN, as pm to pn , that is, as Cp to Cn; therefore the force of the particle p acting at m in a direction perpendicular to the plane MN is properly represented by $p \times Cn$; hence by the property of the lever, the efficacy of this force to move the body round PO is $p \times Cn \times Dm = p \times Cn \times CD - Cm$, when m is above D, and $= p \times Cn \times Cm - CD$ when m is below D. Hence when the body inclines neither way on OP, the sum of all the $p \times Cn \times CD - Cm =$ sum of all the $p \times Cn \times Cm - CD$, or $sp \times Cn \times CD = sp \times Cn$ = (because $Cn : Cp :: Cp : Cm$) $sp \times Cp^2$; hence $CD \times Cn = SO$

$$= \frac{sp \times Cp^2}{sp \times Cn}; \text{ but (by Prop. 2, cor. 3, art. 22.) } sp \times Cn =$$

$$\text{body } b \times SG; \text{ therefore } SO = \frac{sp \times Cp^2}{\text{body } b \times SG} = \text{the distance of}$$

the centre of percussion from the axis of motion. Again the effect of the force $p \times Cn$, to turn the body on the line BP is $p \times Cn \times SB - an$, when m is to the right of BP, and $p \times Cn \times an - SB$, when m is to the left; hence in case of an equilibrium on BP, $sp \times Cn \times an - SB = sp \times Cn \times SB - an$, or $sp \times Cn \times SB = sp \times Cn \times an$, that is, $SB = PO = \frac{sp \times Cn \times an}{sp \times Cn} = \frac{sp \times Cn \times an}{\text{body } b \times SG} =$ the distance of the centre of percussion from the vertical line passing through the centre of gravity. It is to be observed, that when m falls on the contrary side of SG, an is negative; and when m falls above SB, Cn is negative.

Cor. 1. When in every plane, passing through SG, the particles are situated alike on each side of SG, the centre of percussion will be in the vertical line SG at O. For in that case the negative quantities an will be equal to the positive ones, and OP will vanish.

Cor. 2. If Gw be drawn parallel to SB, and from the particle p a line be drawn to w , then by geometry $Cp^2 = Cw^2 \times wp^2 \times (2Cw \times wn)$ and the rectangle is negative when n falls on the contrary side of w ; hence by Pr. 2, Cor. 3, art. 22.) the sum of all the rectangles $2Cw \times wn = 0$; therefore $sp \times Cp^2 = sp \times Cw^2 \times wp^2 \times wn^2 = \text{body } b \times SG^2 \times sp \times wp^2$; substitute this quantity in the numerator of the above value of SO, and it gives

$$SO = \frac{\text{body } b \times SG^2 \times sp \times wp^2}{\text{body } b \times SG} = SG \times \frac{sp \times wp^2}{b \times SG}; \text{ that is,}$$

the distance of the centre of percussion is greater than the distance of the centre of gravity from the axis of motion, and that excess,

$$\text{viz. } GO = \frac{sp \times wp^2}{\text{body } b \times SG}.$$

Cor. 3. Hence $SG \times GO = \frac{sp \times wp^2}{\text{body } b}$, that is, since the body

and Gw remain the same, $SG \times GO$ is a constant quantity wherever the axis of motion is taken parallel to Gw . Hence GO is reciprocally as SG .

(27.) PROP. To find the centre of oscillation of a body or system of bodies. Let ABD , fig. 7, be a plane passing through the centre of gravity G of the body, and perpendicular to the axis of suspension which passes through S ; and conceive the whole body to be projected upon this plane in lines perpendicular to it or parallel to the axis. Let O be the centre of oscillation; draw Sv parallel to the horizon Om , Gg , and pr , perpendicular to it. Then by the property of the lever, the force of gravity to turn the particle p about $S \propto p \times Sr$; hence the force of gravity to turn the whole body about $S \propto$ the sum of all the $p \times Sr$; hence (Cor. 2, Pr. Art. 24,) the angular velocity generated by all these

forces $\propto \frac{sp \times Sr}{sp \times Sp^2}$. Also the angular velocity generated by the

force of gravity on a particle at $O \propto \frac{p \times Sm}{p \times SO^2}$, or $\frac{Sm}{SO^2}$ or $\frac{SG \times SO}{SO^2}$ (because of the similar triangles SmO , SgG .) But by hyp. the vibrations in both cases are performed in the same time; therefore

$\frac{Sg}{SG \times SO} = \frac{sp \times Sr}{sp \times Sp^2}$, hence $SO = \frac{Sg}{SG} \times \frac{sp \times Sr}{sp \times Sp^2}$. but from the nature of the centre of gravity $sp \times Sr =$ body $\times Sg$, therefore $SO = \frac{body \times Sg}{SG}$, which is the same ex-

pression which we obtained for the distance of the centre of percussion from the axis of motion.

Cor. 1. Hence the distances of the centres of percussion and oscillation from the axis of motion are equal, and when the former is in the line of direction the two points coincide.

Cor. 2. Let SO , fig. 5, be the distance of the centre of percussion or oscillation, and SR that of gyration, then (cor. art. 25,) $SR^2 = \frac{sp \times Sp^2}{body}$, and by the above $SO \times SG = \frac{body}{SG}$, therefore $SO \times SG = SR^2$, and $SO : SR :: SR : SG$, that is, the distance of the centre of gyration from the axis of motion is a mean proportional between the distances of the centre of gravity and oscillation from the same axis.

Of the Projectile and Central Forces by which Bodies describe Circles, or any Species of Circular Motion; a Comparison and Computation of the Forces, Velocities, and periodical Times.

(28.) Let C , Plate CX. fig. 9, be any large attracting body, A any less body attracted by it at the distance AC ; again, suppose a projectile force impressed on the body A in the direction AH , perpendicular to AC , and in such proportion to the attractive force of C , as that the body being at liberty, and urged by both, may describe the circle $AFPBA$ about the central body C . Let $AF = z$, be the fluxionary arch described in the first moment; and from F let fall the perpendiculars FE , FG , on the right lines AC , and AH ; then will AG be to $AE (= GF)$, as the projectile force to the attractive force, at the distance AC . Which latter force is called the centripetal force, as being thereby carried towards the centre of attraction C . Draw the radius CF , and the chords AF and BF , and put $ACE = x$, and $AB = d$. Then by the nature

of the circle, $AB : AF :: AF : AE = \frac{AF^2}{AB}$: Now because the sine FE , the arch AF , the chord AF , and the tangent AG , are all equal to each other in their first, or nascent state; therefore $\frac{AF^2}{AB}$ will in

that case be $= \frac{z \cdot z}{d} = x$; whence $x : z :: z : d$: the centrifugal force: the projectile force; and because z is infinitely less than d , therefore z the projectile force does infinitely exceed x , the central force in circular motion. In any other circle ILD ,

the same things are represented by Roman symbols $\frac{z \cdot z}{d} = x$; then we have $x : z :: z : d$:

$\frac{z \cdot z}{d} \propto \frac{z \cdot z}{d}$; that is, the central forces in two different circles, are

as the squares of the projectile forces, or circular velocities applied to the diameters of the circles. Let F, f , represent the central forces x, x ; V, v , the circular velocities z, z ; T, t , the periodical times, D, d , the diameters, or radii; P, p , the peripheries of

the circles. Then from the above we have $\frac{x \cdot z \cdot z}{d} = \frac{x \cdot z \cdot z}{d}$ or $\frac{F \cdot V \cdot V}{d} = \frac{f \cdot v \cdot v}{d}$; hence $F : f :: V^2 \times \frac{1}{d} : v^2 \times \frac{1}{d}$, that is, as above, the

forces are as the squares of the velocities directly, and as the diameters reciprocally. If the bodies I and A so move as to describe equal areas in equal times, (viz. $I L C = A C P$.) that is, if $d \cdot z = d \cdot z$, then $z : z :: d : d$; and so $z^2 : z^2 :: d^2 : d^2$; conse-

quently $x : x :: \left(\frac{z^2}{d} : \frac{z^2}{d} \right) :: \frac{d^2}{d} : \frac{d^2}{d} :: d^3 : d^3$. That is, the cen-

trifugal forces are reciprocally as the cubes of the diameters, (or radii) of the circles. If $D = d$, then $F : f :: V^2 : v^2$; or the forces are directly as the squares of the velocities in the same circle. If

$V = v$; then $F : f :: \frac{1}{D} : \frac{1}{d} :: d : D$; or the forces are inversely

as the distances or diameters, when the velocities are equal. Since the motion in a circle is equable, the spaces will be as the times; and therefore when T is given $P \propto V$, and when V is given $P \propto$

T ; hence when both are variable $T \cdot V \propto P$, and so $V \propto \frac{P}{T} \propto \sqrt{DF}$ (because $z = \sqrt{dx}$; therefore $P^2 \propto T^2 DF \propto 3.1416^2 DD$;

whence $T^2 F \propto 3.1416^2 D$; and since 3.1416^2 is a constant Quantity,

$F \propto \frac{1}{T^2}$; or $F : f :: \frac{1}{T^2} : \frac{1}{t^2}$; that is, the central forces in different cir-

cles will be as the diameters directly, and reciprocally as the squares of the periodical times. When $T = t$, then $F : f :: D : d$; that is, when the periodical times are equal, the central forces are as the distances from the centre directly. When $D = d$, $F : f :: t^2 : T^2$; or the forces are reciprocally as the squares of the periodical times

in the same circle. If $F = f$, then $\frac{D}{T^2} = \frac{d}{t^2}$, so $T : t :: \sqrt{D} :$

$\sqrt{d}$; that is, the periodical times are in the subduplicate ratio of

the distances, when the forces are equal. Also then we have $\frac{V^2}{D}$

$= \frac{v^2}{d}$; and so $V^2 : v^2 :: D : d$; or the squares of the velocities are

as the distances directly from the centre. Hence also $T : t :: \sqrt{D} : \sqrt{d}$; that is, when the central forces are equal

in two different circles, the periodical times will be as the velocities. Again; when $V = v$, we have $T : t :: (P : p ::) D : d$; that is, when the velocities are equal, the periodical times will be

as the diameters directly. And when $D = d$, then $T : t :: v : V$; that is, in the same circle the times will be inversely as the velocities. Since when $F = f$, we had $T : t :: \sqrt{D} : \sqrt{d}$; and when

$V = v$, we had $T : t :: D : d$; therefore when neither F nor V are given, it will be $T : t :: D \cdot \sqrt{D} : d \cdot \sqrt{d}$, or $T^2 : t^2 :: D^3 : d^3$; that is, the squares of the periodical times are universally as the

cubes of the distances of bodies circulating about the same centre

C. Or thus more generally; let $F : f :: D^m : d^m :: \frac{D}{T^2} : \frac{d}{t^2}$

whence

whence $d^n D t^2 = D^n d T^2$; or $d^{n-1} t^2 = D^{n-1} T^2$, and so $T : t :: d^{\frac{n-1}{2}} : D^{\frac{n-1}{2}}$. Now if $m = 0$;

then $T : t :: D^{\frac{1}{2}} : d^{\frac{1}{2}} :: \sqrt{D} : \sqrt{d}$; as before when $F = f$. When $m = 1$, then $T : t :: D^{\frac{3}{2}} : d^{\frac{3}{2}} :: 1 : 1$, viz. when the forces are as the distances, the times of the periods will be equal, in any circles whatsoever. Lastly, if $m = -2$; then $T : t :: D^{\frac{3}{2}} : d^{\frac{3}{2}}$, or $T^2 : t^2 :: D^3 : d^3$; but in this case $F : f :: D^{-2} : d^{-2} :: d^2 : D^2$; that is, when the centripetal forces are inversely as the squares of the distances, then will the squares of the periodical times be as the cubes of the distances. And this is that universal law of nature which is found to obtain in the motions of all the heavenly bodies.

In the above theorems and analogies, we have exhibited the ratios of the forces, velocities, and times of revolution, in different orbits; but to express them in their proper measures for any given orbit whose radius is r , we must proceed in the following manner. The force is measured by the velocity that may be uniformly generated in a given time, 1, which let us expound by the power r^n (the n the power of the radius (r)). Then the distance through which a body will freely descend in the same time will be expressed by $\frac{1}{2} r^n$. Therefore if AF be an arch described in the time (t), the distance AE descended in that time, will be found by

this analogy; as $1^2 : T^2 :: \frac{1}{2} r^n : \frac{T^2 \times \frac{1}{2} r^n}{1^2} = AE$. Now from

the nature of the circle, we have $AF^2 = AB \times AE = 2 AC \times AE = 2 AE \times AC = \frac{T^{2n} r^{n+1}}{1^2} \times r = \frac{T^{2n} r^{n+1}}{1^2}$, there-

fore $AF = \frac{\sqrt{T^{2n} r^{n+1}}}{1^2} = \frac{T \times r^{\frac{n+1}{2}}}{1^2} = \text{Space described in}$

the circle in the time t . But in equable motions, the spaces described with a given velocity (r^n) will be as the times; therefore

$T : T r^{\frac{n+1}{2}} :: 1 : r^{\frac{n+1}{2}}$ = the true measure of the celerity in the circle.

Then by putting $q = 3,14159$, &c. we shall have $r^{\frac{n+1}{2}} : 2rq :: 1 : 2qr^{\frac{1-n}{2}}$ = the true measure of the periodical time.

To find the space S through which a body must descend, to

acquire the velocity $r^{\frac{n+1}{2}}$, we have $r^{2n} : r^{n+1} :: \frac{1}{2} r^n : S = \frac{\frac{1}{2} r^{2n} + 1}{r^{2n}} = \frac{\frac{1}{2} r \times r^{2n}}{r^{2n}} = \frac{1}{2} r$. The velocity in the circle there-

fore is acquired by a descent through half the radius.

To accommodate these expressions for use; suppose the force to be that of gravity; then its measure $r^n = 2s = 32\frac{1}{2}$ feet, because it is known by experiment, that $\frac{1}{2} r^n = s = 16\frac{1}{2}$ feet for the descent in the first second of time. Therefore $r^{n+1} = \frac{n+1}{2s} r$, and $r^{\frac{n+1}{2}} = \sqrt{2sr}$ = the velocity per second, in any given circle whose radius is (r).

Again, $\sqrt{2sr} : 2rq :: 1 : \frac{2rq}{\sqrt{2sr}} = \frac{\sqrt{2r}}{s} = T$, the periodical time; because $2r = D$, the diameter, and $2rq = C$ = the circumference of a circle, therefore $\sqrt{Ds}$ = velocity, and

$\sqrt{\frac{qC}{s}}$ = periodical time; which expressions are now in the most simple forms.

In any circle, whose diameter is d , and t the time of revolution in seconds, then the central force in such a circle may be

compared with gravity. For since $\sqrt{\frac{qC}{s}} = T$, we have

$\frac{D}{T^2} : \frac{d}{t^2} :: F : f$, that is, (supposing gravity, or $F = 1$) $\frac{Ds}{qC} : \frac{d}{t^2} :: 1 : f$, the central force required.

For example, suppose A , (fig. 10,) a ball of one ounce, whirled about the centre C , so as to describe the circle $ABDE$, and each revolution be made in half a second; and let the length of the cord AC be two feet. Then $t = \frac{1}{2}$, and $d = 4$, and $\frac{q^2}{s} = 0.6136$;

therefore $\frac{q^2 d}{stt} = 9.818$ = the central force, or that by which the string AC is stretched, viz. ten ounces nearly.

If the string and ball be suspended from a point D , (fig. 11,) and describe in its motion a conical surface ADB ; then putting $DC = h$, $AC = r$, and $AD = g$; and putting $F = 1$, the force of gravity, as before; then will the body A be affected with three forces, viz. gravity acting in the direction DC , a centrifugal force, in the direction CA , and the tension of the string, or force by which it is stretched in the direction DA ; hence these three powers will be as the three sides of the triangle CAD respec-

tively, and therefore as $CD (=h) : AD (=g) :: 1 : \frac{g}{h}$ = tension of the string compared with the weight of the body.

And $CD (=h) : CA (=r) :: 1 : \frac{q^2 d}{stt}$, that is, $h : r :: 1 :$

$\frac{2q^2 r}{stt}$, whence $\frac{2q^2 r h}{stt} = r$, therefore $2h \times q^2 = stt$; and so

$t = q \sqrt{\frac{2h}{s}}$, or because $\frac{2q^2}{s} = 1.2272$, we have $t = 1.108 \sqrt{h}$ = to the periodical time.

Since the mean distance of the moon is nearly 60 semidiameters of the earth, or 1257696000 feet; if C be the earth and A the moon, (Plate CX. fig. 9,) then will $AB = 2515392000$; and the circumference of her orbit $AFBA = 7897834330$, which is described in $27^d : 7^h : 43^m = 2360580''$. Hence the feet passed over in one second will be $3346 = AF = V$. Therefore $AF^2 = 11128976$;

whence $\frac{11128976}{2515392000} = 0.00443 = AE$, the distance through which

the moon would descend in the time of one second, if the circular motion were to cease. Now on the earth's surface bodies descend in the same time $16\frac{1}{2}$ feet; but $0.00443 : 16.14 :: 1 : 3643$; which is very near as 1 to 3600, the squares of the distances from the earth's centre reciprocally; and therefore confirms the law of central forces above laid down.

Again, since $T^2 : t^2 :: D^3 : d^3$, we have as $D^3 = 60^3 : d^3 = 1^3 :: T^2 = 2360580^2 : \frac{2360580}{60^{\frac{3}{2}}} = t = 83' : 53''$, the periodical time at the earth's surface.

And since when $D = d$, we had $T^2 : t^2 :: f : F$; therefore as $24^h = 1440^2$, the square of the time of the earth's diurnal rotation is to 84^2 , the square of the periodical time when the force is equal to gravity, so is 1 to $\frac{1}{293.8}$, or so is 293.8 to 1 = the central force on the surface of the earth arising from the rotation. Hence

Hence the centrifugal force, viz. that by which bodies endeavour to fly off from the earth's surface directly from its centre, is to gravity, nearly as 1 to 293.8 under the equator.

But at all distances from the equator to the pole, this centrifugal force continually diminishes in the ratio of the velocities of the places; but these velocities are as the distances from the earth's axis, or as the co-sines of the latitude; therefore the centrifugal force is every where to gravity as the co-sine of the latitude to 293.8; the radius being = 1.

(29.) *The general Doctrine of Trajectories, or Orbits described about a Centre, by a Given Force tending to that centre, and compounded with that variable Projectile Force: also of the Proportionality of Areas and the Times in which they are described.*

Since at any distance from the centre the projectile force, by which it may describe a circle, is determined as above, that force may be made the standard for comparison, by which the quantity of other forces, describing other curves, may be discovered; as we shall shew in the following easy and perspicuous method.

Let a body be projected from the point A, (fig. 12,) with such a velocity $AC = v$, as compounded with the centripetal force AE , may cause it to describe a circle AKP about the centre of force S . Then let it be projected from the same point, and in the same direction AX , with any other degree of velocity $AD = n$, to determine the curve it will describe.

By supposition AX is perpendicular to AS , let Eab be drawn parallel to AX , cutting the circle and curve in the points a and b . Put $AS = d$; the semi-transverse diameter = a , the semi-conjugate = b ; and $AE = x$. Then will $\sqrt{2dx - x^2} = y = Ea$ in the circle; and $\frac{b}{a}\sqrt{2ax \mp x^2} = y = Eb$, in the conic section.

Now the fluxions of the ordinates Ea and Eb , viz. $\frac{d - x \times \dot{x}}{\sqrt{2dx - x^2}}$,

and $\frac{b}{a} \times \frac{a \mp x \times \dot{x}}{\sqrt{2ax \mp x^2}}$ will be as the velocities in every point of

the curves in the direction AX ; but these fluxions are as $\frac{d - x}{\sqrt{2d - x}}$

and $\frac{b}{a} \times \frac{a \mp x}{\sqrt{2a \mp x}}$, (dividing each by $\frac{\dot{x}}{\sqrt{x}}$;) and therefore

when $AE = x = 0$, then the ratio of these fluxions will become $\frac{d}{\sqrt{2d}} : \frac{b}{a} \times \frac{a}{\sqrt{2a}}$, or as $\sqrt{d} : \frac{b}{\sqrt{a}}$ in the point A. Conse-

quently $\sqrt{d} : \frac{b}{\sqrt{a}} :: 1 : n$; and so $n\sqrt{d} = \frac{b}{\sqrt{a}}$, and therefore

$nnd = \frac{bb}{a}$. Whence $nna d = b b$. But since $\frac{b}{a} \sqrt{2ax \mp x^2}$

$= y = \frac{b^2}{a}$ (when $x = d$); therefore $2ad \mp d^2 = b^2 = n^2ad$; hence

$a = \frac{\mp d}{n^2 - 2}$; and $b = \frac{\mp nd}{\sqrt{n^2 - 2}}$, from which the kind of conic

section is given. Since in the ellipse $2a - d = \frac{b^2}{d}$; and in the

hyperbola $2a + d = \frac{b^2}{d}$; and in the parabola $2a = \frac{b^2}{d} =$ an inde-

finite quantity. If we put $n^2 = AF^2 = 2$, the equation above for

(a,) will be $a = \frac{\mp d}{0}$; whence a is infinite; and therefore the

curve described with a velocity in the vertical point, which is as $\sqrt{2} = n$, will be a parabola AMR .

If n be less than 2, then it is plain that a will be affirmative and b negative, or $+a$, and $-b$; and therefore the curve described will be an ellipsis. If n be greater than 1, that is, if $Eb = AD$, be greater than $Ea = AC$, then will the ellipsis ALQ be without the circle, and the centre of force in the upper focus. But if n be less than 1, or $Eb = AB$ less than $Ea = AC = 1$, then will the ellipsis AIO be described within the circle, and have the centre of force S in its lower focus. Lastly, when $n = 0$, the body A will descend in a right line AS to the centre of force S .

If n be greater than 2, then will d be affirmative, or $+d$; and consequently the curve ANT described will be an hyperbola.

Hence it appears, that the curves described with all degrees of velocity n , between 0 and $\sqrt{2}$, will be ellipses, (for the circle described with the velocity $n = 1$, is really one species of ellipses) and all the velocities from $\sqrt{2}$ to infinity will produce trajectories of the hyperbolic kind, by a centrifugal force. The parabola with the velocity $= \sqrt{2}$ being the common limit between them.

In any determinate orbit, described as above-mentioned, the areas generated by a right line connecting the centre and revolving body, will always be proportional to the times in which they are described: the velocity in any part of the orbit; the times of describing equal parts, or arches; and the expression of centripetal force every where, may all be determined and demonstrated in a general manner, as follows:

Let S , (fig. 13,) be an immovable centre of force or attraction, and A any body, urged by a projectile and centripetal force conjointly. In the point A let the projectile force be such, as would carry the body through the space AB in an indefinitely small particle of time; then in the same time it would describe $BF = AB$, were it not drawn from the tangent AF to some other point C , by the centripetal force FC , acting in a direction parallel to BS . In like manner, in the third equal particle of time, it would describe $CH = CB$, but is drawn to the point D by the centripetal force HD in a direction parallel to CS ; and so on.

Now all these triangular areas ASB , BSC , CSD , DSE , &c. described about the centre S in equal times, are equal to each other. For joining SE , the triangle ASB is equal to the triangle BSF , as being upon equal bases and of the same perpendicular altitude. Also the triangles $BSF = BSC$; as being both on the same base BS , and between the same parallels BS and CF ; therefore the triangles $ASB = BSC$. In the same manner the triangle CSD is equal to BSC , and therefore to ASB ; and so of all the rest; whence the proposition is evident.

Hence, when the particles of time, or the spaces AB , BC , &c. are taken infinitely small, the polygon $ABCDE$, &c. will become a curve; and the areas described by any radius AS will be always proportional to the times of their description.

And it is evident that the velocities in the different parts of the curve are as the lines AB , BC , CD , &c. that is, the velocity at C is to the velocity at E as CD to BE , but because of the equal triangles CSD and ESK , CD is to BE as the perpendicular SM to SN ; that is, the velocities in every part of the orbit of the revolving body are reciprocally as the perpendiculars let fall from S to the tangents of the orbit in those points.

And because triangles upon equal bases are as their altitudes, it follows, that the times in which equal parts, or arches of the orbit, are described, are directly as those perpendiculars to the tangents. Draw AG , GC , parallel to BC , BF ; then will $BG = FC$, be as the centripetal force in the point B , and because the diagonal AC bisects BG in Q , and this is every where the case; therefore in every part of the orbit the centripetal force will be as the sagitta BQ of the indefinitely small arch ABC . From what has been said, it follows, that every body, which moves in a curve about an immovable point S , and describes areas as above, proportional to the times, is urged by a centripetal force tending to that point. For such a body in the point B is drawn from the tangent by a force which acts in the direction of a line parallel to CF , that is, in the direction BS ; and in the point C it acts in some line parallel to HD , viz. in the line CS ; and therefore in every point, it acts in lines tending to the centre S . But if the areas are not proportional to the times, it is evident that CF , HD , &c. are not parallel to BS , CS , &c. and therefore the direction of the centripetal force is not to the fixed point S ; but to some other uncertain and variable point, on this side or that, as the areas described,

described in equal times increase or decrease, as is evident from the construction of the figure. It is a problem of great importance in astronomy, to determine the law of the centripetal force, when it is directed to some point in the axis of a conic section; and this may be easily done by a fluxionary process as follows: let VAB, fig. 14, be a part of the curve, TVC its axis, C the centre, S a point in the axis to which the revolving body tends, A the place of the body, AB the arch described in an indefinite small part of time; AD = y , an ordinate, VD = x , the absciss belonging thereto, AT a tangent, and AS the distance of the body: DH a line drawn parallel to AS. Let VS = d , AS = z ; the semi-transverse diameter (a), the semi-conjugate (b); and let the absciss VD (= x) flow uniformly, so that its fluxion $\dot{x}$ = Aa , may be constant; while the fluxion of the ordinate AD, viz. Ba = $\dot{y}$, is variable. Then the equation of the conic section being

$$2ax \mp xx = \frac{a^2}{b^2} yy, \text{ we have } 2a\dot{x} \mp 2x\dot{x} = \frac{a^2}{b^2} 2y\dot{y};$$

$$\text{and so } \dot{x} = \frac{a^2 y \dot{y}}{a^2 y^2 \mp b^2 x^2}. \text{ Also } Aa : cg :: AD : TD; \text{ that is,}$$

$$\dot{x} : \dot{y} :: y : TD, \text{ the sub-tangent. Therefore } TD = \frac{\dot{y}}{\dot{x}} = \frac{a^2 y \dot{y}}{a^2 y^2 \mp b^2 x^2} \times \frac{y}{\dot{y}} = \frac{a^2 y^2}{a^2 y^2 \mp b^2 x^2} = \frac{a^2}{b^2} \times \frac{1}{a \mp x}$$

$$= \frac{1}{a \mp x} \times \frac{2ax \mp xx}{2ax \mp xx} = \frac{2ax \mp xx}{a \mp x}.$$

$$\text{Again, } DT - VD = VT = \left(\frac{2ax \mp xx}{a \mp x} - x \right) = \frac{ax}{a \mp x};$$

$$\text{therefore } TS = \frac{ax}{a \mp x} + d = \frac{ax + ad \mp dx}{a \mp x}; \text{ and by reason of the similar triangles TSA, and TDH, we have } TS =$$

$$\frac{ax + ad \mp dx}{2ax \mp xx} : AS = z :: DT = \frac{ax}{a \mp x} : DH$$

$$= \frac{ax + ad \mp dx}{z \times 2ax \mp x^2}.$$

$$\text{And lastly, } DS = d - x : DA = y :: Aa = \dot{x} : ac = \frac{y \dot{x}}{d - x};$$

$$\text{and so } Bc = \dot{y} + \frac{y \dot{x}}{d - x} = \frac{\dot{y}d - \dot{y}x + y \dot{x}}{d - x}; \text{ now the triangle } Bbc \text{ is similar to } Scd, \text{ and therefore to } SAD, \text{ whence}$$

$$SA : SD :: Bc : Bb; \text{ and so } \frac{SD \times Bc}{2} = \frac{SA \times Bb}{2}$$

$$= \frac{\dot{y}d - \dot{y}x + y \dot{x}}{2} = \text{area of the triangle ASB, which is the fluxion}$$

$$\text{of the area SVA, or the space that is uniformly described in the same time with } \dot{x}.$$

$$\text{And because } y = \frac{b}{a} \sqrt{2ax \mp xx}, \text{ we have } \dot{y} = \frac{b \dot{x} \times (a \mp x)}{a^2 b \dot{x}}$$

$$; \text{ and } \dot{y} = \frac{b \dot{x}}{2ax \mp xx}; \text{ therefore these values of } y \text{ and } \dot{y} \text{ substituted in the above found area, will bring it}$$

$$\text{to this expression } \frac{b \dot{x} \times ax + ad \mp dx}{2a \sqrt{2ax \mp xx}} \text{ for the time of describing the constant space } \dot{x}; \text{ or, if } a \mp x = m, \text{ and } \sqrt{2ax \mp xx} = n, \text{ the said area or time will be abridged to this form}$$

$$\frac{b \dot{x} \times ax + ad \mp dx}{2an}.$$

$$\text{Then since the body arrives at the point A with the velocity } \dot{x} \text{ in the direction of the axis VS, and with the velocity } \dot{y} \text{ in the direction of the ordinate DA; let DA be continued on, and take}$$

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$Ae = \dot{y}$, and complete the parallelogram ea . And since the absciss flows uniformly, the body will arrive at the point with a velocity which will still be as $\dot{x}$, or the space Aa uniformly described in that time in the direction VS: but the velocity with which it arrives at B in the direction dB or AD is different from $\dot{x}$, or Ae ; and is $\dot{y} \mp \dot{q} = Ba$, and so $\dot{y} - Ba = \mp \dot{q} = Bg$, which differential quantity being the variation of the fluxion $\dot{y}$,

$$\text{will be the second fluxion of } y, \text{ or } \ddot{y} = \mp Bg \frac{ab \dot{x}}{2ax \pm xa^2} =$$

$$\frac{ab \dot{x}^2}{n \sqrt{n}}, \text{ and therefore will be as the space passed over in the direction AD or } dB, \text{ in the same time with } \dot{x} \text{ by a uniform velocity, generated in that time in the fluxion } \dot{y}.$$

$$\text{Since then we have the space } \frac{ab \dot{x}^2}{n \sqrt{n}} \text{ passed over in the indefinite particle of time } \frac{b \dot{x} \times ax + dm}{2an}, \text{ we can find the}$$

$$\text{space passed through in the constant particle of time } = t, \text{ in the direction DA, by the following analogy of the squares of the}$$

$$\text{times to the spaces, viz. As } \frac{b^2 \dot{x}^2 \times ax + dm^2}{4a^2 n^2} : 1^2 :: \frac{ab \dot{x}^2}{n \sqrt{n}}$$

$$: \frac{b \sqrt{n} \times ax + dm^2}{4a^3} = \text{space described in the given particle}$$

$$\text{of time } = t, \text{ by the velocity that is uniformly generated in that time in the body A, in the direction AD.}$$

$$\text{Lastly, since the spaces run over in equal times are as the velocities, and the velocities as the forces by which they are generated; it is evident, the force by which the body is urged in the direction AD must be every where, or in any given particle of}$$

$$\text{time, proportional to the space } \frac{b \sqrt{n} \times ax + dm^2}{4a^3}, \text{ which distance or force let be represented by } Ak, \text{ and through } k \text{ draw } ik$$

$$\text{parallel to the tangent TA. Then will the force } Ak \text{ be resolved into the two forces } ki, \text{ and } Ai; \text{ of which the latter is in the direction of AS, and therefore the same with the centripetal force by which the body A tends to S, in every equal or given moment of time. And because the triangle } Aki \text{ is similar to } Dkl, \text{ and therefore to } ADH, \text{ we have the following analogy for the expression of the force } Ai, \text{ viz. As } AD = \frac{b \sqrt{n}}{a} : DH = \frac{zn}{ax + dm^2} ::$$

$$\frac{4a^3}{b \sqrt{n} \times ax + dm^2} \cdot \frac{4a^4 z}{b^2 \times ax + dm^3} = Ai, \text{ the centripetal force required.}$$

$$\text{Because } \frac{4a^4}{b^2} \text{ is a constant quantity, the said centripetal force will be every where as } \frac{z}{ax + dm^3} = \frac{x}{ax + ad \mp dx^3} =$$

$$\frac{AS}{DC^3 \times TS^3}; \text{ because } DC = a \mp x.$$

$$\text{If now we suppose } d = a, \text{ or VS = VC, then will the centre of force be in the centre of the curve, and in the ellipsis we have}$$

$$\frac{z}{ax + da - dx^3} = \frac{z}{ax + aa - ax^3} = \frac{z}{a^6} = z, \text{ (because we may put } a = 1.) \text{ Also in the hyperbola, because } a \text{ is negative, or } -a, \text{ we have } -ax - da + dx = ax - aa^2 + ax = -a^2; \text{ and so the force will in this case also be as } -z. \text{ In the parabola, } a \text{ will be infinite, and } ax \text{ and } \pm dx \text{ will vanish out of}$$

$$\text{the equation, and leave only } \frac{z}{a^2} : \frac{z}{1} : z, \text{ as before. And}$$

$$6 A$$

$$\text{therefore}$$

therefore in every section the force will be directly as the distance SA.

If the centre of force be in the vertex of the curve V, then $d = 0$; and the force will be every where as $\frac{z}{x^3}$. When the ellipsis

becomes a circle, then $x = \frac{z^2}{2a}$, and the force is every where as $\frac{8a^2}{z^5}$, or inversely as the fifth power of the distance from the vertex. But if the centre S be removed to an infinite distance, then will the force be as $\frac{z}{a d + d^2 x^3} = \frac{1}{a + x^3} \times \frac{z}{d}$; but $\frac{z}{d} = 1$, as being each infinite and equal; whence, in this case, the force will be every where as $\frac{1}{DC^3}$.

If the centre of the force be placed in the focus of the section; then (per conics) we shall have $AS = \sqrt{AD^2 + DS^2} = \frac{ax + a d + d x}{a} = z$; and therefore $\frac{z}{ax + a d + d x} : \frac{z}{z^3}$

: $\frac{1}{z^2}$: force A i; that is, the centripetal force is every where inversely as the square of the distance, when the centre of force is in the focus of the section. And this is the case with respect to the sun and planets.

From the above demonstrations, we may observe the following particulars, viz. that when the centre of force S was supposed in the centre of the curve, then the force was every where as the distance z, which was demonstrated also of the circle; when, in different circles, the periodical times are equal; whence the periodical times also in similar ellipses are all equal; if made about the same centre C.

Or thus, more universally of all ellipses. Let A = area of an ellipse, T = periodical time. V = velocity at the vertex;

therefore since $A = (S =) TV$, we have $\frac{A}{V} = T$, and so in any

other ellipse $\frac{A}{V} = T$; whence $T : T :: A \times \frac{1}{V} : A \times \frac{1}{V} :: a b \times$

$\frac{1}{V} : a b \times \frac{1}{V}$; and when the ellipses have the same common

transverse, that is, when $a = a$, it will be $T : T :: b \times \frac{1}{V} : b \times$

$\frac{1}{V} :: b V : b V$; but $V^2 = \frac{bb}{ad}$, and $V^2 = \frac{bb}{ad}$; and therefore

since $d = a d$, it is $V : V :: b : b$; and so $V b = V b$; consequently $T = T$. So that universally bodies revolving in similar elliptic orbits about the same common centre C, will all perform their periods in equal time.

Since $T : T :: a b \frac{1}{V} : a b \frac{1}{V}$; and $a b = (a \sqrt{n^2 a d} =$

$n : d^{\frac{1}{2}} a^{\frac{3}{2}} =) V d^{\frac{1}{2}} a^{\frac{3}{2}}$, and $a b = n d^{\frac{1}{2}} a^{\frac{3}{2}}$; therefore $T : T :: d^{\frac{1}{2}} a^{\frac{3}{2}} : d^{\frac{1}{2}} a^{\frac{3}{2}}$; and so $T^2 : T^2 :: d a^3 : d a^3$. Now let r and r be the radii of two circles, and t, t, the periodical times of those circles; then it will be $T^2 : t^2 :: d a^3 : d r^3 :: a^3 : r^3$, (when $d = r$); and in like manner $T^2 : t^2 :: (d a^3 : d r^3) : a^3 : r^3$, (when $d = r$). But since $t^2 : t^2 :: r^3 : r^3$; therefore $T^2 : T^2 :: a^3 : a^3$; that is, the squares of the periodical times are as the cubes of the transverse axes, in bodies revolving in elliptic (as well as circular) orbits about a centre of force, posited in the focus.

Hence the periodical times in ellipses are the same as in circles, whose diameters are equal to the greater axes of the ellipses; and

therefore when the conjugate diameter (or projectile force) is $= 0$, the curve will become a straight line, which the body will describe in $\frac{1}{2}$ the time it would describe a circle, whose diameter is equal to that line.

Since the velocity of a body is every where as the perpendicular ($= p$) let fall from S to the tangent to the curve in the point A as above; and when the point A is the extremity of the conjugate axis,

then will the velocity be $V : \frac{1}{p} : \frac{1}{b} : \frac{1}{\sqrt{\frac{1}{a l}}} : \frac{1}{\sqrt{\frac{1}{a}}}$ (by putting the latus rectum $l = 1$.) Let $a =$ semidiameter of a circle; then since the periodical times in such a circle, and the ellipsis,

are equal; and in the circle when T^2 is as a^3 , we have $V : \frac{1}{\sqrt{a}}$ every where; it follows, that the velocity of a body revolving in an ellipsis, is at its mean distance from the focus, or centre of force, equal to the velocity of a body revolving in a circle, whose semidiameter is equal to that mean distance.

From these conclusions, we may see the reason why a planet or a comet revolves in an ellipsis about the sun; for when it is in the aphelion, the force in its orbit is not great enough to carry it in a circle about the sun at that distance. It will therefore descend from that point towards the sun with a variable velocity in its orbit always increasing till at length it arrives at the perihelion-point, where its velocity is greatest of all. But, as in this situation its projectile force, or velocity in its orbit, is greater than that by which it can describe a circle about the sun, it will necessarily fly off, and recede from the sun to greater and greater distances, but with a velocity always decreasing, all which is evident, from the variable ratio of these two forces above and below what is necessary to produce a circular motion. But farther, it has been shewn, that a body, actuated by a centripetal force, which is every where inversely as the square of the distance, must describe a conic section about that body, or point, supposed to be placed in the focus of the section, and in all cases where the projectile force is to that which would carry it in a circle, at the same distance in a ratio less than that of $\sqrt{2}$ to 1, the section will be an ellipsis. When the projectile force is nearly equal to that of the circle at the same distance, the ellipsis will differ but little from a circle; and this we find is the case of all the planetary orbits. And, on the other hand, when the projectile force compared with that of a circle ($= 1$), is nearly equal to $\sqrt{2}$, then will the orbit be extremely elliptical, and its extreme parts, or apsides will nearly coincide with a parabola, and such are the orbits we find pertaining to all the comets, and this is the reason why astronomers generally make use of the curve of a parabola for calculating the motion, places, and other phenomena of comets, in the perihelion-parts of their orbits, which admits of greater ease, expedition, and hardly any sensible error. But to be more particular, with regard to the motion of the comet in every part of its orbit, it must be remembered, that the forces, circular velocities, and distances, were all defined by the following equation $FD \times r = f d V V$. And since the comet is actuated by the force of gravity, which every where increases in proportion, as the square of the distance decreases; that is, $F : f :: D^2$; this will give $V : v :: \sqrt{d} : \sqrt{D}$, or the circular velocity will be every where inversely as the square root of the distances; but the velocity of the comet in its orbit is ever inversely as the perpendicular to the tangent. From hence it will follow, that the comet descends from the aphelion A, fig. 15, towards the sun S, because its velocity is there less than the circular velocity; as it descends to less distances PS, its velocity in its orbit increases in a higher proportion than the circular velocity at the distance PS; and this will be the case every where, till the comet arrives at the lowest point, or perihelion B, where the proportion of its velocity to that which it had at A, will be as AS to BS, but the proportion of the circular velocities at B and A will be, as $\sqrt{AS}$ to $\sqrt{BS}$. Suppose $SB = 1$, and $SA = 4$, then will the velocity of the comet at B be four times greater than at A, but the velocity in the circle at B will only be twice as great as that in a circle at A. Whence it easily appears, that the velocity in the orbit, getting the better of that in the circle, will carry the comet off again from the sun, when it has attained the lowest point B, since there it is greater than the velocity of the circle at the same distance; and, as it recedes from the sun, the

velocity

velocity in the orbit will decrease much faster than the circular velocity; the latter will prevail by degrees, and cause the comet to describe in its ascent a semi-ellipse BDA, equal to that in its descent AEB, till at last, having attained the highest point A, its motion is then in the direction of the circle AG, but for want of a sufficient projectile force, to continue in that circle, it will descend again from thence towards the sun as before. Therefore the velocity in the circle prevailing in the higher apsis A, and the velocity in the orbit in the lower apsis B alternately, will occasion the comet to describe the same ellipsis perpetually about the sun. We here suppose the planet, or comet, is not affected by any other force than that of gravitation to the sun. Further to illustrate this subject, let a planet be in the three points of its orbit, P, N, M, fig. 15, in its descent towards the sun S, and join SP, SN, SM; on the centre S, with the distance SN, describe the arch Np, and with the distance SM, describe the arch Mm, then it is evident, when the planet comes to N, it will be nearer the sun than it was at P, by the distance Pp; and at M it is nearer the sun than at N, by the distance Nn; now these two distances, or lines, Pp and Nn, are called the paracentric velocities of the planet's motion in those parts of its orbit. On the centre S, describe the arch PV, and from P let fall the perpendicular Pv; also from N and M draw the perpendiculars Nq, Mo. Lastly, draw Mn parallel to the tangent LP, and LM parallel to SN, then Vv, or pq, denotes the planet's centrifugal force at the points P or N; also, mo denotes the same thing at M: and LM is the expression of the centripetal force, as is evident from what we have said above. From the points P and M, draw the lines Pτ, Mo, perpendicular to SN; then because the triangles PSN, NSM, are equal, (the times being supposed equal) therefore because the base SN is common to both the altitudes Pv, Mo are equal; take Nn = LM, then the triangles PNv, Mno will be equal and similar, and PN = Mn and Nv = on; again, in the right line SN (produced) since SV = SP, and Sm = SM, we have NV = SP - SN, and Nn = SN - SM; and consequently NV = (Nτ) no + Vv, and Nn = Nn + no - om; therefore NV - Nn = Vv + mo - v. If now we put SP = y, then Pp = j, and NV (or Pp) - Nn = j, then because Vv = pq = mo, therefore j = 2mo - Nn, or fluxion of the paracentric velocity. Now it is evident, that while the paracentric velocity j increases, its fluxion j̇ will be negative or -j̇ = Nn - 2mo, till at length it becomes nothing, or j̇ = 2mo - Nn = 0, in which case 2mo = Nn. After this, the paracentric velocity j̇ decreases and its fluxion is affirmative, or +j̇ = 2mo - Nn; till the planet arrives at B, where it entirely vanishes. From hence we learn, First, that in the descent of the planet from its aphelion-distance A, towards the sun, its paracentric velocity begins and increases till it arrives at a certain point; after which it decreases continually, till it vanishes in the aphelion-point B, or its velocity of access to the sun is accelerated in the first part of its orbit, and retarded in the last; and vice versa in regard to its recess in the other part of its orbit. Secondly, the fluxion of the paracentric velocity -j̇ = Nn - 2mo shews, that so long as the said velocity continues to increase, or be accelerated, twice the centrifugal force (2mo) will be less than the centripetal force Nn. Thirdly, when the paracentric velocity is a maximum, or greatest of all, the centripetal force (Nn) is equal to twice the centrifugal force (mo). Fourthly, from the time the paracentric velocity continues to decrease, till it vanisheth at B, the centripetal force, or gravity (Nn) will be less than twice the centrifugal force (mo). But that gravity Nn can never decrease so far, as to become equal to the centrifugal force mo, even in the perihelion-point B, is what we shall shew by and by. Let the triangles PSN and MSN be equal, or described in equal times; then will SN × Np = SM × Mm, then it will be Np : Mm :: SM : SN. Let IK be the latus rectum, or parameter of the elliptic orbit,

and L × a be a constant rectangle, equal to SM × Mm. Put SM = D, and IK = L. Then the arch Mm = $\frac{La}{D}$, and $Mm^2 = \frac{L^2 a^2}{D^2}$, add mo = $\frac{Mm^2}{2SM} =$ (as above) $\frac{a^2 L^2}{2D^2} =$ centrifugal force. Again the centripetal force, or gravity LM, is inversely as D³, or directly, as Mm², or as $\frac{a^2 L^2}{D^2}$; that is,

(dividing by the constant quantity $\frac{1}{2} L$) $\frac{2La^2}{D^2}$, is as the force of gravity. Wherefore gravity is to the centrifugal force, as $\frac{2La^2}{D^2}$, to $\frac{L^2 a^2}{2D^2}$, or as D to $\frac{1}{2} L$. That is, the force of gravity

is to the centrifugal force every where, as the distance of a planet to a fourth part of the latus rectum of the ellipsis. Let IO = $\frac{1}{2} IS = \frac{1}{2} L$, then in the point I, gravity is to the centrifugal force, as IS is to IO, or as 2 to 1, and consequently, the paracentric velocity in the point I, will be the greatest of all, or a maximum. Besides the velocity of a planet's motion hitherto mentioned, there is one other, which is called the angular velocity of a planet in its orbit. In order to estimate this, it must be considered, that any angle is greater in proportion, as the arch described with a given radius is so. And also, when the arch is given, the angle will be less in proportion, as the radius is greater; and therefore every angle will be in a ratio compounded of the direct ratio of the arch, and reciprocal ratio of the radius, and farther we have just now shewn that in the case of describing equal areas, the arches are inversely as the radii; therefore, in this case of a planet's motion, the angles described in equal times will be inversely as the squares of the radii.

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MECHLIN, or MALINES, a lordship, and district in the late Austrian province of Brabant, now included in the department of the Dyle.

MECHLIN, or MALINES, a city of France, in the department of the Dyle, late capital of the above district, 12 miles N. E. of

Brussels, 12 S. E. of Antwerp, and 10 N. W. of Louvain. Lon. 4. 34. E. Lat. 51. 2. N.

MECHOACAN, a province of Mexico, bounded on the N. by Panuco and Gaudalajara, E. by Panuco and Mexico Proper, S. by the Pacific Ocean, and W. by Guadalajara and the South sea.

Sea. The soil is exceedingly fertile; and the climate so wholesome, that the Spaniards suppose it to be possessed of some peculiarly restorative quality; for which reason the sick and infirm flock to it from all quarters. The commodities are sulphur, indigo, sarsaparilla, sassafras, cocoa, vanilloes, ambergrise, hides, wool, cotton, silk, sugar, mechoacan, and silver. This province was an independent kingdom when Mexico was reduced by Cortez.

MECHOACAN, the capital of the above province. It is a large and elegant city, finely decorated, and has a grand cathedral; 110 miles W. of Mexico.

MECKENHEIM, a town of France in the department of Sarre, and late archbishopric of Cologne, 18 miles S. W. of Cologne.

MECKLENBURG, in the late German constitution, a duchy of Germany, which contained those of Schwerin and Guströ, and was bounded on the E. by Pomerania; S. by the marquisate of Brandenburg and the duchy of Lüneburg; W. by Holstein and Saxe-Lauenburg; and N. by the Baltic Sea. Their greatest length is about 120 miles, and greatest breadth upwards of 60. The soil consists, in general, either of sand, or large and desolate heaths, interspersed with moors, woods, fens, and lakes. It yields oats, rye, and barley, but very little wheat. It breeds a considerable number of sheep and cattle, has plenty of fish, with stone-quarries, salt-springs, alum, iron, and some copper. The principal rivers are the Elbe, Stör, which run into the Elbe; and the Reckenitz, Peene, Warno, and Stopenitz, which fall into the Baltic; on which it has only one harbour, viz. that of Rostock.

MECKLENBURG, a town, anciently the capital of the above duchy, formerly called Megapolis, or the Great City, from its great extent. It lies 2 miles S. of Wismar.

MECKLENBURG, a county of Virginia.

MECKLENBURG, a town in the above county, 70 miles S. W. of Richmond.

MECKLENBURG, a county of N. Carolina. Charlotte is the capital.

MECKLEY, a country of Asia, bounded on the N. by Thibet, E. by China, S. by Ava, and W. by thick forests, which separate it from Bengal; 350 miles long, and 170 broad; subject to the king of Ava. Lon. 93. 20, to 98. 40. E. Lat. 22. 30, to 27. 40. N.

MECON, or **MENAN**, a large river of Asia, which rises in the mountains of Thibet, and falls into the E. Sea, above 200 miles S. of Cambodia.

MECONIUM, [*μεκωνιον*], in pharmacy, the extract of British poppies, and has all the virtues of foreign opium, but in a somewhat lower degree.

MECONIUM, in medicine, a black thick fæces gathered in the intestines of infants, and brought with them into the world at the time of their birth. If this matter is not soon purged off, it occasions gripes, &c. A tea-spoonful of true castor oil is an excellent purge, but the first milk from the mother's breast is usually sufficient, if it flow in due time.

MECRAN, a province of Persia, anciently called Gedrosia, bounded N. by Segestan and Candahar, E. by Hindoostan, S. by the Indian Sea, and W. by Kerman. Kidge is the capital.

MEDAL, a substance generally of metal in the form of coin, such as was either current money among the ancients, or struck on any particular occasion, to preserve to posterity the portrait of some great person, or the memory of some illustrious action. Scaliger derives the word medal from the Arabic *methalia*; a sort of coin with a human head upon it. But the opinion of Vossius is generally received; viz. that it comes from *metallum*, metal; of which substance medals are commonly made. For information on this subject, see **NUMISMATOGRAPHY**.

MEDALLIONS, or **MEDALIONS**, large antique stamps or medals. They are supposed to have been anciently struck by

the emperors for their friends, and for foreign princes and ambassadors. But, that the smallness of their number might not endanger the loss of the devices they bore, the Romans generally took care to stamp the subject of them upon their ordinary coins. Medallions were exempted from all commerce, and had no other value than what was set upon them by the fancy of the owner.

MEDEA, in fabulous history, a celebrated sorceress, daughter of Æetes king of Colchis. Her mother's name, according to the more received opinion of Hesiod and Hyginus, was Idyia. She was the niece of Circe. When Jason came to Colchis in quest of the golden fleece, Medea became enamoured of him, and to her well-directed labours the Argonauts owed their preservation. Medea had an interview with her lover in the temple of Hecate: where they swore eternal fidelity. When Jason had overcome all difficulties, Medea embarked with the conquerors for Greece. To stop the pursuit of her father, she tore to pieces her brother Absyrtus, and left his mangled limbs in the way through which Æetes was to pass.

MEDEBACH, a town in Westphalia; 32 miles W. of Cassel. Lon. 29. 7. E. Lat. 51. 4. N.

MEDELPADIA, a province of Sweden, in Nordland.

MEDEMBLICK, or **MEDENBLICK**, an ancient town of Holland, in the department of the Texel, and late province of N. Holland, at the entrance into the Zuyder Zee; 15 miles N. E. of Alenmaer, and 26 N. of Amsterdam.

MEDEOLA, **CLIMBING AFRICAN ASPARAGUS**; in botany, a genus of the hexandria order, and trigynia class of plants; natural order, Samentaceæ. Calyx none; corolla sexpartite, revolved; berry trispermous. There are two species.

MEDIA, the ancient seat of a powerful empire, now the province of Ghilan in Persia, was bounded, according to Ptolemy, on the N. by part of the Caspian Sea; S. by Persia, Susiana, and Assyria; E. by Parthia and Hyrcania; and W. by Armenia Major. It was anciently divided into several provinces, viz. Tropatene, Charomithrene, Darites Marciane, Amariace, and Syro-Media. By a latter division, however, all these were reduced to two; the one called Media Magna, the other Media Atropatia, or simply Atropatene. Media Magna was bounded by Persia, Parthia, Hyrcania, the Hyrcanian Sea, and Atropatene, and contained the cities of Ecbatan, Laodicea, Apamea, Raga, Rageia or Ragea, &c. Atropatene lay between the Caspian mountains and the Caspian Sea. This country originally took its name from Madai, the third son of Japhet; as is plain from Scripture, where the Medes are constantly called Madai. Some derive the name from Medus the son of Jason and Medea; others from a city called Media. Sextus Rufus tells us, that in his time it was called Medena, and from others we learn that it was also called Aria.

MEDIANA, a vein or little vessel, made by the union of the cephalic and basilic, in the bend of the elbow.

MEDIASTINE, or **MEDIASTINUM**, in anatomy, a double membrane, formed by a duplicature of the pleura; serving to divide the thorax and the lungs into two parts, and to sustain the viscera, and prevent their falling from one side of the thorax to the other. See **ANATOMY**.

MEDIATOR, in Scripture, is applied, 1. To Jesus Christ, who is the only intercessor and peace-maker between God and man, (1 Tim. ii. 5.) 2. To Moses, who interposed between the Lord and his people, to declare unto them his word; Deut. v. 5. iii. 19.

MEDICAGO, **SNAIL-TREFOIL**; in botany, a genus of the decandria order, and diadelphia class of plants; natural order, Papilionaceæ. Legumen compressed, screwed; carina of the corolla luring down from the vexillum. There are nine species, low trailing plants, adorned with small yellow flowers, succeeded by small, round, snail-shaped fruit, which are downy, and armed with a few short spines. They are all easily propagated by seeds.

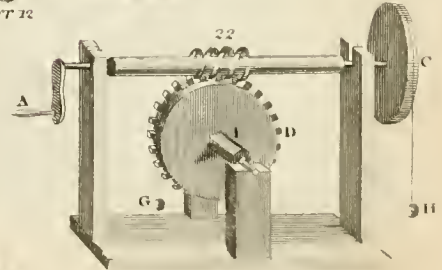
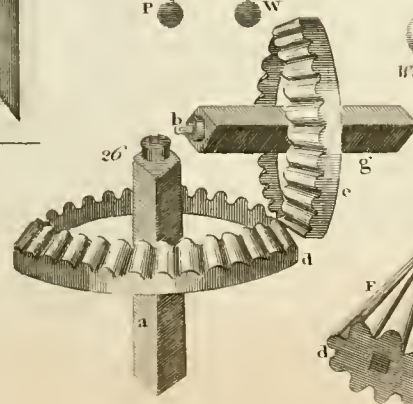
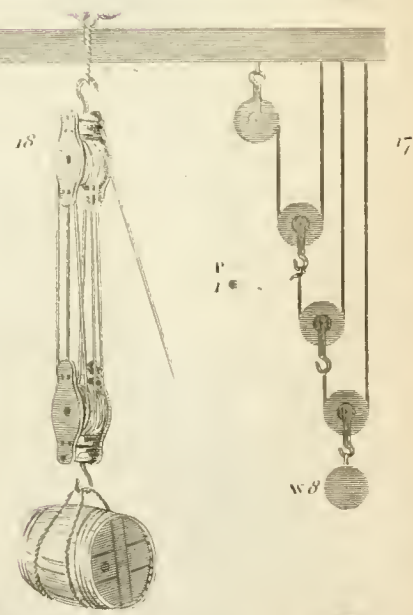
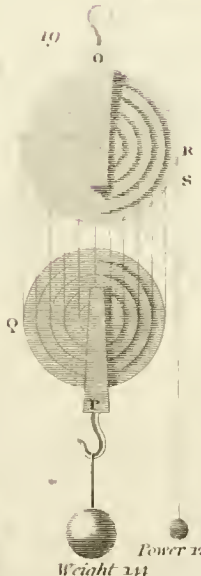
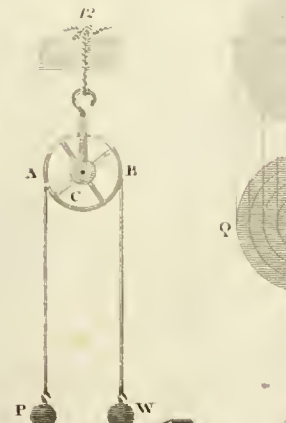
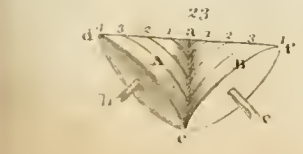
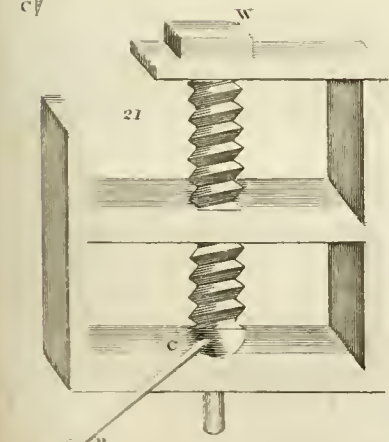
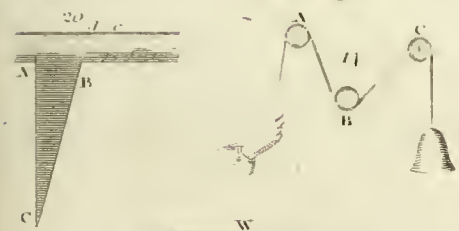
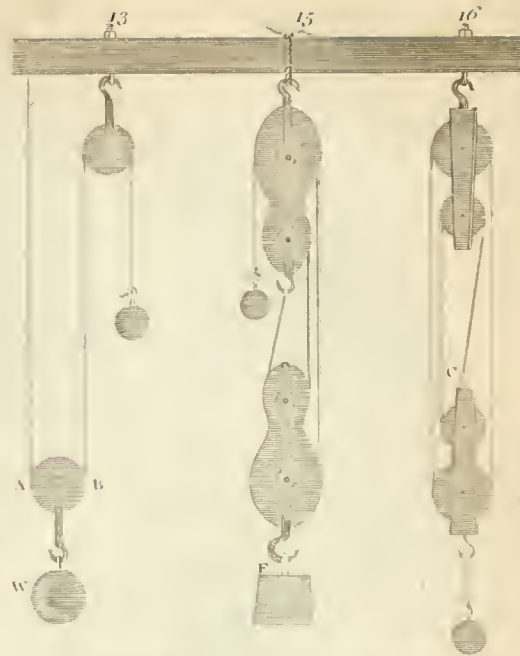
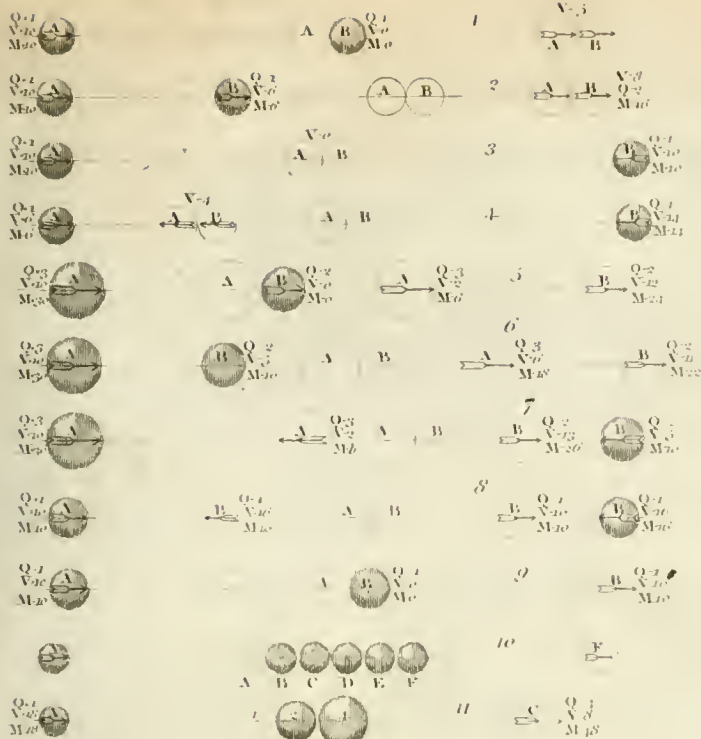
MEDICINE.

MEDICINE, is the art of preventing, curing, or alleviating, those diseases to which the human species are subjected.

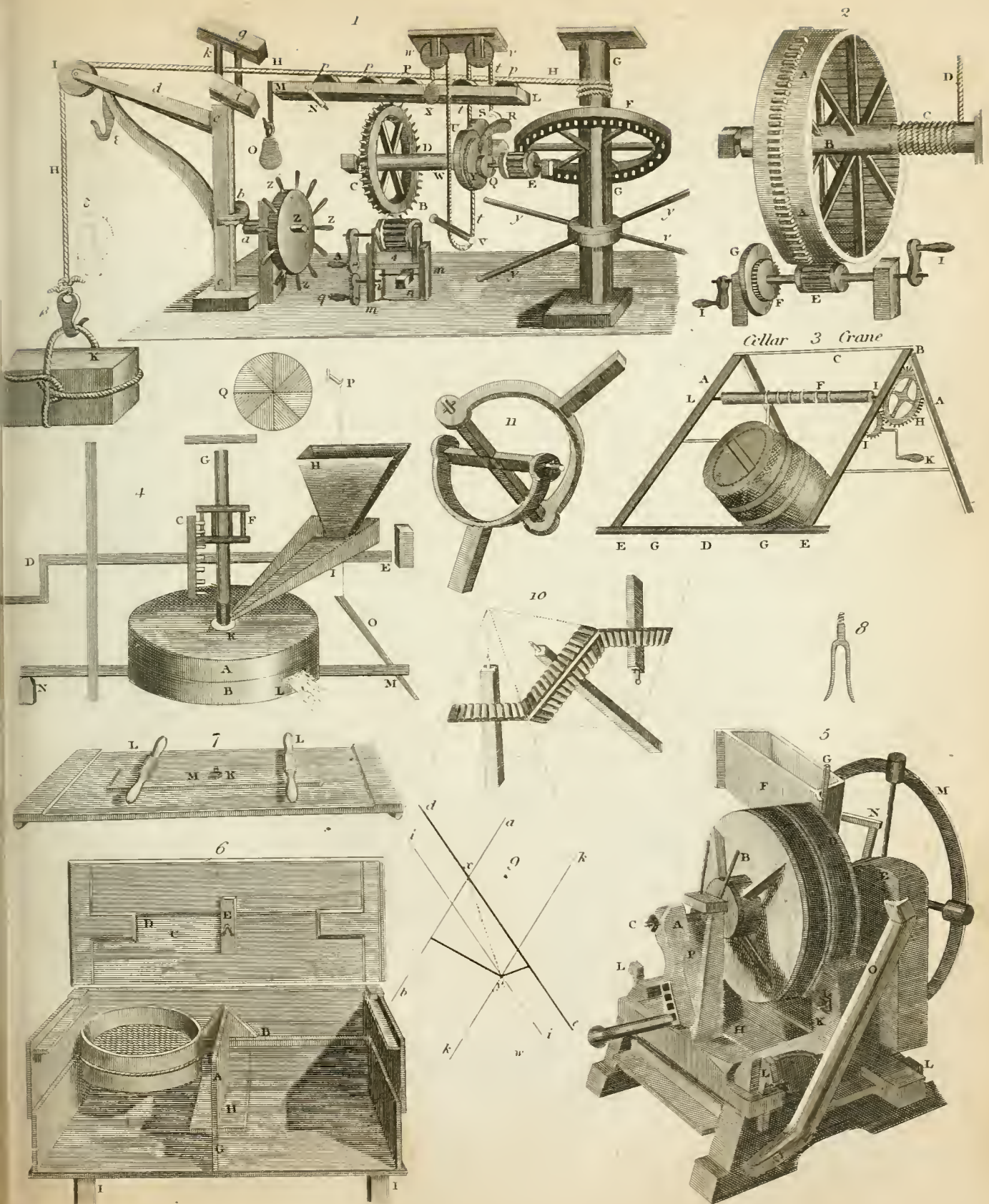
HISTORY.

The fabulous history of the ancients derives this art immediately from

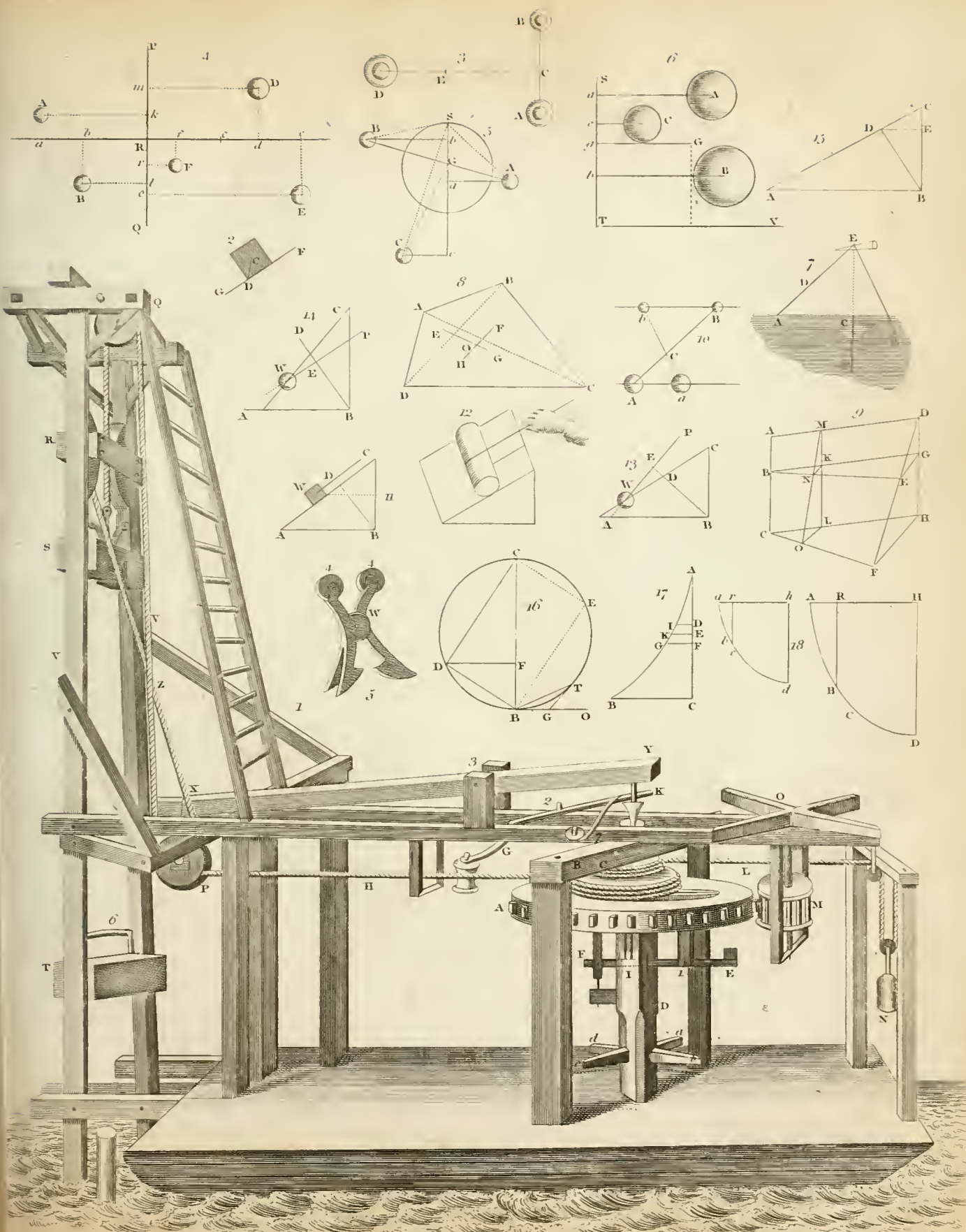




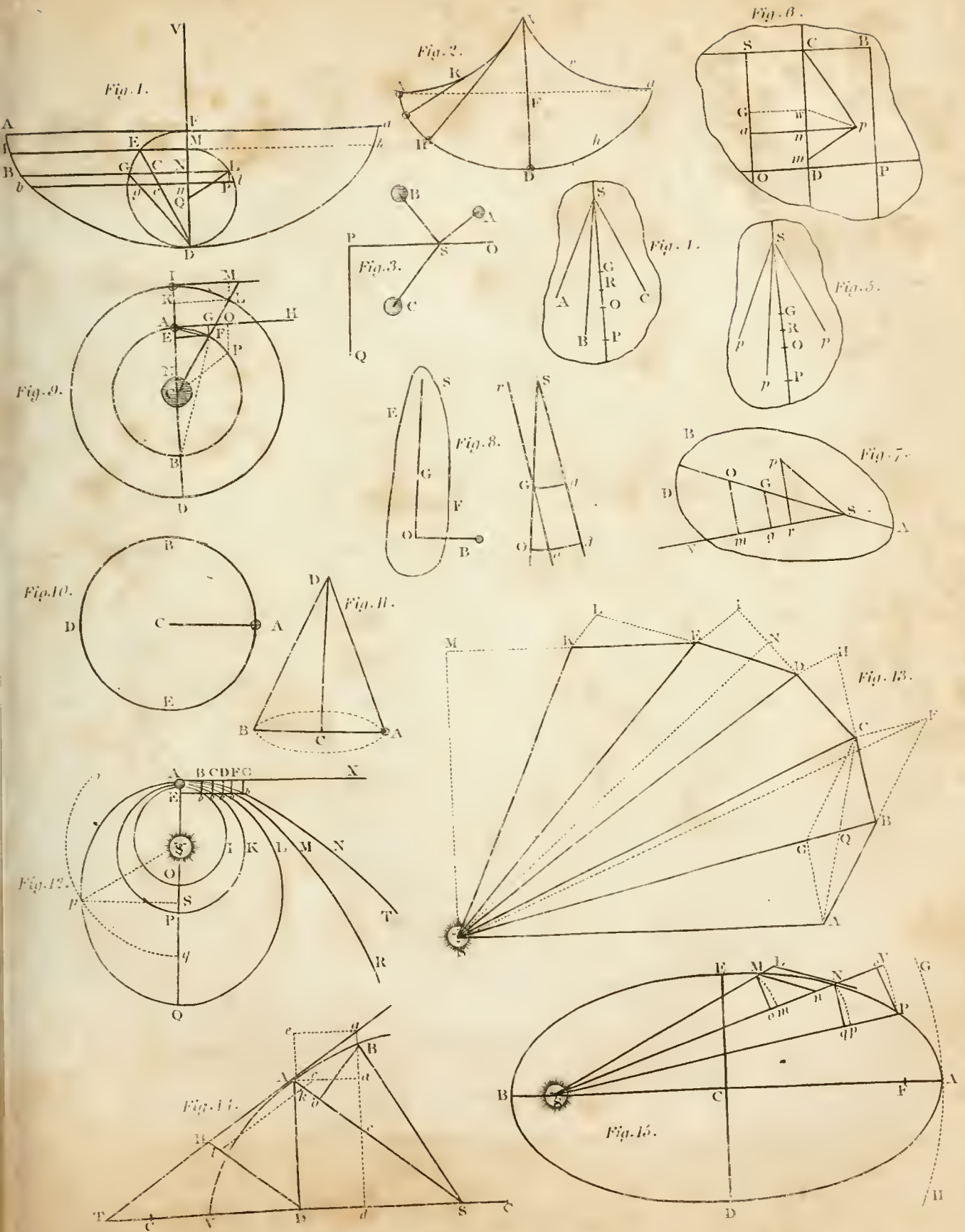














from their gods; and, even among the moderns, some think that it may justly be considered as of divine revelation. But without adopting any supposition of which no evidence can be given, we may conclude that men were early led to it from casual observations on the diseases to which they found themselves subjected; and that therefore, it is nearly as ancient as the human race. But at what period it began to be practised as an art, by individuals following it as a profession, is not known. The most ancient physicians we read of were those who embalmed the patriarch Jacob by order of his son Joseph. Moses styles these physicians servants to Joseph: whence we are certain that they were not priests, as the first physicians are generally supposed to have been; for in that age the Egyptian priests were in such high favour, that they retained their liberty, when, through a public calamity, all the rest of the people became slaves to the king. It is not probable, therefore, that among the Egyptians, religion and medicine were originally conjoined. That the Jewish physicians were absolutely distinct from their priests, is very certain; for when king Asa was diseased in his feet, "he sought not to the Lord, but to the physicians." Hence it is clear, that among the Jews the medicinal art was considered as a mere human invention; and it was thought that the Deity never cured diseases by making people acquainted with the virtues of this or that herb, but only by his miraculous power. That the same opinion prevailed among the heathens who resided near the Jews, is also probable from what is recorded of Ahaziah king of Judah, who having sent messengers to inquire of Baal-zebub god of Ekron concerning his disease, he did not desire any remedy from him or his priests, but only to know whether he should recover or not. The Greeks had several persons to whom they attributed the invention of physic, particularly Prometheus, Apollo, and Æsculapius. But as the Greeks were a very warlike people, their physic seems to have been little else than what is now called surgery, or the cure of wounds, fractures, &c. Hence Æsculapius, his pupil Chiron, and his sons Machaon and Podalirius, are celebrated by Homer only for their skill in curing these, without any mention of their attempting the cures of internal diseases. They might, however, occasionally prescribe for internal disorders; but as they were most conversant with wounds, we may suppose the greatest part of their skill to have consisted in knowing how to cure these. Hippocrates, who flourished between the 80th and the 88th Olympiad, about B. C. 400, is the most ancient author whose writings expressly on the medical art are preserved; and he is therefore justly considered as the father of physic. Even the medical knowledge of Pythagoras, so much celebrated as a philosopher, can hardly be considered as any thing more than conjectural. But from the time of Hippocrates, medicine seems to have assumed the form of a science, and to have been practised as a profession. In his writings we find a general principle adopted, which he calls Nature. "Nature (says he) is of itself sufficient to every animal. She performs every thing that is necessary to them, without needing the least instruction from any one how to do it." Upon this footing, as if Nature had been a principle endowed with knowledge, he gives her the title of just; and ascribes virtues or powers to her, by means of which she performs all her operations in the bodies of animals: and distributes the blood, spirits, and heat, through all parts of the body, which by these means receive life and sensation. And he adds, that it is this faculty which gives nourishment, preservation, and growth, to all things. The manner in which nature acts, or commands her subservient powers to act, is by attracting what is good and agreeable to each species, and by retaining, preparing, and changing it; and on the other side in rejecting whatever is superfluous or hurtful, after she has separated it from the good. This is the foundation of the doctrine of depuration, concoction, and crisis in fevers, so much insisted upon by Hippocrates and most other physicians. He supposes also, that every thing has an inclination to be joined to what agrees with it, and to remove from every thing contrary to it; and likewise that there is an affinity between the several parts of the body, by which they mutually sympathize with each other. When he attempts to explain what nature is, he is obliged to resolve it into heat, which, he says appears to have something immortal in it. As far as he attempts to explain the causes of disease, he refers much to the humours of the body, particularly to the blood and the bile. He treats also of the effects of sleep, watchings, exercise, and rest, and the bene-

fit or mischief we may receive from them. Of all the causes of diseases, mentioned by Hippocrates, the most general are diet and air. On diet he composed several books, and in the choice of this he was exactly careful, as his practice turned almost wholly upon it. He also studied the air very much; he examined what winds blew ordinarily or extraordinarily; he considered the irregularity of the seasons, the rising and setting of stars, and the time of certain constellations; of the solstices, and of the equinoxes; those days in his opinion, producing great alterations in certain diseases. He does not, however, attempt to explain how, from these causes, the great variety of distempers arises. All that he says with regard to this is, that the different parts of the body, produce a great variety of distempers. Some of these he accounted mortal, others dangerous, and the rest easily curable, according to the cause whence they spring, and the parts on which they fall. He also distinguishes diseases, from the time of their duration, into acute or short, and chronical or long: as well as by the particular places where they prevail, whether ordinary or extraordinary. The former, which are frequent and familiar to certain places, he called endemic diseases; the latter, which ravage extraordinarily sometimes in one place, sometimes in another, and seize great numbers at certain times, he called epidemic, that is, popular diseases; and of this kind the most terrible is the plague. He likewise mentions a third kind which he calls sporadic, or straggling diseases; these include all the different sorts of distempers which invade at any one season, which are sometimes of one sort, and sometimes of another. He distinguished between those diseases which are hereditary, or born with us, and those which are contracted afterwards; and between those of a kindly and those of a malignant nature; the former are easily cured, but the latter give the physicians a great deal of trouble, and are seldom overcome by all their care. Hippocrates remarked four stages in distempers; viz. the beginning of the disease, its augmentation, its state or height, and its declination. In such diseases as terminate fatally, death comes in place of the declination. In the third stage therefore, the change is most considerable, as it determines the fate of the sick person; and this is most commonly done by means of a crisis. By this word he understood any sudden change in sickness, whether for the better or for the worse, whether health or death succeed immediately. Hippocrates imagined diseases to be only a disturbance of the animal economy, with which Nature was perpetually at variance, and using her utmost endeavours to expel the offending cause; by reducing to their natural state those humours whose discord occasions the disturbance of the whole body, whether in relation to their quantity, quality, mixture, motion, or any other way in which they become offensive. The principal means employed by nature for this end he calls concoction. By this he understood the bringing of the morbid matter in the humours to such a state, as to be easily fitted for expulsion. When matters are brought to this pass, whatever is superfluous or hurtful immediately empties itself, or nature points out to physicians the way by which such an evacuation is to be accomplished. The crisis takes place either by bleeding, stool, vomit, sweat, urine, tumors or abscesses, scabs, pimples, spots, &c. But these evacuations are not to be considered as the effects of a true crisis, unless they are in considerable quantity; small discharges not being sufficient to make a crisis. Small discharges are a sign that nature is depressed by the load of humours, and that she lets them go through weakness and continual irritation. What comes off in this manner is crude, because the distemper is yet too strong; and while matters remain in this state, nothing but a bad or imperfect crisis is to be expected. This shews that the distemper triumphs, or at least is equal in strength to nature, which prognosticates death, or a prolongation of the disease. In this last case, however, nature often attempts a new crisis more happy than the former, after having made fresh efforts to advance the concoction of the humours, which cannot be made but in a certain time, as every fruit has a limited time to ripen. But what has chiefly contributed to procure the vast respect paid to Hippocrates, is his industry in observing the most minute circumstances of diseases, and his exactness in describing every thing that happened before, and at the same time with them; and likewise what appeared to give ease, and what to increase the malady: which is called writing the history of a disease. Thus he not only distinguished one disease from another by the signs which properly belong

long to each; but by comparing the same sort of distemper which happened to several persons, and the accidents which usually appeared before and after, he could often foretel a disease before it came, and afterwards give a right judgement of the event of it. By this way of prognosticating, he came to be exceedingly admired; and this may justly be said to be his master-piece; for, as Celsus remarks, succeeding physicians, though they found out several new things, yet were obliged to Hippocrates for all that they knew of signs. The first thing Hippocrates considered, when called to a patient, was his looks. It was a good sign to have a visage resembling that of a person in health, and the same with what he had before the disease. As it varied from this, so much the greater danger was apprehended. The condition of the patient is also shewn by his posture in bed. If he lies on one side, his body, neck, legs, and arms, a little contracted, which is the posture of a man in health, it is a good sign: if he lies on his back, his arms stretched out, and his legs hanging down, it is a sign of great weakness; when he slides down towards the feet, it denotes death. When a patient in a burning fever is continually feeling about with his hands and fingers, and moves them up before his face and eyes, as if he were going to take away something before them; or on his bed-covering, as if he was picking or searching for little straws, or taking away some filth, or drawing out little flocks of wool; all this is a sign that he is delirious, and that he will die. Among the other signs of delirium he adds this. When a patient who naturally speaks little begins to talk more than he used to do, or when one that talks much becomes silent, this change is to be reckoned a sort of delirium, or a sign that the patient will soon fall into one. The frequent trembling or starting of the tendons of the wrist, presage likewise a delirium. Hippocrates was much more afraid of those deliriums that run upon mournful subjects, than such as are accompanied with mirth. When a patient breathes fast, and is oppressed, it is a sign that he is in pain, and that the parts above the diaphragm are inflamed. Breathing long, or when the patient is a great while in taking his breath, shews him to be delirious; but easy and natural respiration is always a good sign. Hippocrates depended much on respiration in making his prognostics; and therefore carefully describes the different manner of a patient's breathing. Continual watchings, in acute diseases, are signs of present pain, or approaching delirium. Hippocrates also drew signs from all kinds of excrements, but his most remarkable prognostics were from the urine. The urine is best when the sediment is white, soft to the touch, and of an equal consistence. If it continue so during the course of the distemper, and till the crisis, the patient is in no danger, and will soon be well. This he called concocted urine, or what denotes the concoction of the humours; and he said, that this concoction of the urine seldom appeared thoroughly, but on the days of the crisis which put an end to the distemper. His prognostics from the excretions by stool are as follow: Those that are soft, yellowish, of some consistence, and not of an extraordinary ill smell, that answer to the quantity of what is taken inwardly, and that are voided at the usual hours, are the best. They ought to be of a thicker consistence when the distemper is near the crisis; and it is a good prognostic, when some worms, round and long, are evacuated at the same time. The prognosis, however, may still be favourable, though the matter excreted be thin and liquid, provided the evacuation be not too noisy, or in a small quantity, or too often; or in so great abundance, or so often, as to make the patient faint. All matter that is watery, white, of a pale green, or red, or frothy and viscous, is bad. That which is blackish, or of a livid hue, is the most pernicious. That which is pure black, and nothing else but a discharge of black bile, always prognosticates very ill. The matter that is of several different colours, denotes the length and danger of the distemper. Hippocrates places in the same class the matter that is bilious or yellow, and mixed with blood, or green and black, or like the dregs or scrapings of the guts. The stools that consist of pure bile, or entirely of phlegm, he also reckoned very bad. Matter cast up by vomiting ought to be mixed with bile and phlegm; where one of these humours only is observed, it is worse. That which is black, livid, green, or of the colour of a leek, indicates alarming consequences; as well as that which smells very ill; and if at the same time it be livid, death is not far off. The vomiting of blood is very often mortal. The spittings which give ease in diseases of the lungs and in pleurisies,

are those that come up readily and without difficulty; and it is good if they be mixed at the beginning with much yellow; but if they appear of the same colour, or are red, long after the beginning of the distemper, or are salt and acrimonious, and cause violent coughing, they are bad. Spittings purely yellow are bad; and those that are white, viscous, and frothy, give no ease. Whiteness is a good sign of concoction in regard to spittings; but they ought not at all to be viscous, nor too thick, nor too clear. He formed the same judgement of the excrements of the nose, according to their concoction and crudity. Spittings that are black, green, and red, are of very bad consequence. In inflammations of the lungs, those that are mixed with bile and blood presage well, if they appear at the beginning, but are bad if they arise not about the seventh day. But the worst sign in these distempers is, when there is no expectation at all, and the too great quantity of matter that is ready to be discharged this way makes a rattling in the breast. After spitting of blood, the discharge of purulent matter often follows, which brings on a consumption, and at last death. A kind good sweat is that which arises on the day of the crisis, and is discharged in abundance all over the body, and at the same time from all parts of the body, and thus carries off the fever. A cold sweat is alarming, especially in acute fevers, for in others it is only a sign of long continuance. When the patient sweats nowhere but on the head and neck, it is a sign that the disease will be long and dangerous. A gentle sweat in some particular part, of the head and breast, for instance, gives no relief, but denotes the seat of the distemper, or the weakness of the part. This kind of sweat was called by Hippocrates *epidrosis*. The *Hypochondria*, or the abdomen in general, ought always to be soft and even, as well on the right side as on the left. When there is any hardness or unevenness in those parts, or heat and swellings, or when the patient cannot endure to have it touched, it is a sign the intestines are indisposed. Hippocrates also inquired into the state of the pulse, or the beating of the arteries. The most ancient physicians, however, and even Hippocrates himself, for a long time, by this word understood the violent pulsation that is felt in an inflamed part, without putting the fingers to it. Hippocrates, used very few medicines, but was generally contented with observing what nature is able to accomplish without the aid of the physician. That this was really the case, appears from his books intitled, "*Of epidemical Distempers*;" which are, as it were, journals of his practice, for there he often does nothing more than describe the symptoms of a distemper, and what had happened to the patient day after day, to his death or recovery, without mentioning any kind of remedy. Sometimes, however, he did use remedies; but these were very simple and few.

DIET was the first, the principal, and often the only remedy he made use of: by means of it he opposed moist to dry, hot to cold, &c.; and thus he supported nature, and assisted her to overcome the malady. The dietetic part of medicine was so much the invention of Hippocrates himself, that he claimed to be the author of it; and says, that the ancients had wrote almost nothing concerning the diet of the sick, having omitted this point, though it was one of the most essential parts of the art. The diet he prescribed for patients labouring under acute distempers, differed from that which he ordered for those under chronic ones. In the former, he preferred liquid food to solid, especially in fevers. For these he used a sort of broth made of cleansed barley, which he called *ptisan*. The manner in which the ancients prepared *ptisan* was this: They first steeped the barley in water till it was plumped up; and afterwards they dried it in the sun, and beat it to take off the husk. They next ground it; and having let the flour boil a long time in the water, they put it out into the sun, and when it was dry they pressed it close. This flour was properly the *ptisan*. They did almost the same thing with wheat, rice, lentils, and other grain; but they gave these *ptisanes* the name of the grain whence they were extracted, as *ptisan* of lentils, rice, &c., whereas the *ptisan* of barley was called simply *ptisan*, on account of its excellency. To use it, they boiled one part of it in 10 or 15 of water; and when it began to grow plump in boiling, they added a little vinegar, and a small quantity of anise or leek, to keep it from clogging or filling the stomach with wind. Hippocrates prescribes this broth boiled with the fat of a goat, for women that have pains in their belly after delivery. He preferred the *ptisan* to all other food in fevers, because it was soft, and of easy digestion. In a

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continual fever, he ordered the patient to begin with a ptisan of a pretty thick consistence, and go on by little and little, lessening the quantity of barley-flour as the height of the distemper approached; so that he did not feed the patient but with what he called the juice of the ptisan; that is, the ptisan-strained, where there was very little of the flour remaining, that nature, being discharged in part from the care of digesting the aliments, might the more easily hold out, and overcome the distemper, or the cause of it. He caused the ptisan to be taken twice a-day by such patients as in health used to take two meals a-day; but he would not allow it twice a-day to those who eat but once a-day in health. In the paroxysm of a fever he gave nothing; and in all distempers where there are exacerbations, he forbade nourishment while the exacerbations continued. He let children eat more; but those who were grown up, or were of an advanced age, less; making allowance, however, for the custom of each patient, or for that of the country. But though he would not allow too much food to the sick, he prohibited long abstinence, especially in the beginning of fevers. The contrary practice, he said, weakened the patients too much during the first days of the distemper, by which means their physicians were obliged to allow them more food when the illness was at its height. Besides, in acute distempers, and particularly in fevers, he prescribed refreshing and moistening nourishment; and among other articles, oranges, melons, spinach, gourd, and dock. This food he gave to those who could eat, or take something more than a ptisan. The Drink he gave to his patients was made of 5 parts of water and one of honey. In some distempers he added a little vinegar; they had also another sort named *κρηνη*, or mixture; which consisted of rue, anise, celery, coriander, juice of pomegranate, the roughest red-wine, water, flour of wheat and barley, with old cheese made of goat's milk. Hippocrates did not approve of giving plain water to the sick; but he did not forbid wine, even in acute distempers and fevers, provided the patients were not delirious, nor had pains in the head. He preferred white wine that is clear and has a great deal of water, with neither sweetness nor flavour. These are the chief particulars concerning diet prescribed by Hippocrates in acute distempers; in chronic ones he made much use of milk and whey. In many diseases he judged the Bath a proper remedy. Among the circumstances necessary to cause the patient to receive benefit from it, the following are the principal. The patient must remain still and quiet in his place without speaking, while the assistants throw water over his head, or are wiping him dry; for which last purpose he desired them to keep sponges, instead of that instrument called by the ancients strigil, which served to rub off from the skin the dirt left upon it, by the unguents and oils with which they anointed themselves. He must also take care not to catch cold; and must not bathe immediately after eating and drinking, nor eat or drink immediately after coming out of the bath. It should also be inquired, if the patient has been accustomed to bathe while in health, and whether he has been benefited by it. He must abstain from the bath when the body is too open, or too costive, or when he is too weak; or if he has an inclination to vomit, a great loss of appetite, or bleeds at the nose. The advantage of the bath consists in moistening and refreshing, taking away weariness, making the skin soft and the joints pliant; in provoking urine, and opening the nostrils and other excretories. He allows two baths in a day to those who have been accustomed to it. In chronic distempers Hippocrates approved much of exercise, though he did not allow it in acute ones; but even in these he did not think that a patient ought always to lie abed; but says, "we must sometimes push the timorous out of bed, and rouse up the lazy." When diet and exercise were not sufficient to ease nature of a burden of corrupted humours, he made use of other means, of which Purgation was one. By this word he understood all the means used to discharge the stomach and bowels; though it commonly signifies only evacuation by stool.

BLOOD-LETTING was another method of evacuation used by Hippocrates. One aim he had in this, besides the mere evacuation, was to divert or recel the course of the blood, when he imagined it was going where it ought not. A third end of bleeding was to procure a free motion of the blood and spirits; upon which subject he had formed a very absurd theory. His fourth intention for bleeding was refreshment. In the iliac passion, he

ordered bleeding in the arm and in the head; "that the superior venter, or the breast, may cease to be overheated."

Of the external remedies prescribed by Hippocrates, FOMENTATIONS were the chief. These were of two kinds. The one was a bath, in which the patient sat in a vessel full of a decoction of simples appropriated to his malady; so that the part affected was soaked in the decoction. The second way of fomenting was, to put warm water into a skin or bladder, or even into a copper or earthen vessel, and apply it to the part affected; as, e. g. in a pleurisy. They used likewise a large sponge, which they dipped in the water, or other hot liquor, and squeezed out part of the liquor before they applied it. The same use was made of barley, vetches, or bran, boiled in some liquor, and applied in a linen-bag. These are called moist fomentations. The dry ones were made of salt or millet, heated considerably, and applied to the part. Another kind of fomentation was the vapour of some hot liquor; an instance of which we find in his first book of Women's Distempers.

FUMIGATIONS were likewise often used by Hippocrates. In the quinsey, he burned hyssop with sulphur and pitch, and caused the smoke to be drawn into the throat by a funnel; and thus brought away phlegm through the mouth and nose.

GARGLES were also known to Hippocrates. In the quinsey he used a gargle of marjoram, savory, celery, mint, and nitre, boiled with water and a little vinegar. When this was strained, they added honey to it, and washed their mouths frequently with it. Oils and ointments were likewise much used by him to abate pain, to ripen boils, resolve tumours, refresh after weariness, make the body supple, &c.

CATAPLASMS were made of powders or herbs, steeped or boiled in water, or some other liquor, to which sometimes they added oil. They were used to soften or resolve tumours, ripen abscesses, &c. though they had also cooling cataplasms made of the leaves of beets or oak, fig or olive-trees, boiled in water.

To complete the catalogue of external remedies used by Hippocrates, we must mention his COLLYRIUM. It was compounded of powders, to which was added a small quantity of some ointment, or juice of a plant, to make a solid or dry mass; the form of which was long and round. After Hippocrates, medicine in ancient Greece gradually derived improvement from the labours of other physicians of eminence. There were three in particular to whom its progress seems to have been indebted, viz. Praxagoras, Erasistratus, and Herophilus. According to Celsus, medicine, about this time, was first divided into three branches, viz. the dietetic, the pharmaceutical, and the surgical. The first employed a proper regimen in the cure of diseases; the second medicines; and the third the operation of the hands; and these three branches became now the business of as many distinct classes; so that, from this period, we may date the origin of the professions of physicians, apothecaries, and surgeons. Before this period, physicians discharged the several offices belonging to all the three professions. The first grand revolution after this period, was the founding of the empiric sect by Serapion of Alexandria, about B. C. 287. The division into dogmatics and empirics had indeed subsisted before; but about this time the latter party began to grow strong, and to have champions publicly defending their cause. Galen says, that Serapion in his writings discovered an excess of pride, self-sufficiency, and contempt for all physicians that had gone before him. C. Aurelianus says, that, in his practice, he retained the medicines of Hippocrates and the former physicians, though he rejected their reasoning. His works being lost as well as those of the other empirics, we should have known nothing of them, if their adversaries had not quoted them to confute them. The empirics admitted only one general method of obtaining skill in the medical art, viz. by *εμπειρία*, experience. From this word they took their name, and refused to be called after the founder, or any champion of their sect. They defined experience, "a knowledge derived from the evidence of sense." For acquiring practical skill they recommended *τηρησις*, or one's own observation, and the reading of cases faithfully related by others. Hence they said, we are enabled to know a disease by its resemblance to others; and, when new diseases occurred, to conclude what was proper to be done from the symptoms they had in common with others before known. They asserted, that observation ought to be employed, first, in discovering what things are salutary, and what are indifferent;

indifferent; and, second, what particular disease is produced by a certain concurrence of symptoms; for they did not call every symptom a disease, but only such a combination of them, as from long experience they found to accompany each other, and produce such disorders as began and terminated in the same manner. The Dogmatists, on the other hand, affirmed, that there was a necessity for knowing the latent as well as the evident causes of diseases; and that the physician ought to understand the natural actions and functions of the human body, by a knowledge of the internal parts. By secret or latent causes they meant such as related to the principles of which our bodies are composed, and which are the origin of a good or bad state of health. They asserted that it was impossible to know how to cure a disease, without knowing the cause whence it proceeded; because undoubtedly they behaved to vary prodigiously, according to the different causes by which they were produced. The next remarkable person, in the history of medicine, is Asclepiades, who flourished in the century immediately before the Christian era. He introduced the philosophy of Democritus and Epicurus into medicine, and ridiculed the doctrines of Hippocrates. He asserted, that matter in itself was of an unchangeable nature; and that all perceptible bodies were composed of a number of smaller ones, between which there were interspersed an infinity of small spaces totally void of all matter. He thought that the soul itself was composed of these small bodies. He laughed at the principle called Nature by Hippocrates, as well as at the imaginary faculties said by him to be subservient to her; and still more at his principle of Attraction. This last Asclepiades denied in every instance, even in that of the loadstone and steel, affirming that this phenomenon proceeded from a concurrence of corpuscles, and a particular modification of their pores. He also maintained, that nothing happened, or was produced, without some cause; and that what was called nature, was in reality no more than matter and motion. From this last principle, he inferred that Hippocrates knew not what he said, when he spoke of Nature as an intelligent being, and ascribed qualities of different kinds to her. For the same reason he ridiculed Hippocrates's doctrine of crises; and asserted that the termination of diseases might be as well accounted for from mere matter and motion. Asclepiades's practice was suited to remove these imaginary causes of disorders. He composed a book concerning remedies, which he principally reduced to three, viz. gestation, friction, and wine. The next great revolution in the medicinal art was brought about by Themison, the disciple of Asclepiades, who lived a short time before Celsus, about the end of the reign of Augustus, or beginning of that of Tiberius. The sect founded by him was called methodic, because he endeavoured to find a method of rendering medicine more easy than formerly. He maintained, that a knowledge of the causes of diseases was not necessary, provided we observe what diseases have in common, and analogous to one another. On this principle, he divided all diseases into two, or at most three, kinds. The first included diseases arising from stricture; the second, those arising from relaxation; and the third, those of a mixed nature, or such as partook both of stricture and relaxation. He also asserted, that diseases are sometimes acute, and sometimes chronic; that, for a certain time they increase; that at a certain time they are at their height; and that at last they diminish. Acute diseases, therefore, according to him, must be treated in one way, and chronic ones in another; one method must be followed with such as are in their augmentation, another with such as are in their height, and a third with such as are in their declension. The most skilful of all the methodic sect, and he who put the last hand to it, was Soranus. He lived under Trajan and Adrian, and was a native of Ephesus. One of the most celebrated medical writers of antiquity was Celsus, who lived under Tiberius, but his country is uncertain. It is even disputed whether he was a professed physician. Certain it is, however, that his books on medicine are the most valuable of all the ancients next to those of Hippocrates. From the latter, indeed, he has taken so much, as to acquire the name of the Latin Hippocrates; but he has not attached himself to him so closely as to reject the assistance of other authors. In many particulars he has preferred Asclepiades. About A. D. 131, in the reign of the emperor Adrian, lived the celebrated Galen, a native of Pergamus, whose name makes such a conspicuous figure in the history of physic. At this time the dogmatic, empiric, methodic, and

other sects, had each their abettors. The methodics were held in great esteem, and reckoned superior to the dogmatics, who were strangely divided, some following Hippocrates, others Erasistratus, and others Asclepiades. The empirics made the least considerable figure. Galen undertook the reformation of medicine, and restored dogmatism. He seems to have been of that sect called eclectic, from their choosing out of different authors what they esteemed good in them, without being particularly attached to any one. This declaration he indeed sets out with, yet he follows Hippocrates much more than any of the rest. Though, before his time, several physicians had commented on the works of Hippocrates, yet Galen says that none of them had understood his meaning. His first attempt, therefore, was to explain the works of Hippocrates, and next to compose a system of his own. In his book, intitled, "Of the Establishment of Medicine," he defines the art to be one which teaches to preserve health and cure diseases. In another book, however, he gives the following definition: "Medicine (says he) is a science which teaches what is sound, and what is not so; and what is of an indifferent nature, or holds a medium between what is sound and what is the reverse." He affirmed, that there are three things which constitute the objects of medicine, and which the physician ought to consider as sound, as not sound, or of a neutral and indifferent nature. These are the body itself, the signs and the causes. He esteems the human body sound, when it is in a good state with regard to the simple parts of which it is composed, and when there is a just proportion between the organs formed of these simple parts. On the contrary, the body is unsound, when it recedes from this state, and the just proportion above-mentioned. It is in a state of indifference, when it is in a medium between soundness and its opposite state. The salutary signs are such as indicate present health, and prognosticate that the man may remain in that state for some time to come. The insalubrious signs indicate a present disorder, or give cause for suspecting the approach of one. The neutral or indifferent signs denote neither health nor indisposition, either for the present, or the future. In like manner he speaks of causes salutary, and unsalutary, and indifferent. These three dispositions of the body, its soundness, the reverse, and a neutral state, comprehend all the differences between health and disease; and each of them has a certain extent. A perfectly sound habit of body is very rare, perhaps never to be met with; but such a model may be supposed for regulating our judgement with respect to different constitutions. On this principle Galen establishes eight other principal constitutions, all of which differ more or less from the perfect model. The four first are such as have one of the four qualities of hot, cold, moist, or dry, prevailing in too great a degree; and receive their denomination from that quality which prevails most. The four other species receive their denominations from a combination of the above-mentioned; so that, according to his definition, there may be a hot and dry, a hot and moist, a cold and moist, and a cold and dry, constitution. Besides these differences, there are others, resulting from occult and latent causes, which, by Galen, are said to arise from an idiosyncrasy of constitution. Galen defined a disease to be "such a preternatural disposition or affection of the parts of the body, as primarily, and of itself, hinders their natural and proper action." He established three principal kinds of diseases; the first relates to the similar parts; the second to the organical; and the third is common to both. Galen's system, however, notwithstanding its defects and absurdities, remained almost uncontradicted for a very long period. Indeed it may be considered as having been the prevailing system, till the foundation of the Goths and Vandals put an almost entire stop to the cultivation of letters in Europe. But during the general prevalence of Galen's system, there appeared some writers to whom medicine was indebted for improvements, at least in certain particulars. Among the most distinguished of these were Oribasius, Aetius, Alexander, and Paulus. The first flourished in the fourth century, and the last in the seventh century. In the beginning of the sixteenth century, the famous chemist Paracelsus introduced a new system into medicine, founded on the principles of his art. The Galenical system had prevailed till his time; but the practice had greatly degenerated, and was become quite trifling. The physicians rejected the use of opium, mercury, and other efficacious remedies. Paracelsus, who used these, had therefore greatly the advantage over them; and now all things relating

lating to medicine were explained on imaginary chemical principles. It will easily be conceived that a practice thus founded must have been the most dangerous quackery. The revival of learning, which now took place throughout Europe, the appearance of new distempers, and the natural fondness of mankind for novelty, contributed greatly to promote the advancement of medicine as well as other sciences; while, at the same time, the discovery of printing rendered the communication of new opinions as well as new practices so easy, that to enumerate even the names of those who have been justly rendered eminent for medical knowledge would be a very tedious task. It was not, however, till 1628, that Dr. William Harvey of London demonstrated and communicated to the public one of the most important discoveries respecting the animal economy, the circulation of the blood. This discovery, more effectually than any reasoning, overturned all the systems which had subsisted prior to that time. It may justly be reckoned the most important discovery that has hitherto been made in the healing art; as it puts the explanation of the phenomena of the animal body, both in a state of health and disease, on a more solid and rational footing than formerly. It has not, however, prevented the rise of numerous fanciful and absurd systems. These, though fashionable for a short time, and strenuously supported by blind adherents, have yet in no long period fallen into deserved contempt. And notwithstanding the abilities and industry of Stahl, Hoffman, Boerhaave, and Cullen, we may venture to assert, that no general system has yet been proposed which is not liable to innumerable, and unsurmountable objections. Very great progress has, indeed, been made in explaining the philosophy of the human body, from ascertaining by decisive experiment the influence of the circulating, the nervous, and the lymphatic systems in the animal economy. But every attempt hitherto made to establish any general theory in medicine, that is to conduct the cure of every disease on a few general principles, has equally tended to mislead those who have adopted it. Indeed we may with confidence venture to assert, that from the very nature of the subject, medicine does not admit of such simplicity. No one can deny that the human body consists of a very great number of different parts, both solids and fluids. It is, however, equally certain, that each of these is from many different causes liable to deviations from the sound state. And although some slight changes may take place without what can be called a morbid affection, yet we know, that every change taking place to a certain degree in any one part will necessarily and unavoidably produce an affection of the whole. Hence we may without hesitation venture to affirm, that every general theory which can be proposed, attempting to explain the phenomena, and conduct the cure of all diseases on a few general principles, though for some time it may have strenuous advocates, will yet in the end be found to be both ill-grounded and pernicious. Of late years a new system of medicine has been proposed by Dr. Brown, and called the New or Brunonian doctrine, for which see the articles, BROWN, BRUNONIAN SYSTEM, DEBILITY, EXCITABILITY, &c. Also the introduction of the vaccine inoculation for the prevention of the small-pox, is a valuable discovery, which, in the opinion of many, bids fair in time to extirpate that fatal disease. The ingenious discoverer, Dr. Jenner, received a reward of 10,000*l.* from the British Legislature, in 1801-2; after its utility and beneficial effects had been put past all possibility of doubt, by a series of the most decisive experiments, made by physicians and gentlemen of science and philanthropy, in England, Scotland, Ireland, France, Italy, Germany, Sweden, Denmark, Russia, and Turkey. See VACCINATION.

OF CLASSIFICATION AND THE PRACTICE OF MEDICINE.

Every disease incident to the human body is, in its progress, subjected to almost endless varieties from differences in climate, constitution, treatment, and various other particulars. Hence we may readily explain both the difficulty of distinguishing morbid affections from each other in actual practice, and the diversity of names which have been affixed to them in the writings of ancient physicians. In this, as well as in other arts and sciences, there has been a gradual improvement from the progressive labours of industrious and ingenious men. And though much yet remains to be done in the proper arrangement and distinction of diseases, or what has been called methodical nosology, yet there cannot be a

doubt, that during the course of the last century, this subject has received very great improvements. For these, we are highly indebted to the labours of Francis Boissier de Sauvages, an eminent professor of medicine at Montpellier, who, following out an idea suggested by the sagacious Dr. Sydenham, first successfully attempted to arrange diseases as botanists had done plants, into classes, orders, genera, and species. Since the publication of the *Nosologia Methodica* of Sauvages, this subject has been successfully cultivated by several ingenious men, particularly by Sir Charles Linnæus of Upsal, to whose genius for arrangement every branch of natural history, but botany in particular, has been so highly indebted; by Rudolphus Augustus Vogel, an eminent professor at Gottingen; and by John Baptist Sagar, a distinguished physician at Iglaw in Moravia. But of all the systems of arrangement yet presented to the medical world, that published by the late illustrious Dr. William Cullen of Edinburgh, may be justly considered as the best. After laying before the reader the systematic arrangements of these eminent writers, we shall proceed according to that of Dr. Cullen, as being preferable, in many respects, to any of the others.

Nosological Arrangement of SAUVAGES.

CLASS I. VITIA.

ORDER I. MACULÆ.

- | | | |
|------------------|----------------|--------------|
| Genus 1. Leucoma | 3. Ephelis | 5. Nævus |
| 2. Vitiligo | 4. Gutta rosea | 6. Ecchymoma |

ORDER II. EFFLORESCENTIÆ.

- | | | |
|---------------|---------------|------------|
| 7. Herpes | 9. Psyrdracia | 10. Hidroa |
| 8. Epiniectis | | |

ORDER III. PHYMATA.

- | | | |
|---------------|----------------|----------------|
| 11. Erythema | 15. Phlegmone | 19. Anthrax |
| 12. Edema | 16. Bubo | 20. Cancer |
| 13. Emphysema | 17. Parotis | 21. Paronychia |
| 14. Scirrhus | 18. Furunculus | 22. Phimosis |

ORDER IV. EXCRESCENTIÆ.

- | | | |
|---------------|-----------------|----------------|
| 23. Sarcoma | 26. Pterygium | 29. Exostosis |
| 24. Condyloma | 27. Hordeolum | 30. Gibbositas |
| 25. Verruca | 28. Bronchocele | 31. Lordosis |

ORDER V. CYSTITES.

- | | | |
|---------------|-----------------|----------------|
| 32. Aneurisma | 36. Staphyloma | 39. Apôtomia |
| 33. Varix | 37. Lux | 40. Exomphalus |
| 34. Hydatis | 38. Hydrarthrus | 41. Oscheocele |
| 35. Marisca | | |

ORDER VI. ECTOPIÆ.

- | | | |
|--------------------|-------------------|-------------------|
| 42. Exophthalmia | 49. Hysteroptosis | 56. Cystocele |
| 43. Blepharoptosis | 50. Enterocoele | 57. Encephalocele |
| 44. Hypostophyle | 51. Epiplocele | 58. Hysteroloxia |
| 45. Paraglossa | 52. Gasterocele | 59. Parorchidium |
| 46. Proptoma | 53. Hepatocele | 60. Exarthema |
| 47. Exania | 54. Splenocele | 61. Diastasis |
| 48. Exocyste | 55. Hysterocele | 62. Laxarthrus |

ORDER VII. PLAGÆ.

- | | | |
|----------------|-----------------|----------------|
| 63. Vulnus | 69. Ruptura | 74. Fistula |
| 64. Pinetura | 70. Amputatura | 75. Rhagus |
| 65. Excoriatio | 71. Ulcus | 76. Esclara |
| 66. Contusio | 72. Exulceratio | 77. Caries |
| 67. Fractura | 73. Sinus | 78. Arthrocace |
| 68. Fissura | | |

CLASS II. FEBRES.

ORDER I. CONTINUÆ.

- | | | |
|--------------|--------------|--------------|
| 79. Ephemera | 81. Synochus | 83. Ilectica |
| 80. Synocha | 82. Typhus | |

ORDER II. REMITTENTES.

- | | | |
|-----------------|----------------|-----------------|
| 84. Amphimerina | 85. Triptophya | 86. Tetartophya |
|-----------------|----------------|-----------------|

ORDER

ORDER III. INTERMITTENTES.

87. Quotidiana 89. Quartana 90. Erratica
88. Tertiana

CLASS III. PHILEGNASIE.

ORDER I. EXANTHEMATICÆ.

91. Pestis 95. Miliaris 98. Scarlatina
92. Variola 96. Purpura 99. Essera
93. Pemphigus 97. Erysipelas 100. Aphthia
94. Rubeola

ORDER II. MEMBRANACEÆ.

101. Phrenitis 104. Gastritis 107. Metritis
102. Paraphrenesis 105. Enteritis 108. Cystitis
103. Pleuritis 106. Epiploitis

ORDER III. PARENCHYMATOSÆ.

109. Cephalitis 112. Peripneumonia 114. Splenitis
110. Cynanche 113. Hepatitis 115. Nephritis
111. Carditis

CLASS IV. SPASMI.

ORDER I. TONICI PARTIALES.

116. Strabismus 118. Obstipitas 120. Crampus
117. Trismus 119. Contractura 121. Priapismus

ORDER II. TONICI GENERALES.

122. Tetanus 123. Catochus

ORDER III. CLONICI PARTIALES.

124. Nystagmus 127. Apomyttosis 130. Palpitatio
125. Carphologia 128. Convulsio 131. Claudicatio
126. Pandiculatio 129. Tremor

ORDER IV. CLONICI GENERALES.

132. Rigor 134. Epilepsia 136. Scelotyrhe
133. Eclampsia 135. Hysteria 137. Beriberia

CLASS V. ANIHELATIONES.

ORDER I. SPASMODICÆ.

138. Ephialtes 140. Oscedo 142. Tussis
139. Sternutatio 141. Singultus

ORDER II. OPPRESSIVÆ.

143. Stertor 146. Orthopnoea 149. Rhuma
144. Dyspnoea 147. Angina 150. Hydrothorax
145. Asthma 148. Pleurodyne 151. Empyema

CLASS VI. DEBILITATES.

ORDER I. DYSÆSTHESIE.

152. Cataracta 156. Anosmia 159. Paracusis
153. Caligo 157. Agheusia 160. Cophosis
154. Amblyopia 158. Dysecceæ 161. Anæsthesia
155. Amaurosis

ORDER II. ANEPITHYMIÆ.

162. Anorexia 163. Anipsia 164. Anaphrodisia

ORDER III. DYSINESIE.

165. Musitas 168. Paraphonia 170. Hemiplegia
166. Aponia 169. Paralysis 171. Paraplexia
167. Psellismus

ORDER IV. LEIPOPSYCHIÆ.

172. Asthenia 174. Syncope 175. Asphyxia
173. Leipothymia

ORDER V. COMATA.

176. Catalepsis 179. Lethargus 181. Carus
177. Ecstasis 180. Cataphora 182. Apoplexia
178. Typhomania

CLASS VII. DOLORES.

ORDER I. VAGI.

183. Arthritis 185. Rhumatismus 187. Anxietas
184. Osteocopus 186. Catarrhus 188. Lassitudo

189. Stupor
190. Pruritus

191. Algor 192. Ardor

ORDER II. CAPITIS.

193. Cephalalgia 195. Hemisrania 197. Otagia
194. Cephalæa 196. Ophthalmia 198. Odontalgia

ORDER III. PECTORIS.

199. Dysphagia 200. Pyrosis 201. Cardiognus

ORDER IV. ABDOMINALES INTERNI.

202. Cardialgia 205. Hepatalgia 208. Dystocia
203. Gastrodynia 206. Splenalgia 209. Hysteralgia
204. Colica 207. Nephralgia

ORDER V. EXTERNI ET ARTUUM.

210. Mastodynia 212. Lumbago 214. Proctalgia
211. Rachialgia 213. Ischias 215. Pudendagra

CLASS VIII. VESANIÆ.

ORDER I. HALLUCINATIONES.

216. Vertigo 218. Diplopia 220. Hypochondriasis
217. Sulfusio 219. Syrogismus 221. Somnambulismus

ORDER II. MOROSITATES.

222. Pica 226. Nostalgia 229. Nymphomania
223. Bulimia 227. Panophobia 230. Tarantismus
224. Polydipsia 228. Satyriasis 231. Hydrophobia
225. Antipathia

ORDER III. DELIRIA.

232. Paraphrosyne 234. Melancholia 236. Demonomania
233. Amentia 235. Mania

ORDER IV. VESANIÆ ANOMALÆ.

237. Amnesia 238. Agrypnia

CLASS IX. FLUXUS.

ORDER I. SANGUIFLUXUS.

239. Hæmorrhagia 242. Hæmatemesis 244. Menorrhagia
240. Hæmoptosis 243. Hæmaturia 245. Abortus
241. Stomacæ

ORDER II. ALVIFLUXUS.

246. Hepatirrhœa 250. Nausea 254. Diarrhœa
247. Hæmorrhœis 251. Vomitus 255. Celiaca
248. Dysenteria 252. Ileus 256. Lienteria
249. Melæna 253. Cholera 257. Tenesmus

ORDER III. SERIFLUXUS.

258. Ephidrosis 263. Diabetes 268. Gonorrhœa
259. Epiphora 264. Eneuresis 269. Dyspermatismus
260. Coryza 265. Dysuria 270. Galactirrhœa
261. Ptyalismus 266. Pyuria 271. Octorrhœa
262. Anacatharsis 267. Leucorrhœa

ORDER IV. ÆRIFLUXUS.

272. Flatulenta 273. Ædopsophia 274. Dysodia

CLASS X. CACHEXIÆ.

ORDER I. MACIES.

275. Tabes 277. Atrophia 278. Aridura
276. Phthisis

ORDER II. INTUMESCENTIÆ.

279. Polysarcia 281. Anasarca 283. Physconia
280. Pneumatosis 282. Phlegmatia 284. Graviditas

ORDER III. HYDROPE PARTIALES.

285. Hydrocephalus 288. Ascites 291. Tympanites
286. Physocephalus 289. Hydrometra 292. Metrorismus
287. Hydrachitis 290. Physometra 293. Ischuria

ORDER IV. TUBERA.

294. Rachitis 296. Carcinoma 298. Malis
295. Serophula 297. Leontiasis 299. Framboesia

ORDER V. IMPETIGINES.

- | | | |
|----------------|--------------------|--------------|
| 300. Syphilis | 302. Elephantiasis | 304. Scabies |
| 301. Scorbutus | 303. Lepra | 305. Tinea |

ORDER VI. ICTERITÆ.

- | | | |
|-------------------|----------------|----------------|
| 306. Aurigo | 308. Phanigmus | 309. Chlorosis |
| 307. Melasicterus | | |

ORDER VII. CACHEXIE ANOMALÆ.

- | | | |
|------------------|---------------|---------------|
| 310. Phthiriasis | 312. Alopecia | 314. Gangrena |
| 311. Trichoma | 313. Eleosis | 315. Necrosis |

Nosological Arrangement of LINNÆUS.

CLASS I. EXANTHEMATICI.

ORDER I. CONTAGIOSI.

- | | | |
|-----------|------------|-------------|
| 1. Morta | 3. Variola | 5. Petechia |
| 2. Pestis | 4. Rubeola | 6. Syphilis |

ORDER II. SPORADICI.

- | | | |
|-------------|----------|-----------|
| 7. Miliaria | 8. Uredo | 9. Aphtha |
|-------------|----------|-----------|

ORDER III. SOLITARIÆ.

10. Erysipelas

CLASS II. CRITICI.

ORDER I. CONTINENTES.

- | | | |
|-------------|--------------|-----------|
| 11. Diaria | 13. Synochus | 14. Lenta |
| 12. Synocha | | |

ORDER II. INTERMITTENTES.

- | | | |
|----------------|---------------|------------|
| 15. Quotidiana | 17. Quartana | 19. Errana |
| 16. Tertianæ | 18. Duplicana | |

ORDER III. EXACERBANTES.

- | | | |
|-----------------|-----------------|-------------|
| 20. Amphimerina | 22. Tetartophia | 24. Hectica |
| 21. Tritæus | 23. Hemitritæa | |

CLASS III. PHILOGISTICI.

ORDER I. MEMBRANACEI.

- | | | |
|-------------------|---------------|---------------|
| 25. Phrenitis | 28. Gastritis | 30. Proctitis |
| 26. Paraphrenesis | 29. Enteritis | 31. Cystitis |
| 27. Pleuritis | | |

ORDER II. PARENCHYMATICI.

- | | | |
|-------------------|---------------|----------------|
| 32. Sphacelismus | 35. Hepatitis | 37. Nephritis |
| 33. Cynanche | 36. Splenitis | 38. Hysteritis |
| 34. Peripneumonia | | |

ORDER III. MUSCULOSI.

39. Phlegmone

CLASS IV. DOLOROSI.

ORDER I. INTRINSECI.

- | | | |
|-----------------|----------------|-----------------|
| 40. Cephalalgia | 47. Soda | 54. Pneumonica |
| 41. Hermicrania | 48. Cardialgia | 55. Hysteralgia |
| 42. Gravedo | 49. Gastrica | 56. Nephritica |
| 43. Ophthalmia | 50. Colica | 57. Dysuria |
| 44. Otalgia | 51. Hepatica | 58. Pudendagra |
| 45. Odontalgia | 52. Splenica | 59. Proctica |
| 46. Angina | 53. Pleuritica | |

ORDER II. EXTRINSECI.

- | | | |
|---------------|------------------|--------------|
| 60. Arthritis | 62. Rheumatismus | 64. Pruritus |
| 51. Ostocopus | 63. Volatica | |

CLASS V. MENTALES.

ORDER I. IDEALES.

- | | | |
|------------------|-------------|-----------------|
| 55. Delirium | 68. Mania | 70. Vesania |
| 56. Paraphrosyne | 69. Dæmonia | 71. Melancholia |
| 57. Amentia | | |

ORDER II. IMAGINARIÆ.

- | | | |
|---------------|----------------|---------------------|
| 72. Strygmus | 74. Vertigo | 76. Hypochondriasis |
| 73. Phantasma | 75. Panophobia | 77. Somnambulismus |

ORDER III. PATHETICI.

- | | | |
|----------------|-----------------|-----------------|
| 78. Citta | 82. Erotomania | 86. Hydrophobia |
| 79. Bulimia | 83. Nostalgia | 87. Cacositia |
| 80. Polydipsia | 84. Tarantismus | 88. Antipathia |
| 81. Satyriasis | 85. Rabies | 89. Anxietas |

CLASS VI. QUIETALES.

ORDER I. DEFECTIVI.

- | | | |
|---------------|----------------|--------------|
| 90. Lassitudo | 92. Asthenia | 94. Syncope |
| 91. Languor | 93. Lipothymia | 95. Asphyxia |

ORDER II. SOPOROSI.

- | | | |
|-----------------|-----------------|-----------------|
| 96. Somnolentia | 100. Carus | 103. Hemiplegia |
| 97. Typhomania | 101. Apoplexia | 104. Paralysis |
| 98. Lethargus | 102. Paraplegia | 105. Stupor |
| 99. Cotaphora | | |

ORDER III. PRIVATIVI.

- | | | |
|----------------|---------------|-----------------|
| 106. Morosis | 111. Scotomia | 116. Anorexia |
| 107. Oblivio | 112. Cophosis | 117. Adipsia |
| 108. Amliopia | 113. Anosmia | 118. Anæsthesia |
| 109. Cataracta | 114. Agcusia | 119. Atecnia |
| 110. Amaurosis | 115. Aphonia | 120. Atonia |

CLASS VII. MOTORII.

ORDER I. SPASTICI.

- | | | |
|------------------|----------------|-----------------|
| 121. Spasmus | 125. Sardiasis | 128. Catochus |
| 122. Priapismus | 126. Hysteria | 129. Catalepsia |
| 123. Borborygmus | 127. Tetanus | 130. Agrypnia |
| 124. Trismus | | |

ORDER II. AGITATORII.

- | | | |
|-----------------|-----------------|-----------------|
| 131. Tremor | 135. Carpologia | 138. Psellismus |
| 132. Palpitatio | 136. Stridor | 139. Chorea |
| 133. Orgasmus | 137. Hippos | 140. Beriberi |
| 134. Subsultus | | |

ORDER II. AGITATORII.

- | | | |
|----------------|-----------------|-----------|
| 141. Rigor | 143. Epilepsia | 145. Rapa |
| 142. Convulsio | 144. Hieranosus | |

CLASS VIII. SUPPRESSORII.

ORDER I. SUFFOCATORII.

- | | | |
|------------------|-------------------|-----------------|
| 146. Rucedo | 152. Pandiculatio | 158. Suffocatio |
| 147. Vociferatio | 153. Singultus | 159. Empyema |
| 148. Risus | 154. Sternutatio | 160. Dyspnœa |
| 149. Fletus | 155. Tussis | 161. Asthma |
| 150. Suspirium | 156. Stertor | 162. Orthopnœa |
| 151. Oscitatio | 157. Anhelatio | 163. Ephelates |

ORDER II. CONSTRICTORII.

- | | | |
|------------------|-------------------|-----------------|
| 164. Aglutitio | 167. Ischuria | 170. Aglactatio |
| 165. Flatulentia | 168. Dysmenorrhœa | 171. Sterilitas |
| 166. Obstipatio | 169. Dyslochia | |

CLASS IX. EVACUATORII.

ORDER I. CAPITIS.

- | | | |
|---------------|------------------|-----------------|
| 172. Otorrhœa | 174. Hæmorrhagia | 176. Stomacace |
| 173. Epiphora | 175. Coryza | 177. Ptyalismus |

ORDER II. THORACIS.

- | | | |
|-------------------|-----------------|-------------|
| 178. Screatus | 180. Hæmoptysis | 181. Vomica |
| 179. Expectoratio | | |

ORDER III. ABDOMINIS.

- | | | |
|------------------|----------------|-----------------|
| 182. Ructus. | 187. Cholera | 192. Dysenteria |
| 183. Nausea | 188. Diarrhœa | 193. Hæmorrhœis |
| 184. Vomitus | 189. Lienteria | 194. Tenesmus |
| 185. Hæmatemesis | 190. Cæliaca. | 195. Crepitus. |
| 186. Iliaca | 191. Choliric | |

ORDER IV. GENITALIUM.

- | | | |
|------------------|----------------|-----------------|
| 196. Enuresis | 198. Diabetes | 200. Glus |
| 197. Stranguria. | 199. Hæmaturia | 201. Gonorrhœa. |
| | | 202. Leucorrhœa |

ORDER IV. GENITALIUM.

202. Leucorrhœa 204. Parturitus 206. Moia
203. Menorrhagia 205. Abortus

ORDER V. CORPORIS EXTERNI.

207. Galactia 208. Sudor

CLASS X. DEFORMES.

ORDER I. EMACIANTES.

209. Phthisis 211. Atrophia 213. Rachitis
210. Tabes 212. Marasmus

ORDER II. TUMIDOSI.

214. Polysarcia 216. Anasarca 219. Hyposarca
215. Lucophlegmatia 217. Hydrophalus 220. Tympanites
218. Ascites 221. Graviditas

ORDER III. DECOLORES.

222. Cachexia 224. Scorbutus 226. Plethora
223. Chlorosis 225. Icterus

CLASS XI. VITIA.

ORDER II. HUMORALIA.

227. Ardura 230. Oedema 233. Abscessus
228. Digitum 231. Sugillatio 234. Gangrena
229. Emphysema 232. Inflammatio 235. Sphacelus

ORDER II. DIALYTICA.

236. Fractura 241. Vulnus 246. Combustura
237. Luxatura 242. Amputatura 247. Excoriatura
238. Ruptura 243. Laceratura 248. Intertrigo
239. Contusura 244. Punctura 249. Rhagas
240. Profusio 245. Morsura

ORDER III. EXULCERATIONES.

250. Ulcus 255. Fistula 259. Paronychia
251. Cacoethies 256. Caries 260. Pernio
252. Noma 257. Arthrocace 261. Pressura
253. Carcinoma 258. Cocyta 262. Arctura
254. Ozena

ORDER IV. SCABIES.

263. Lepra 270. Varus 276. Papula
264. Tinea 271. Bacchia 277. Hordeolum
265. Achor 272. Bubo 278. Verruca
266. Psora 273. Anthrax 279. Clavus
267. Lippitudo 274. Phlyctana 280. Myrmecium
268. Serpigo 275. Pustula 281. Eschiana
269. Herpes

ORDER V. TUMORES PROTUBERANTES.

282. Aneurisma 286. Atheroma 289. Natta
283. Varix 287. Anchylosus 290. Spinola
284. Schirrus 288. Ganglion 291. Exostosis
285. Struma

ORDER VI. PROCIDENTIE.

292. Hernia 295. Sarcoma 298. Phimosis
293. Prolapsus 296. Pterygium 299. Clitorismus
294. Condyloma 297. Ectropium

ORDER VII. DEFORMATIONES.

300. Contractura 306. Lagophthalmia 312. Apella
301. Gibber 307. Nyctalopia 313. Atreta
302. Lordosis 308. Presbytia 314. Plica
303. Distortio 309. Myopia 315. Hirsuties
304. Tortura 310. Labarium 316. Alopecia
305. Strabismus 311. Lagostoma 317. Trichiasis

ORDER VIII. MACULÆ.

318. Cicatrix 321. Vibex 324. Hepatizon
319. Nævus 322. Sudamen 325. Lentigo
320. Morphæa 323. Melasma 326. Ephelis

Nosological Arrangement of VOGEL.

CLASS I. FEBRES.

ORDER I. INTERMITTENTES.

- | | | |
|---------------|-------------|----------------------|
| 1. Quotidiana | 6. Septana | 11. Menstrua |
| 2. Ternaria | 7. Octana | 12. Tertiana duplex |
| 3. Quartana | 8. Nonana | 13. Quartana duplex |
| 4. Quintana | 9. Decimana | 14. Quartana triplex |
| 5. Sextana | 10. Vaga | |

ORDER II. CONTINUÆ.

- § 1. *Simplices.*
- | | | |
|------------------------|-------------------|--------------------|
| 15. Quotidiana | 36. Morbillosa | 59. Splenitis |
| 16. Synochus | 37. Miliaris | 60. Mesenteritis |
| 17. Amatoria | 38. Petechialis | 61. Omentitis |
| 18. Phrenitis | 39. Scarlatina | 62. Peritonitis |
| 19. Epiala | 40. Utica | 63. Myocolitis |
| 20. Causos | 41. Bullosa | 64. Pancreatica |
| 21. Elodes | 42. Varicella | 65. Nephritis |
| 22. Lethargus | 43. Pemphingodes | 66. Cistitis |
| 23. Typhomania | 44. Aphthosa | 67. Hysteritis |
| 24. Leipyria | 45. Phrenismus | 68. Erysipelacca |
| 25. Phricodes | 46. Chemosis | 69. Podagrica |
| 26. Lyngodes | 47. Ophthalmites | 70. Panarititia |
| 27. Assodes | 48. Otites | 71. Cystosis |
| 28. Cholericæ | 49. Angina | 72. Apoplectica |
| 29. Synchopalis | 50. Pleuritis | 73. Catarrhalis |
| 30. Hydropophobia | 51. Peripneumonia | 74. Rheumatica |
| 31. Oscitans | 52. Mediastina | 75. Hæmorrhoidalis |
| 32. Ictericodes | 53. Pericarditis | 76. Lactea |
| 33. Pestilentialis | 54. Carditis | 77. Vulneraria |
| 34. Siriasis | 55. Paraphrenitis | 78. Suppuratoria |
| § 2. <i>Compositæ.</i> | 56. Gastritis | 79. Lenta |
| 35. Variolosa | 57. Enteritis | 80. Hectica |
| | 58. Hepatitis | |
- ¶ 1. *Exanthematica.*

CLASS II. PROFLUVIA.

ORDER I. HÆMORRHAGIÆ.

- | | | |
|-----------------|----------------------|-------------------|
| 81. Hæmorrhagia | 87. Otorrhœa | 93. Cystirrhagia |
| 82. Epistaxis | 88. Ophthalmorrhagia | 94. Stymatosis |
| 83. Hæmoptoe | 89. Hæmatemesis | 95. Hæmatopedesis |
| 84. Hæmoptysis | 90. Heptirrhœa | 96. Menorrhagia |
| 85. Stomacace | 91. Catarrhexis | 97. Abortio |
| 86. Odontirrhœa | 92. Hæmaturia | |

ORDER II. APOCENOSSES.

- | | | |
|-----------------|------------------|---------------------|
| 98. Catarrhus | 108. Lienteria | 117. Chylaria |
| 99. Epiphora | 109. Cæliaca | 118. Gonorrhœa |
| 100. Coryza | 110. Cholera | 119. Leucorrhœa |
| 101. Otopuosis | 111. Pituitaria | 120. Exonecrosis |
| 102. Otoplotos | 112. Leucorrhœis | 121. Hydropedesis |
| 103. Ptyalismus | 113. Eneuresis | 122. Galactia |
| 104. Vomica | 114. Diuresis | 123. Hypercatharsis |
| 105. Diarrhœa | 115. Diabetes | 124. Ecphyse |
| 106. Puorrhœa | 116. Puoturia | 125. Dysodia |
| 107. Dysenteria | | |

CLASS III. EPISCHESES.

- | | | |
|------------------|-----------------|---------------|
| 126. Gravedo | 129. Ischuria | 132. Deuteria |
| 127. Flatulentia | 130. Amenorrhœa | 133. Agalaxis |
| 128. Obstipatio | 131. Dyslochia | |

CLASS IV. DOLORES.

- | | | |
|-------------------|------------------|-------------------|
| 134. Anxietas | 147. Odaxismus | 160. Colica |
| 135. Blestrismus | 148. Otalgia | 161. Eilema |
| 136. Pruritus | 149. Acataposis | 162. Ileus |
| 137. Catapsyxis | 150. Cionis | 163. Stranguria |
| 138. Rheumatismus | 151. Himantosis | 164. Dysuria |
| 139. Arthritis | 152. Cardiognus | 165. Lithuriasis |
| 140. Cephalalgia | 153. Mastodynïa | 166. Tenesmus |
| 141. Cephalæa | 154. Soda | 167. Clunesia |
| 142. Clavus | 155. Periadynia | 168. Cedma |
| 143. Hemicrania | 156. Pneumatosis | 169. Hysteralgia |
| 144. Carebaria | 157. Cardialgia | 170. Dysmenorrhœa |
| 145. Odontalgia | 158. Encausis | 171. Dystochia |
| 146. Hamodia | 159. Nausea | 172. Atocia |
| | | 173. Priapismus |

173. Priapismus 176. Osteocopus 178. Volatica
174. Psoriasis 177. Psophus 179. Epiphilgisma
175. Podagra

CLASS V. SPASMI.

180. Tetanus 194. Crampus 208. Capistrum
181. Opisthotonus 195. Sclerotyrbe 209. Sardiass
182. Episthotonus 196. Angone 210. Gelasmus
183. Catochus 197. Glossocoele 211. Incubus
184. Tremor 198. Glossocoma 212. Singultus
185. Frigus 199. Hippos 213. Palpitatio
186. Horror 200. Illosis 214. Vomitus
187. Rigor 201. Cinclesis 215. Ructus
188. Epilepsia 202. Cataclasis 216. Ruminatio
189. Hecampsis 203. Catilosis 217. Oesophagismus
190. Hieranosus 204. Sternutatio 218. Hypochondriasis
191. Convulso 205. Tussis 219. Hysteria
192. Raphania 206. Clamor 220. Phlogosis
193. Chlorca 207. Trismus 221. Digitium

CLASS VI. ADYNAMIÆ.

222. Lassitudo 243. Nyctalopia 264. Pandiculatio
223. Asthenia 244. Hæmeralopia 265. Apnæa
224. Torpor 245. Hemalopia 266. Macropnœa
225. Adynamia 246. Dysicoia 267. Dyspnœa
226. Paralysis 247. Surditas 268. Asthma
227. Paraplegia 248. Anosmia 269. Orthopnœa
228. Hemiplegia 249. Apogeusis 270. Pnigma
229. Apoplexia 250. Asaphia 271. Rencbus
230. Gatalepis 251. Clangor 272. Rhochmos
231. Carus 252. Raucitas 273. Lipothymia
232. Coma 253. Aphonia 274. Syncope
233. Somnolentia 254. Leptophonia 275. Asphyxia
234. Hypophasis 255. Oxyphonia 276. Apepsia
235. Ptosis 256. Rhenophonia 277. Dyspepsia
236. Amblyopia 257. Mutitas 278. Diaphthora
237. Mydriasis 258. Traulotis 279. Anorexia
238. Amaurosis 259. Psellotis 280. Anatrope
239. Cataracta 260. Isclnophonia 281. Adypsia
240. Synizezis 261. Battarismus 282. Acyisis
241. Glaucoma 262. Suspirium 283. Agenesia
242. Achlys 263. Oscitatio 284. Anodynia

CLASS VII. HYPÆRESTHESES.

285. Antipathia 292. Susurrus 298. Cynorexia
286. Agrypnia 293. Vertigo 299. Allotriophagia
287. Phantasma 294. Apogeusia 300. Malacia
288. Caligo 295. Polydipsia 301. Pica
289. Hæmalopia 296. Bulimus 302. Bombus
290. Marmaryge 297. Addephagia 303. Celsa
291. Dysopia

CLASS VIII. CACHEXIÆ.

304. Cachexia 313. Anasarca 321. Elephantiasis
305. Chlorosis 314. Ascites 322. Elephantia
306. Icterus 315. Hydrocystis 323. Plica
307. Malanchlorus 316. Tympanites 324. Phthiriasis
308. Atrophia 317. Hysterophyse 325. Physconia
309. Tabes 318. Scorbutus 326. Paracysis
310. Phthisis 319. Syphilis 327. Gangræna
311. Hydrothorax 320. Lepra 328. Sphacelus
312. Rachitis

CLASS IX. PARANOIÆ.

329. Athymia 333. Ecstasis 337. Amentia
330. Delirium 334. Ecplexis 338. Oblivio
331. Mania 335. Enthusiasmus 339. Somnium
332. Melancholia 336. Stupiditas 340. Hypnobotasis

CLASS X. VITIÆ.

ORDER I. INFLAMMATIONES.

341. Ophthalmia 345. Paronychia 348. Phimosis
342. Blepharotis 346. Onychia 349. Paraphimosis
343. Erysipelas 347. Encausis 350. Pernio
344. Hieropyr

ORDER II. TUMORES.

351. Pleginone 378. Condyloma 401. Ichiatocele
352. Furunculus 379. Ganglion 402. Elytrocele
353. Anthrax 380. Ranula 403. Hypogastrocele
354. Abscessus 381. Terminthus 404. Cystocoele
355. Oonyx 382. Oedema 405. Cytoma
356. Hippopyon 383. Encephalocoele 406. Hydrenterocele
357. Phygetiloin 384. Hydrocephalum 407. Varix
358. Empyema 385. Hydrophthalma 408. Aneurisma
359. Phyma 409. Cirsocele
360. Ecchymata 386. Spina bifida 410. Gastrocele
361. Urticaria 387. Hydromphalus 411. Hepatocele
362. Parulis 388. Hydrocele 412. Splenocoele
363. Epulis 389. Hydrops Scorti 413. Hysterocele
364. Anchylops 390. Steatitis 414. Hygrocirsocele
365. Paraglossa 391. Pneumatosi 415. Sarcocoele
366. Chilon 392. Emphysema 416. Physocoele
367. Scrophula 393. Hysteroptosis 417. Exostoses
368. Bubon 394. Cystoptosis 418. Hyperostosis
369. Bronchocoele 395. Archoptoma 419. Padartirocac
370. Parotis 396. Bubonocoele 420. Encystis
371. Gongrona 397. Oscheocoele 421. Staphyloma
372. Sparganosis 398. Omphalocoele 422. Staphylosis
373. Coilima 399. Merocele 423. Fungus
374. Scirrhus 400. Enterocoele 424. Tofus
375. Cancer 425. Flemen
376. Sarcoma
377. Polypus

ORDER III. EXTUBERANTIÆ.

426. Verruca 431. Pladarotis 436. Varus
427. Porrus 432. Pinnula 437. Gutta rosacea
428. Clavus 433. Pterygium 438. Ephelis
429. Callus 434. Hordeolum 439. Eoche
430. Encanthis 435. Grando 440. Exoche

ORDER IV. PUSTULE AND PAPULÆ.

441. Epinyctis 445. Aquula 448. Varicella
442. Phlyctæna 446. Hydroa 449. Purpura
443. Herpes 447. Variola 450. Encauma
444. Scabies

ORDER V. MACULÆ.

451. Ecchymoma 456. Urticaria 461. Cyasma
452. Petechie 457. Stigma 462. Lichen
453. Morbilli 458. Vibex 463. Scilina
454. Scarlatæ 459. Vitiligo 464. Nebala
455. Lentigo 460. Leuce

ORDER VI. DISSOLUTIONES.

465. Vulus 478. Anapleusis 491. Fistula
466. Ruptura 479. Spasma 492. Sinus
467. Rhagas 480. Contusio 493. Caries
468. Fractura 481. Diabrosis 494. Achores
469. Fissura 482. Agomphiasis 495. Crusta lactea
470. Plicatio 483. Eschara 496. Favus
471. Thlasia 484. Piptonychia 497. Tinea
472. Luxatio 485. Cacoethes 498. Argemon
473. Subluxatio 486. Therioma 499. Fgilops
474. Diachalasis 487. Carcinoma 500. Ozana
475. Attritis 488. Phagedæna 501. Aphthæ
476. Porrigo 489. Noma 502. Intertrigo
477. Aposyrma 490. Sycosis 503. Rhacosis

ORDER VII. CONCRETIONES.

504. Ancyloblepharon 506. Dacrymoma 509. Cicatrix
505. Zinizesis 507. Ancyloglossum 510. Dactylion
508. Ancylosis

CLASS XI. DEFORMITATES.

511. Phoxos 516. Lagophthalmus 521. Rhysemata
512. Gibber 517. Trichiasis 522. Lagocheilos
513. Caput obstipum 518. Ectropium 523. Melachostecn
514. Strabismus 519. Entropium 524. Hirsuties
515. Myopiasis 520. Rhæas 525. Canities
526. Distri

- | | | |
|-------------------|-------------------|----------------------|
| 526. Distrix | 538. Nævus | 550. Saniodes |
| 527. Xirasia | 539. Monstrositas | 551. Crip-orchis |
| 528. Phalacrotris | 540. Polysarcia | 552. Hermaphrodites |
| 529. Alopecia | 541. Ischnotis | 553. Dionyscus |
| 530. Madarosis | 542. Rhicnosis | 554. Arletiscus |
| 531. Ptilosis | 543. Varus | 555. Nefrendis |
| 532. Rodatio | 544. Valgus | 556. Spanopogon |
| 533. Phalangosis | 545. Leiopodes | 557. Hyperartetiscus |
| 534. Coloboma | 546. Apella | 558. Galiæon |
| 535. Cercosis | 547. Hypospadiæos | 559. Galbulus |
| 536. Cholosis | 548. Urorhæas | 560. Mola |
| 537. Gryposis | 549. Atreta | |

Nosological Arrangement of SAGAR.

CLASS I. VITIA.

ORDER I. MACULÆ.

- | | | |
|-------------|------------|--------------|
| 1. Leucoma | 3. Ephelis | 5. Ecchymoma |
| 2. Vitiligo | 4. Nævus | |

ORDER II. EFFLORESCENTIA.

- | | | |
|---------------|---------------|------------------|
| 6. Pustula | 10. Varus | 13. Hemeropathos |
| 7. Papula | 11. Herpes | 14. Psyracia |
| 8. Phlycthæna | 12. Epinyctis | 15. Hydroa |
| 9. Bacchia | | |

ORDER III. PHYMATA.

- | | | |
|---------------|-----------------|----------------|
| 16. Erythema | 20. Inflammatio | 24. Anthrax |
| 17. Oedema | 21. Bubo | 25. Cancer |
| 18. Emphysema | 22. Parotis | 26. Paronychia |
| 19. Scirrhus | 23. Farunculus | 27. Phimosis |

ORDER IV. EXCRESCENTIA.

- | | | |
|---------------|---------------|-------------------|
| 28. Sarcoma | 31. Pterygium | 33. Trachelophyma |
| 29. Condyloma | 32. Hordeolum | 34. Exostosis |
| 30. Verruca | | |

ORDER V. CYSTITES.

- | | | |
|---------------|----------------|-----------------|
| 35. Aneurysma | 39. Staphyloma | 42. Apostema |
| 36. Varix | 40. Lupia | 43. Exomphalus |
| 37. Marisca | 41. Hydarthrus | 44. Oscheophyma |
| 38. Hydatis | | |

ORDER VI. ECTOPIÆ.

- | | | |
|--------------------|-----------------|--------------------|
| 45. Exopthalmia | 54. Gastrocele | 63. Peritonæorixis |
| 46. Blepharoptosis | 55. Omphalocele | 64. Encephalocele |
| 47. Hypostaphyle | 56. Hepatocele | 65. Hysterotoxia |
| 48. Paraglossa | 57. Merocele | 66. Parorchidium |
| 49. Proptoma | 58. Bubonocele | 67. Exarthrema |
| 50. Exania | 59. Opodeocele | 68. Diastasis |
| 51. Exocystis | 60. Ischiocele | 69. Loxarthrus |
| 52. Hysteroptosis | 61. Colpocele | 70. Gibbositas |
| 53. Colpoposis | 62. Perinæocele | 71. Lordosis |

ORDER VII. DEFORMITATES.

- | | | |
|---------------|-----------------|--------------------|
| 72. Lagostoma | 74. Polymerisma | 76. Anchylomerisma |
| 73. Apella | 75. Epidosis | 77. Hirsuties |

CLASS II. PLAGÆ.

ORDER I. SOLUTIONES.

Recentes, Cruentæ.

- | | | |
|-------------------|----------------|--------------|
| 78. Vulnus | 81. Morsus | 83. Contusio |
| 79. Punctura | 82. Excoriatio | 84. Ruptura |
| 80. Sclopetopлага | | |

ORDER II. SOLUTIONES.

Recentes, Cruentæ, Artificiales.

- | | | |
|---------------|------------|------------------|
| 85. Operatio | 87. Sutura | 88. Paracentesis |
| 86. Amputatio | | |

ORDER III. SOLUTIONES.

Incruentæ.

- | | | |
|-----------------|-------------|----------------|
| 89. Ulcus | 92. Sinus | 94. Caries |
| 90. Exulceratio | 93. Eschara | 95. Arthrocace |
| 91. Fistula | | |

ORDER IV. SOLUTIONES.

Anomala.

- | | | |
|--------------|--------------|-------------|
| 96. Rhagas | 98. Fractura | 99. Fissura |
| 97. Ambustio | | |

CLASS III. CACHEXIÆ.

ORDER I. MACIES.

- | | | |
|---------------|------------------|--------------|
| 100. Tabes | 102. Atrophia | 104. Aridura |
| 101. Phthisis | 103. Hæmatoporia | |

ORDER II. INTUMESCENTIÆ.

- | | | |
|------------------|-----------------|-----------------|
| 105. Plethora | 108. Anasarca | 110. Physconia |
| 106. Polysarcia | 109. Phlegmatia | 111. Graviditas |
| 107. Pneumatosis | | |

ORDER III. HYDROPE.

Partiales.

- | | | |
|--------------------|-----------------|------------------|
| 112. Hydrocephalus | 115. Ascites | 118. Tympanites |
| 113. Physocephalus | 116. Hydrometra | 119. Meteorismus |
| 114. Hydrorachitis | 117. Physometra | |

ORDER IV. TUBERA.

- | | | |
|----------------|-----------------|-----------------|
| 120. Rachitis | 122. Carcinoma | 124. Malis |
| 121. Scrophula | 123. Leontiasis | 125. Framboesia |

ORDER V. IMPETIGINES.

- | | | |
|----------------|--------------------|--------------|
| 126. Syphilis | 128. Elephantiasis | 130. Scabies |
| 127. Scorbutus | 129. Lepra | 131. Tinea |

ORDER VI. ICTERITIÆ.

- | | | |
|-------------------|----------------|----------------|
| 132. Aurigo | 134. Phœnignus | 135. Chlorosis |
| 133. Melanicterus | | |

ORDER VII. ANOMALÆ.

- | | | |
|------------------|---------------|---------------|
| 136. Phthiriasis | 138. Alopecia | 140. Gangræna |
| 137. Trichoma | 139. Ekcosis | 141. Necrosis |

CLASS IV. DOLORES.

ORDER I. VAGI.

- | | | |
|-------------------|----------------|---------------|
| 142. Arthritis | 146. Anxietas | 149. Pruritus |
| 143. Ostocopus | 147. Lassitudo | 150. Algor |
| 144. Rheumatismus | 148. Stupor | 151. Ardor |
| 145. Catarrhus | | |

ORDER II. CAPITIS.

- | | | |
|------------------|-----------------|-----------------|
| 152. Cephalalgia | 154. Hemicrania | 156. Otalgia |
| 153. Cephalæa | 155. Ophthalmia | 157. Odontalgia |

ORDER III. PECTORIS.

- | | |
|--------------|-----------------|
| 158. Pyrosis | 159. Cardiognus |
|--------------|-----------------|

ORDER IV. ABDOMINIS.

- | | | |
|------------------|-----------------|------------------|
| 160. Cardialgia | 163. Hepatalgia | 165. Nephralgia |
| 161. Gastrodynia | 164. Splenalgia | 166. Hysteralgia |
| 162. Colica | | |

ORDER V. EXTERNARUM.

- | | | |
|-----------------|-----------------|-----------------|
| 167. Mastodynia | 170. Ischias | 172. Pudendagra |
| 168. Rachialgia | 171. Proctalgia | 173. Digitium |
| 169. Lumbago | | |

CLASS V. FLUXUS.

ORDER I. SANGUIFLUXUS.

- | | | |
|------------------|------------------|------------------|
| 174. Hæmorrhagia | 177. Hæmatemesis | 179. Menorrhagia |
| 175. Hæmoptysis | 178. Hæmaturia | 180. Abortus |
| 176. Stomacæ | | |

ORDER II. ALVIPLUXUS.

Sanguinolenti.

- | | | |
|------------------|-----------------|-------------|
| 181. Hepatirrhœa | 183. Dysenteria | 184. Melæna |
| 182. Hæmorrhœis | | |

ORDER III. ALVIPLUXUS.

Non Sanguinolenti.

- | | | |
|--------------|---------------|------------------|
| 185. Nausea | 188. Cholera | 191. Lienteria |
| 186. Vomitus | 189. Diarrhœa | 192. Tenesmus |
| 187. Ileus | 190. Cæliaca | 193. Proctorrhœa |

194. Ephidrosis
195. Epiphora
196. Coryza
197. Ptyalismus
198. Anacatharsis
- ORDER IV. SERIFLUXUS.
199. Diabetes
200. Enuresis
201. Pyuria
202. Leucorrhœa
203. Lochiorrhœa
204. Gonorrhœa
205. Galactorrhœa
206. Otorrhœa

207. Flatulentia
208. Adopsophia
209. Dysodia

CLASS VI. SUPPRESSIONES.

- ORDER I. EGERENDORUM.
210. Adiapneustia
211. Sterilitas
212. Ischuria
213. Dysuria
214. Aglactatio
215. Dyslochia

- ORDER II. INGERENDORUM.
216. Dysphagia
217. Angina

- ORDER III. IMI VENTRIS.
218. Dysmenorrhœa
219. Dystocia
220. Dyshæmorrhœis
221. Obstipatio

CLASS VII. SPASMI.

- ORDER I. TONICI PARTIALES.
222. Strabismus
223. Trismus
224. Obstipitas
225. Contractura
226. Crampus
227. Priapismus

- ORDER II. TONICI GENERALES.
228. Tetanus
229. Catochus

- ORDER III. CLONICI PARTIALES.
230. Nystagmus
231. Carphologia
232. Subsultus
233. Pandiculatio
234. Apomystosis
235. Convulsio
236. Tremor
237. Palpitatio
238. Claudicatio

- ORDER IV. CLONICI GENERALES.
239. Phricasmus
240. Eclampsia
241. Epilepsia
242. Hysteria
243. Scelotyrbe
244. Beriberia

CLASS VIII. ANHELATIONES.

- ORDER I. SPASMODICÆ.
245. Ephialtes
246. Sternutatio
247. Oscedo
248. Singultus
249. Tussis

- ORDER II. SUPPRESSIVÆ.
250. Stertor
251. Dyspnœa
252. Asthma
253. Orthopnœa
254. Pleurodyne
255. Rheuma
256. Hydrothorax
257. Empyema

CLASS IX. DEBILITATES.

- ORDER I. DYSÆSTHESIÆ.
258. Amblyopia
259. Caligo
260. Cataracta
261. Amaurosis
262. Anosmia
263. Agheusia
264. Dysecœa
265. Paracusis
266. Cophosis
267. Anæsthesia

- ORDER II. ANEPITHYMIÆ.
268. Anorexia
269. Adipsia
270. Anaphrodisia

- ORDER III. DYSINESIÆ.
271. Mutitas
272. Aphonia
273. Psellismus
274. Cacophonia
275. Paralysis
276. Hemiplegia
277. Paraplexia

- ORDER IV. LEIPOPSYCHIÆ.
278. Asthenia
279. Lipothymia
280. Syncope
281. Asphyxia

- ORDER V. COMATA.
282. Catalepsis
283. Ecstasis
284. Typhomania
285. Lethargus
286. Cataphora
287. Carus
288. Apoplexia

CLASS X. EXANTHEMATA.

- ORDER I. CONTAGIOSA.
289. Pestis
290. Variola
291. Pemphigus
292. Purpura
293. Rubeola
294. Scarlatina

ORDER II. NON CONTAGIOSA.

295. Miliaris
296. Erysipelas
297. Essera
298. Aphtha

CLASS XI. PHLEGMASIE.

- ORDER I. MUSCULOSÆ.
299. Phlegmone
300. Cynanche
301. Myositis
302. Carditis

- ORDER II. MEMBRANACEÆ.
303. Phrenitis
304. Diaphragmitis
305. Pleuritis
306. Gastritis
307. Enteritis
308. Epiploitis
309. Cystitis

- ORDER III. PARENCHYMATOSÆ.
310. Cephalitis
311. Peripneumonia
312. Hepatitis
313. Splenitis
314. Nephritis
315. Metritis

CLASS XII. FEBRES.

- ORDER I. CONTINUÆ.
316. Judicatoria
317. Humoraria
318. Frigeraria
319. Typhus
320. Hæctica

- ORDER II. REMITTENTES.
321. Amphimerina
322. Tritæophya
323. Tetartophya

- ORDER III. INTERMITTENTES.
324. Quotidiana
325. Tertiana
326. Quartana
327. Erratica

CLASS XIII. VESANIÆ.

- ORDER I. HALLUCINATIONES.
328. Vertigo
329. Sulfusio
330. Diplopia
331. Syrigmos
332. Hypochondriasis
333. Somnambulismus

- ORDER II. MOROSITATES.
334. Pica
335. Bullmia
336. Polydipsia
337. Antipathia
338. Nostalgia.
339. Panophobia
340. Satyriasis
341. Nymphomania
342. Tarantismus
343. Hydrophobia
344. Rabies

- ORDER III. DELIRIA.
345. Paraphrosine
346. Amentia
347. Melancholia
348. Dæmonomania
349. Mania

- ORDER IV. ANOMALÆ.
350. Amnesia
351. Agrypnia

Nosological Arrangement of CULLEN.

CLASS I. PYREXIE.

- ORDER I. FEBRES.
§ 1. Intermittentes.
1. Tertiana
2. Quartana
3. Quotidiana
§ 2. Continuæ.
4. Synocha
5. Typhus
6. Synochus

- ORDER II. PHLEGMASIE.
7. Phlogosis
8. Ophthalmia
9. Phrenitis
10. Cynanche
11. Pneumonia
12. Carditis
13. Peritonitis
14. Gastritis
15. Enteritis
16. Hepatitis
17. Splenitis
18. Nephritis
19. Cystitis
20. Hysteritis
21. Rheumatismus
22. Odontalgia
23. Podagra
24. Arthropusis

- ORDER III. EXANTHEMATA.
25. Variola
26. Varicella
27. Rubeola
28. Scarlatina
29. Pestis
30. Erysipelas
31. Miliaria
32. Urticaria
33. Pemphigus
34. Aphtha

- ORDER IV. HÆMORRHAGIÆ.
35. Epistaxis
36. Hæmoptysis
37. Hæmorrhœis
38. Menorrhagia

ORDER V. PROFLUVIA.

39. Catarrhus
40. Dysenteria

CLASS II. NEUROSES.

ORDER I. COMATA.

41. Apoplexia
42. Paralysis

ORDER II. ADYNAMIÆ.

43. Syncope
44. Dyspepsia
45. Hypochondriasis
46. Chlorosis

ORDER III. SPASMI.

47. Tetanus
48. Trismus
49. Convulsio
50. Chorea
51. Raphania
52. Epilepsia
53. Palpitatio
54. Asthina
55. Dyspnœa
56. Pertussis
57. Pyrosis
58. Colica
59. Cholera
60. Diarrhœa
61. Diabetes
62. Hysteria
63. Hydrophobia

ORDER IV. VESANIÆ.

64. Amentia
65. Melancholia
66. Mania
67. Oneirodynia

CLASS III. CACHEXIÆ.

ORDER I. MARCORES.

68. Tabes
69. Atrophia

ORDER II. INTUMESCENTIÆ.

- § 1. *Adiposa*.
70. Polysarcia
§ 2. *Flatua*.
71. Pneumatosis
72. Tympanites
73. Physometra
§ 3. *Aquosa*.
74. Anasarca
75. Hydrocephalus
76. Hydrochitis
77. Hydrothorax
78. Ascites
79. Hydrometa
80. Hydrocele
§ 4. *Solida*.
81. Physconia
82. Rachitis

ORDER III. IMPETIGINES.

83. Scrofula
84. Syphilis
85. Scorbutus
86. Elephantiasis
87. Lepra
88. Frambœsia
89. Trichoma
90. Icterus

CLASS IV. LOCALES.

ORDER I. DYSÆSTHESIÆ.

91. Caligo
92. Amaurosis
93. Dysopia
94. Pseudoblepsis
95. Dysecœa
96. Paracusis
97. Anosmia
98. Ageusia
99. Anæsthesia

ORDER II. DYSORENIÆ.

- § 1. *Appetitus erronci*.
100. Bulimia
101. Polydipsia
102. Pica
103. Satyriasis
104. Nymphomania
105. Nostalgia
§ 1. *Appetitus defici-*
106. Anorexia
107. Adipsia
108. Anaphrodisia

ORDER III. DYSINESIÆ.

109. Aphonia
110. Mutitas
111. Paraphonia
112. Psellismus
113. Strabismus
114. Dysphagia
115. Contractura

ORDER IV. APOCENOSIS.

116. Profusio
117. Ephidrosis
118. Epiphora
119. Ptyalismus
120. Enuresis
121. Gonorrhœa

ORDER V. EPISCHESES.

122. Obstipatio
123. Ischuria
124. Dysuria
125. Dyspermatismus
126. Amenorrhœa

ORDER VI. TUMORES.

127. Aneurisma
128. Varix
129. Ecchymoma
130. Schirrus
131. Cancer
132. Bubo
133. Sarcoma
134. Verruca
135. Clavus
136. Lupia
137. Ganglion
138. Hydatid
139. Hydarthrus
140. Exostosis

ORDER VII. ECTOPIÆ.

141. Hernia
142. Prolapsus
143. Luxatio

ORDER VIII. DIALYSES.

144. Vulnus
145. Ulcus
146. Herpes
147. Tinea
148. Psora
149. Fractura
150. Caries

From a view of these classifications it would seem that the arrangement of Vogel is the fullest, as comprising not less than five hundred and sixty distinct genera of diseases; and that of Cullen the least complete, as extending to not more than a hundred and fifty; but it is to be observed that nearly five parts out of six of the distinct genera of Vogel are regarded as mere species of other genera by Cullen, and arranged accordingly; hence the latter must at once be allowed to be equally full, and to possess a high advantage in point of simplicity. Sagar's is the most numerous next to Vogel's; and like Vogel's it is numerous, not from the possession of additional matter, but from extending to distinct genera, diseases of the same genus, and which ought to rank merely as separate species, or even varieties. The general arrangement of Sauvages bears a considerable resemblance to those of Vogel and Sagar, but is more simple, at the same time that it is more comprehensive. The arrangement of Linnaeus, like all his arrangements, neat and classical. Dr. Cullen's classes are for the most part simple, and at the same time comprehensive; his orders are natural, and his genera ably disposed. The most objectionable of his classes is the last, or that entitled locales, which, like the cryptogamia of Linnaeus's botanical system, is a mere appendix for the purpose of comprehending whatever could not conveniently be disposed under the previous heads. There is also some confusion as to a few of his orders, and we may here enumerate profluvia in class I. compared with apocenos in Class IV; since the former is only a Latin, and the latter a Greek word of the same meaning; and since the diseases in the former order are only distinct genera of the latter in many instances; there is also some doubt as to the situation of several of his genera. Nevertheless, it is, upon the whole, the best division that has hitherto appeared; it is far more generally studied and lectured upon than any other. We shall now proceed to give a particular account of diseases, and their more important affections, treating of them in the order of Dr. Cullen's arrangement.

CLASS I.

PYREXIÆ, OR, THE FEBRILE DISEASES.

These disorders are indicated by a frequent pulse, increased heat, disturbed functions, and prostration of strength.

ORDER I. FEBRES, Fevers.

In every proper fever, there is a feeling of depressed power, which essentially differs from actual debility. "A diminution of strength in the animal functions," which constitutes part of Dr. Cullen's definition of the febrile state, is scarcely characteristic of the condition to which we allude. It is a feeling with which every one is more or less familiar, and appears to indicate rather obstructed than exhausted strength. Dr. Rush endeavours to illustrate this necessary constituent of genuine fever as a distinct expression from simple irritation of the blood-vessels on the one hand, and mere debility on the other, by comparing it with the smothered sound which may be supposed to be emitted from a musical instrument, provided a heavy weight were applied to the chords; which ought to be suffered to vibrate freely and without obstruction, in order to produce a full and harmonious sound. An illustration of a similar nature is likewise employed by Dr. Jackson. Dr. Brown defines fever, an asthenic disease that disturbs the pulse. In this, however, there is the same want of distinction which we have just complained of in the definition of Dr. Cullen. Asthenic diseases are diseases of deficient excitement; but in fevers we have an interruption rather than diminution of power. The faculties are locked up, not lost.

Of the phenomena of fever. Dr. Cullen very properly selects the more ordinary circumstances that present themselves in the course of an attack of intermittent fever, as an example of what occurs with more or less regularity in every case of genuine febrile disorder. The following, he says, are to be observed in such a paroxysm. The person is affected with languor or sense of debility.

bility, a sluggishness in motion, and some uneasiness in exerting it, with frequent yawning and stretching. At the same time the face and extremities become pale, the features shrink, the bulk of every external part is diminished, and the skin over the whole body appears constricted as if cold had been applied to it. Fevers are divided into intermittent and continued, which however have many circumstances in common, and often pass into each other; thus, what is termed in the schools a quartan intermittent, formed by an interval of 72 hours from the commencement of one to the commencement of another paroxysm, will in its course become a tertian ague, with only 48 hours of interval: this again shall fall into a quotidian, characterized by an interval of only 24 hours. A quotidian shall pass into the state of a remittent, and this last be converted into a true continued fever. Besides, however, this leading distinction of fever, from the times of the recurrence of the fits, we have many others arising from the nature of the constitution of the individuals attacked, the prevailing condition of the atmosphere, and other extraneous circumstances, and likewise (what is ascertained however with less exactness) the specific difference of the exciting cause; thus, common fever has sometimes the inflammatory, at others the typhoid, character. Thus are presented the bilious remittent fever of damp and warm climates, the yellow fever of the West India islands, the jail-fever of crowded prisons, and the plague in Eastern countries. The genera of Dr. Cullen of continued fever, are,

1. *Synocha*. "Great heat, pulse frequent, strong, and hard; high-coloured urine, the functions of the sensorium not much impaired." Such character, however, does not answer to any case of simple fever; it is the definition of what Dr. Brown calls the sthenic, which is opposed to the true febrile state.

2. *Typhus*. "A contagious disease, the heat not much increased, pulse frequent, small, and weak; urine little changed, sense much impaired, and the strength greatly diminished." This definition approaches nearest to the more usual form of fever in this country. That part of the definition, however, is extremely defective which describes the heat as not much increased.

3. *Synochus*. This is made by Cullen a kind of intermediate disease between synocha and typhus.

Exciting causes of fever. On this subject the most opposite opinions prevail. It is imagined by some, that no case of genuine fever, beyond those ephemeral irritations which are of daily occurrence, can possibly originate without the previous application, either through the medium of the lungs, or the surface of the body, of a certain something generated in the system of another individual in the course of the same disease. Others infer, from the daily observation of febrile diseases where no communication with the sick can be traced or suspected, that although the febrifacient matter just spoken of be in many, it is not in all instances the cause of fever; that cold, damp, heat, putrid exhalations whether animal or vegetable, insufficient ventilation, the depressing passions, &c. are all, either singly or in conjunction, capable, under some circumstances, not merely of predisposing to, but of actually engendering, proper fever. Lastly, there are some who consider contagion, or the generation in fever of specific febrifacient matter, as totally imaginary; and conceive in instances where fever has spread by communication, that either certain undetected conditions in the air, or the confined effluvia of animal excretions accumulated by want of cleanliness and ventilation, with other circumstances, are causes sufficiently adequate to produce the affection, without supposing the agency of a specific and occult power. "It is from nastiness," says one of the most celebrated of the anticontagionists, "degenerating into infection by chemical changes, that the bodies, clothes, beds, and apartments, of the poor in Great Britain, derive their poisonous, their pestilential charge. By a common putrefactive process, this septic venom is formed, and derives none of its qualities from pulsating arteries or glands. Away then with this preposterous phrase, 'from the poison engendered by septic processes.' Let human contagion for the future mean nothing but small-pox, vaccinia, and the kindred forms of morbid secretions." (Dr. Rush.)

Proximate cause of fever. On this subject the following errors appear to have misled systematics. 1. A want of distinction between final and proximate cause; between enquiries instituted in order to divide the intentions of nature, and a careful examination of the phenomena of nature as they occur in sequence. 2. The

indivisibility of the body, and the universal nature of the disorder, have been too much overlooked. Fever has been considered as an affection of parts rather than of the universal system. 3. An error which appears to result from the conjunction of the two former; that shrinking and coldness of the external surface, which is merely a consequence and concomitant effect resulting from a febrile attack, has been viewed as a cause of the other symptoms which present themselves in the course of the affection. "The remote causes of fever," says Dr. Cullen, "are certain sedative powers applied to the nervous system, which diminishing the energy of the brain, thereby produce a debility in the whole of the functions, and particularly in the action of the extreme vessels; this debility proves an indirect stimulus to the sanguiferous system, whence by the intervention of the cold stage, and spasm connected with it, the action of the heart and larger arteries is increased, and continues till it has had the effect of restoring the energy of the brain, of extending this energy to the extreme vessels, of restoring therefore their action, and thereby especially overcoming the spasm affecting them." The more immediate cause of fever is an abrupt suspension and consequent disruption of all the connected movements of the animal frame by which the balance of excitement is overthrown, "the laws of excitability are changed, and in consequence of which the same agents no longer produce the same effects. Fever differs from debility inasmuch as the latter is a gradual and regular exhaustion, not an abrupt interruption of the powers of life; it differs from strength, as strength consists in a powerful and equable excitement, while fever, however it may counterfeit vigour, is never attended by the necessary constituent of vigour, regular and orderly display of power. The primary cold, or as the Latins term it, horror, is from the quiescence that has been induced; during this state of quiescence, a new and inordinate condition of the excitability is established, and by consequence both the external and internal stimuli excite perturbed in the place of orderly and usual actions: action without power commences; hence morbid heat is generated, diseased associations are formed, and without being in a state of actual weakness, the whole system sinks, oppressed. The plain indications of approaching dissolution.

Treatment in Fever, are, therefore, to break the morbid associations on which this oppression is established, or obviate the symptoms by which it is continued; to diminish the cold in the cold stage, the heat in the hot stage, and not to await the sanative process of nature, either of dissolving spasm, or of correcting and expelling morbid matter. The various remedies employed for these purposes are, the external and internal use of cold and warm water; refrigerants, sudorifics, opiates, emetics, purgatives: on each of these, we shall introduce a few separate remarks; in the course of which an opportunity will be afforded, of enquiring more minutely into the pathology of the febrile state.

Of cold and tepid affusions, and ablution.—*Cold water internally.*—*Cold air.*—The medical reports of Dr. Currie, on the effects of water, cold and warm, in the treatment of fever, are introduced in the following manner:

Narrative of Dr. Wright.

"In the London Medical Journal for the year 1786, Dr. William Wright, formerly of the island of Jamaica, gave an account of the successful treatment of some cases of fever, by the ablution of the patient with cold water. On the 1st of August, 1777, says Dr. Wright, I embarked in a ship bound to Liverpool, and sailed the same evening from Montego-bay. The master told me he had several sailors on the same day we took our departure, one of whom had been at sick quarters on shore, and was now but in a convalescent state. On the 23d of August, we were in the latitude of Bermudas, and had a very heavy gale of wind for three days, when the above-mentioned man relapsed, and had a fever with symptoms of the greatest malignity. I attended this person often, but could not prevail on him to be removed from a dark and confined situation to a more airy and convenient part of the ship; and as he refused medicine and even food, he died on the eighth day of his illness. By my attention to the sick man, I caught the contagion, and began to be indisposed on the 5th of September; and the following is a narrative of my case, extracted from notes daily marked down: I had been many years in Jamaica, but, except being somewhat relaxed by the climate and fatigue of busi-

ness, I ailed nothing when I embarked. This circumstance, however, might perhaps dispose me more readily to receive the infection. Sept. 5th, 6th, 7th: Small rigours now and then; a preternatural heat of the skin; a dull pain in the forehead; the pulse small and quick; a loss of appetite, but no sickness at the stomach; the tongue white and slimy: little or no thirst; the belly regular; the urine pale and rather scanty; in the night restless with starting and delirium. Sept. 8th. Every symptom aggravated; with pains in the loins and lower limbs, and stiffness in the thighs and ham. I took a gentle vomit on the second day of this illness, and next morning a decoction of tamarinds; at bed-time an opiate joined with antimonial wine; but this did not procure sleep or open the pores of the skin. No inflammatory symptoms being present, a drachm of Peruvian bark was taken every hour for six hours successively, and now and then a glass of port-wine, but with no apparent benefit. When upon deck my pains were greatly mitigated, and the colder the air the better. This circumstance, and the failure of every means I had tried, encouraged me to put in practice on myself, what I had often wished to try on others, in fevers similar to my own. Sept. 9. Having given the necessary directions, about three o'clock in the afternoon I slipped off all my clothes, and threw a sea-cloak loosely about me till I got upon deck, when the cloak also was laid aside: three buckets of salt-water were then thrown at once upon me; the shock was great, but I felt immediate relief. The head-ache and other pains instantly abated, and a fine glow and diaphoresis succeeded; towards evening, however, the same febrile symptoms threatened a return, and I had again recourse to the same method as before, with the same good effect. I now took food with an appetite, and for the first time had a sound night's rest. Sept. 10. No fever, but a little uneasiness on the ham and thighs: used the cold bath twice. Sept. 11. Every symptom vanished; but to prevent a relapse I used the cold bath twice. Mr. Thomas Kirk, a young gentleman, passenger in the same ship, fell sick of a fever on the 9th day of August; his symptoms were nearly similar to mine, and having taken some medicines without experiencing relief, he was desirous of trying the cold bath; with my approbation he did on the 11th and 12th of September, and by this method was happily restored to health. He lives at this time (Jan. 1786) near Liverpool." We have thus presented our readers with this important narration of Dr. Wright, both as it furnishes a history of fever, as it details the mode in which the cold affusions should be employed, and as it was confessedly the means of introducing this most valuable remedy into general practice. We shall now add from Dr. Currie the more particular rules which ought to govern the use of the affusion or aspersion of cold water in fevers, and then make one or two observations on the nature of its operation. The safest and most advantageous time, says Dr. Currie, "for using the cold water is, when the exacerbation is at its height, or immediately after its declination has begun; and this has led me almost always to direct it to be employed from six to nine in the evening; but it may be safely used at any time of the day, when there is no sense of chilliness present, when the heat of the surface is steadily above what is natural, and when there is no general or profuse perspiration.—These particulars are of the utmost importance: for, 1st. If the affusion be used during the cold stage, the respiration is nearly suspended; the pulse becomes fluttering, feeble, and of incalculable frequency; the surface and the extremities become doubly cold and shrivelled, and the patient seems to struggle with the pangs of instant dissolution. I have no doubt, from what I have observed, that in such circumstances the repeated affusions of a few buckets of cold water would extinguish life. This remedy should therefore never be used when any considerable sense of chilliness is present, even though the thermometer applied to the trunk of the body, should indicate a degree of heat greater than usual. 2nd. Neither ought it to be used, when the heat measured by the thermometer is less than, or even only equal to, the natural heat, though the patient should feel no degree of chilliness. This is sometimes the case towards the last stages of fever, when the powers of life are too weak to sustain so powerful a stimulus. 3d. It is also necessary to abstain from the use of this remedy under profuse sensible perspiration, and this caution is more important in proportion to the continuance of this perspiration. Under these restrictions, our author adds, the cold affusion may be used at any period of fever; but its effects are more salu-

tary in proportion as it is used early. When employed in the advanced stages of fever, where the heat is reduced and the debility great, some cordial should be given immediately after, and the best is warm wine."

Observations. Cold water, as a remedy for fever, may be conceived to operate upon a twofold principle. In the earlier stages, and before the vital power is too much harassed and oppressed to endure a violent shock, the copious and sudden affusion of cold water all over the naked body, appears to effect its beneficial purposes in part by the abruptness of its agency; it in a manner severs the chain of diseased associations, and restores the healthy and orderly movements of the frame. This operation is not, as has been suggested, mechanical: it is in some measure similar to that produced by the operation of an emetic, to which it is in every respect greatly preferable, or to sudden mental agitation. In the language of the schools, it cuts short fever. When, however, the diseased associations are more firmly established, and the vital power greatly oppressed by the disorder's continuance, although the surface of the body retains its morbid heat, the water is to be applied, not in the way of sudden affusion, but by washing with a sponge, and this under the restrictions enjoined by Dr. Currie, or we may safely say, while it is found genial to the patient's feelings, ought to be resorted to in every case of simple fever.

Cold air. The extraordinary melioration in the modern practice of medicine, as it relates to the treatment of fever and febrile diseases, is not confined to the copious use of affusion and ablution. The terrors of our predecessors, in relation likewise to cold air, are fast departing; and the importance of its free admission in the apartments of the febrile sufferer especially, comes to be generally acknowledged and applied. It has been stated by a physician, above all praise for fidelity of observation and justness of remark, that the corrupted air of sick rooms, from neglect of ventilation, has been much more fatal even among the higher classes of society, than the virulence of the disease itself. Vereor ne quidam agroti non tam morbo suo perierint, quam halitibus putribus, quos discuti vetuit prepostera amicorum cura. The utility of cold-air in fever is referable to two principles: 1st. That of immediately lowering the heat of the surface, and thus taking off the oppression occasioned by such heat: and 2ndly, from affording a larger quantity of oxygen at each inspiration. The first of these principles is sufficiently evident, and does not require any further illustration: if cold ablution prove beneficial chiefly by virtue of diminishing the temperature of the body, it necessarily follows that coldness in the circumambient atmosphere must be attended with precisely similar effects; but on the purity, as connected with diminished temperature of the atmosphere, it may not be improper to embrace the present opportunity of offering one or two remarks. A given bulk of air at an inferior temperature, contains more of the oxygenous principle than the same quantity at a superior degree of heat; hence the greater refreshment which is experienced from the inhalation of a cold and dense, over that of a warm and rarefied atmosphere; hence, in part, the more vigorous digestion and keen appetite of a healthy individual during the winter, than the summer months; and finally, by the relief a febrile patient experiences from the inspiration of such air, it is rendered evident, both that the heat of fever originates, and is kept up, independently of those organs which modern chemistry and physiology have supposed to be the sole organs for the supply of heat to the living system. From this fact Dr. Reid infers, and we think with justice, that the constant equality of animal temperature in a condition of health, has more dependance upon living actions in general than upon the chemical evolution of caloric in the lungs, according to the ingenious theory first suggested by Dr. Crawford, but since materially modified.

Of refrigerants in fever. Besides, however, the employment of cold water, and the free admission of a cool and pure atmosphere, other agents have been had recourse to, and with considerable effect, in order to abate the inordinate heat of fever. From possessing the faculty of cooling the system, certain medicines have been distinguished by the term refrigerants: refrigerants are principally chosen from the vegetable acids, and the different neutral salts; and so evident is their power in reducing animal temperature, that they have properly been made to constitute a considerable part of regimen in fever. Indeed nitre, and other neutral salts, with the vegetable acids, have been received into

some systems of classification, under the distinct head of febrifuge medicines.

Of Sudorifics. We now proceed to consider the agency of sudorifics as febrifuge remedies. Moisture on the surface of the body may be procured by medicines which appear to have a direct power over the cutaneous vessels, or by those whose action seems to be directed primarily to the stomach. These last are principally of the saline class, which are by far the most suitable in the febrile state. The physiology of perspiration, and the principles by which it operates as a cooling process, are, notwithstanding the recent discoveries in chemistry, and their application to this interesting subject, still involved in much obscurity. The ancients imagined sweat to be not merely an excrementitious product, but the vehicle of conveying that morbid matter out of the body which had been the occasion of disease. This opinion does not, in the present state of science, require to be confuted. The questions of most interest, respecting the phenomena and causes of perspiration, are, in what relation does it stand to the respiratory function; and is that moisture on the surface of the skin which closes a febrile paroxysm to be regarded as a cause or consequence of the disorder's declination.

Of Purgatives and Emetics. Nothing, perhaps, is of greater moment in almost every stage and every kind of fever, than to preserve the whole of the alimentary canal free from accumulations of colluvies, &c. From a deficient attention to this principle, the medical practitioner is in many instances foiled in the treatment of this, and indeed in a variety of other diseases. Viscidities and impurities in the stomach and bowels, are often both effect and cause of the persistence of the febrile state; for as the powers of assimilation are weakened by the induction of fever, so the consequent accumulations of foreign matter in the alimentary and intestinal canal, themselves prove direct sources of irritation and disorder. In the primary stages of fever, an emetic has been known abruptly to arrest its progress, and the same purpose is sometimes accomplished, especially in ephemeral affections of the febrile kind, by the employment of a brisk purgative. In the more advanced periods however of the disorder, the object of the physician ought to be rather that of keeping the bowels gently open, and this is best affected by saline in place of drastic purgatives; the former of which principally operate by exciting the exhalants on the internal surface of the intestines to pour out their contents, the latter by stimulating in a forcible manner the intestinal fibre. It is a fact worthy particular notice in the treatment of fevers especially, that where due attention is given to ensure regular evacuations from the bowels, those stimuli, the copious use of which is often necessary to support the sinking powers in the last stages of the disease, are more freely admissible and abundantly more efficacious: this is indeed an important principle in the treatment of diseases generally; and it is perhaps chiefly by virtue of preserving the excitability in an orderly and due condition for the agency of other stimuli, that purgatives, like sudorifics, form so useful, and indeed the former, almost an indispensable, part of the remedial process in the greater number of ailments. In intermittent fevers it is generally necessary to evacuate the bowels by more stimulant cathartics, more especially when the cure of these fevers is conducted by the Peruvian bark. Having thus discussed the nature, causes, and treatment, of fever, it may be proper to present the reader with a recapitulatory view of the remedies which are required in the different forms of this affection.

Treatment of continued fever during the first three or four days. Cold effusion. Water to be impregnated with salt; its application to be confined to the hot stages of the paroxysm. Large draughts of cold water taken under the same limitation. Cold and pure air. Emetics. Purgatives. Antimonial and saline sudorifics.

After the fifth or sixth day. Cold and tepid ablution. Water employed to be impregnated with salt or mixed with vinegar. In the urgency of debility, coldness, or delirium, pediluvium or the warm bath. Bowels to be kept gently but constantly open, by saline or mild purgatives and subacid drinks. While the skin is preserved moist by diaphoretics, give opiates and wine; these last are almost invariably improper when the skin is dry and hot, and the bowels costive. For head-ache and other nervous affections, blisters, æther, camphor. In the last stages, when critical sweats break out, and the powers of life appear to be shrinking from the

contest, repeated glasses of port-wine with tincture of opium in large quantities. During the whole course of the disease, the apartment to be diligently preserved cool, clean, constantly ventilated, and free from all individuals but those who are necessary attendants on the sick.

Treatment of intermittent fever. Cold effusion immediately upon the full accession of the hot fit. Warm bath, warm spiced wine, during the cold stage of the paroxysm. Tincture of opium, either previous to the accession of the cold, or towards the decline of the hot fit. Emetics, immediately preceding the accession of the paroxysm. Calomel purges before the administration of tonics; arsenic, zinc, Peruvian bark, quassia, and if any enlargement of one of the viscera (ague cake) appear, steel. Hope: upon the excitation of hope the power of charms altogether depends; these sometimes succeed in ague, when other remedies are counteracted by the violence of the complaint.

ORDER II. PHLEGMASIÆ, Inflammations.

When any part of the body has an unusual heat and redness, with pain and swelling, it is said to be inflamed. To constitute this state of a part, an inordinate action and dilatation of vessels have generally been esteemed sufficient. Such opinion, however, has been questioned by the author of *Zoonomia*. "Inflammation," says Dr. Darwin, "is uniformly attended with the production or secretion of new fibres, constituting new vessels; this, therefore, may be esteemed its essential character, or the criterion of its existence. The extension of the old vessels seems rather a consequence than a cause of the germination or pullulation of these new ones; for the old vessels may be enlarged and excited with unusual energy, without any production of new ones, as in the blush of shame or of anger." On the contrary, however, we are disposed to regard the formation of new vessels, which does not perhaps take place in every case even of genuine inflammation, to be subsequent to, and not the occasion of, capillary dilatation.

Sthenic and asthenic inflammation. The disturbance of the system does not correspond more with the magnitude of the local disorder, than with the constitutional character of the individual affected. Of two persons that are the subjects of inflammation, as of the mucous membrane of the nostrils, constituting inflammatory catarrh, or a cold; of the pulmonary vessels, occasioning inflammation of the lungs; or of the joints, forming rheumatism; one shall previously have possessed much constitutional vigour, the other shall have been languid and feeble—the former will have a sthenic, the latter an asthenic disease. This distinction in practice will be found of immeasurable importance. It was first distinctly pointed out by Dr. Brown. We believe, however, that this author was mistaken in the mode in which the inflammation of a part, and the disorder of the system, are connected; for the purpose of confirming his favourite tenet of sthenic and asthenic disorder, he laboured to prove that the systematic in many cases of inflammation actually preceded the local disease—this is not the case. Even in the most violent forms of pneumonia, the disorder of the lungs precedes that of the system; and indeed sthenic disorder, independantly of local irritation, is in some measure a contradiction in terms. High excitement, to whatever extent it may be carried, while there is no irregularity or want of balance in any of the corporeal or mental functions, and no affection of a part, cannot be properly regarded as a disease, however it may predispose to the diseased state.

Termination of inflammation. Inflammation is said to be resolved when the natural state and action of parts are renewed without disorganization. If, however, the inflammation has existed for any time, or has been violent, an unnatural secretion takes place from the vessels inflamed, which is called pus; this when collected or confined, constitutes abscess, and when the inflammation ends in this manner, it is said to terminate by suppuration. In cases of much weakness, constitutional or induced, the vascular action in the part shall cease altogether, its excitability be irrecoverably exhausted, and what in scholastic language is termed gangrene be the consequence, which extending, shall form sphacelus, or mortification. Resolution, suppuration, gangrene, are therefore the usual modes in which inflammation terminates. There are others, however, which are peculiar to certain parts; thus, an inflammation of the lungs often ends fatally by a copious effusion

effusion of a watery matter into the cellular texture of these organs; thus, an inflammation of a gland shall end in schirrus, or hardness of the parts, depending perhaps upon the deposition of matter which remains unabsorbed.

Species of inflammation. This disorder is systematically divided into two leading species—phlegmonous and erythematic. The first is defined by Dr. Cullen, “an inflammation of a bright-red colour, with a circumscribed pointed tumour, and tending towards suppuration.” The erythema has a less vivid colour, with scarcely any tumour, spreading irregularly, burning rather than throbbing pain, and terminating in vesicles. These species are principally established by the difference of part upon which the inflammation may happen to fall. Thus if the disorder be seated superficially, or in any internal part where there is an uninterrupted expansive or cellular texture, it will be erythematic or spreading; if it be more deeply lodged among muscular substances, it will be for the most part phlegmonous.

Indications of the disorder's decline. It scarcely requires to be observed, that a cessation of pain, a reduction of tumor, a loss of redness and heat, a diminution of the systematic disturbance, are all evidences that the inflammation is about to terminate. If, however, it be suffered to run on into the stage of suppuration, the indications of this state are, the pulse becoming fuller and softer, the patient being attacked with shiverings, and a pulsatory feel in the affected part. Again, the tendency to gangrene is denoted by the tumour losing of its redness, and assuming a darker hue; by the sudden cessation of pain; sometimes by blisters arising near or upon the tumour; and, lastly, if the local disorder have been considerable, by a rapid declension of the pulse, and powers of life.

Treatment. The indications of cure are to be deduced from the sthenic or asthenic disposition of the disease, and from the peculiar nature of the part or organ injured. Before the time of Dr. Brown, action, at least inflammatory action, was too indiscriminately viewed as an evidence of power; the inference from this highly erroneous doctrine was, that inflammation almost invariably required for its cure a debilitating and evacuating plan of treatment. Nothing can be more inconsistent with the laws of the animal economy. “It had been,” says the author of the *Elements of Medicine*, “a prevailing opinion that the fits of the gout could not be constituted by debility, because inflammation accompanies them. This question he subjected to the test of experiment. He invited some friends to dinner; and by taking stimulants in their presence, recovered the most perfect use of that foot with which, before dinner, he could not touch the floor for pain. By this he saw, that not only the gout itself, but the inflammation accompanying it, was asthenic, that is, depending upon debility. Such he found likewise to be the nature of the inflammations in the gangrenous sore throat, in chronic rheumatism, &c. &c.” The application of this principle in the practice of medicine has proved of incalculable importance. In conducting the cure, then, of inflammation, the physician is to be guided not so much by the extent and degree of the local injury, as by the nature of what Brown calls the prevailing diathesis; if inflammation be attended by a full, hard, and vigorous pulse, with other expressions of power, a debilitating plan of treatment is to be adopted; blood is to be drawn from the arm, saline purgatives are to be administered; cold, under the limitations immediately to be mentioned, is to be applied, and the exciting powers as much as possible withdrawn. If, on the contrary, an equal degree of local affection shall be accompanied with feeble, although quick, pulse, and the remaining symptoms of debility, an opposite plan, under certain regulations and exceptions, is to be pursued; stimulants are to be thrown in, and the inflammation cured by impelling and supporting the torpid and feeble powers of the frame. But from the peculiar nature of the part or organ affected, the mode of treatment in the same degree and kind of inflammation will likewise be materially modified. Thus an asthenic affection of the liver requires different stimuli from an asthenic affection of the stomach. Again, although in inflammation, as in fever, we generally recommend the cool treatment, and consequent free admission of air, it is to be recollected that this principle is objectionable in some kinds of inflammations, as of the lungs. For example, in small-pox and in measles, we shall have the same degree of pyrexia, or fever, present; and cold air would be equally indicated in either, were we

to infer the proper method of treatment alone from the inflammatory excitement; but in measles the lungs are often the principal seat of the local affection, an oxygenous or pure atmosphere would prove too stimulating to these organs; and thus if we pursued general doctrines without particular exceptions, or overlooked “the peculiar nature of the part or organ injured,” the object of our plans would be frustrated and defeated.

Genus I. *Ophthalmia*, inflammation of the eyes. See SURGERY.

Genus II. *Phrenitis*, inflammation of the brain. This, as a sthenic affection, independently of proper maniacal disorder, or febrile affection, is an extremely rare disease.

Symptoms. Redness of the face and eyes, impatience of light and sound, watchfulness, and furious delirium.

Methodus medendi. Copious evacuations. “Foment the head with cold water for hours together.” Blisters. Blood to be drawn from the temporal artery.

N. B. The delirium of fever, which has been supposed to indicate an inflammation of the brain, is for the most part of an asthenic nature, and requires stimuli.

Genus III. *Cynanche*, quinsy.

Species 1st. *Cynanche tonsillaris*, common inflammatory sore throat.

M. M. Acid gargles. Saline purgatives. Blisters. Antimonial diaphoretics.

Species 2d. *Cynanche maligna*. An accidental, but very common, symptom of scarlet fever.

Species 3d. *Cynanche trachealis*, croup. See INFANCY.

Species 4th. *Cynanche pharyngæa*, a mere extension into the pharynx of the *cynanche tonsillaris*.

Species 5th. *Cynanche parotidæa*. The mumps is an affection of the parotid and maxillary glands, which appears in the form of a swelling under the jaws: it is more common in some than in other counties of England. It sometimes appears as an epidemic. The mumps is in itself a slight disease; but after its declension, which is in general about the fourth day, the testes in men, and breasts in women, are very apt to be affected with swelling, in consequence of some peculiar sympathy of these parts with the throat.

M. M. If delirium supervene upon the retrocession of the swellings, blisters. “Foment the head with warm water.” Darwin.

Genus IV. *Pneumonia*, inflammation of the lungs.

Genus V. *Carditis*, inflammation of the heart or pericardium.

Genus VI. *Peritonitis*, inflammation of the peritoneum. This disorder which is usually termed inflammation of the lungs varies in some measure its seat. Thus the diseased action shall be directed towards that part of the pleura which is called the pericardium, and then it may be called carditis: or it may pass down the diaphragm, or the peritoneum, and form the peritonitis of Cullen, and the diaphragmatis of Darwin. The general symptoms are, pyrexia, pain in the chest, difficulty of breathing, cough; and, if the disorder happen in the sthenic diathesis, the pulse is hard and frequent. Sometimes the expectoration is tinged with blood. The particular symptoms are, in carditis, palpitation, with unequal intermitting pulse, pain in the region of the heart, vomiting, fainting: if the inflammation be particularly directed to the diaphragm, the pain is situated towards the lower ribs, the respiration in a recumbent posture is extremely difficult, and the corners of the mouth are sometimes so retracted as to form a disagreeable smile, called *risus sardonius*.

M. M. It is of the utmost importance to attend to the prevailing diathesis. If the constitution is sthenic, and the disorder urgent, immediate and copious bleeding. Refrigerant and emollient cathartics. Cool and equal, not cold and irregular, atmosphere. Diluent drinks. Total abstinence from animal food, sometimes during the first five days. Antimonial preparations. After venesection a blister on the pained part. Digitalis. In Dr. Currie's Medical Reports we find the following observations: “I have employed the digitalis to a very considerable extent in inflammations of the brain, of the heart, and the lungs; and have succeeded with it in cases where I otherwise should have despaired.” In Dr. Reid's *Treatise on Consumption* we meet with an acquiescence in this sentiment on the foxglove. Our experience, however,

ever, has taught us to value this remedy principally in other pulmonary affections than the more violent kinds of inflammation, as is mentioned under the head of phthisis. After the excitement has been moderated, opium in small doses. "Do neutral salts increase the tendency to cough?" Pediluvium. Small doses of calomel, to prevent adhesions.

N. B. If pneumonia run on into suppuration pus will be discharged by cough, and thus a species of consumption be formed; or will be detained in the cavity of the chest, and constitute empyema. In either case, digitalis in large doses. Calomel. Opium. Peruvian bark.

Genus VII. *Gastritis*, inflammation of the stomach.

Symptoms. Violent pain in the region of the stomach, with pyrexia; small, frequent, and sometimes contracted, pulse; vomiting; hiccough.

Causes. It may be occasioned by any thing acrid taken into the stomach; by blows on the region of this organ; and a slight species of it is often consequent upon taking cold liquids after exercise.

M. M. In inflammation of the stomach and bowels we have, in some measure, an exception to the general rule of cure, according as the disease appears sthenic or asthenic. The pulse and vital powers are often suddenly reduced, and yet venesection is required. Warm bath. Fomentations. Anodyne and mucilaginous clysters. Blisters on the pained part.

Genus VIII. *Enteritis*, inflammation of the bowels; fixed and distressing pain in the bowels. Pyrexia; pulse always quick, sometimes hard.

Causes. The same as in gastritis. Likewise strangulated hernia, spasmodic colic, intussusception.

M. M. The same as in gastritis after the urgent symptoms have subsided. Small doses of calomel and opium.

Genus IX. *Hepatitis*, inflammation of the liver.

Symptoms. Pain in the region of the liver, extending to the clavicle and top of the right shoulder; difficulty of lying, on the left side especially. Pyrexia; high-coloured urine; pulse frequent, strong, and often hard. Bilious evacuations, or jaundice. The tendency of disease is to suppuration.

M. M. Copious and repeated bleeding, before the suppurative process has commenced. Calomel, and cathartics of the refrigerant class. Digitalis in considerable doses. Blisters to the region of the liver. If suppuration takes place, the matter makes its way through the lungs, or the intestinal canal, in the cavity of the abdomen, or through the peritoneum to the surface. During this process opium and bark.

N. B. The disease above described is principally an affection of warm climates. A species of chronic hepatitis is more usual in Britain, and indeed is one of our most common maladies, especially among dram-drinkers.

Symptoms. Obtuse and weighty kind of sensation in the region of the liver; difficulty of lying on the left side; pain in the right shoulder; the countenance slightly marked by hectic; dejection of spirits. (Edema of the ancles.

M. M. Small doses of calomel, with, or without opium. Tonic bitters, such as quassia, or gentian. An abstinence from spirituous liquors.

Genus X. *Splenitis*, inflammation of the spleen.

Symptoms. Tension; tumor; heat of the left side; pyrexia; pain increased by pressure.

M. M. Blisters, cathartics, calomel, and digitalis.

Genus XI. *Nephritis*, inflammation of the kidneys.

Symptoms. Pyrexia; pain in the lumbar regions; retraction of the testicle; numbness of the thigh; vomiting; costiveness.

Causes. Alternations of heat and cold; external violence, &c. as in other inflammations, but chiefly calculi.

Distinctions. Nephritis is distinguished from lumbago by the more confined situation, and pungent character of the pain; by the presence of pyrexia; and by there being in the latter no retraction of the testicle, or numbness of the thigh. It is distinguished from incipient psoas abscess, by the pain of this last being principally seated in the vertebral column; by such pain being increased on pressure of this part; and by its taking the course of the psoas muscle. See SURGERY.

M. M. Venesection. Digitalis, and opium. Nitrous æther. Emollient clysters. Castor oil. Demulcents.

Genus XII. *Cystitis*, inflammation of the bladder. Pyrexia. Pain and tumor above the pubes; pain in discharging urine; tenesmus.

M. M. Venesection. Warm bath. Anodyne clysters. Diuents.

Genus XIII. *Hysteritis*, inflammation of the womb. Heat, pain, tension, and swelling in the lower belly; pyrexia; vomiting.

M. M. Venesection. Mucilaginous clysters, with opiates. Anodyne fomentations.

Genus XIV. *Rheumatismus*. Pyrexia; pains in joints, frequently extending along the muscles; heat and tumor on the part.

Peculiarities. Rheumatic inflammations never, like others, terminate in suppuration. Dr. Darwin attributes this circumstance to the secondary and associate nature of the disease; the original cause, like that of the gout, not being in the inflamed part; and therefore not continuing to act after the inflammation commences. Perhaps the peculiarity would be more properly referred to the nature of the parts that rheumatism attacks.

Division. Rheumatism is sthenic, or asthenic: the latter, or chronic rheumatism, often succeeds to the former; which the author just quoted refers to the deposition of mucus, or coagulable lymph, which the inflamed vessels had poured out in the first stages, remaining unabsorbed on the membranes of the joints. It would probably be more correctly attributed to the loss of energy in the parts affected: an opinion which appears to receive support from the circumstance of the asthenic form of the complaint sometimes coming on in a direct way, without the intervention of the acute species.

M. M. Bleeding would appear to be indicated in the sthenic kind of rheumatism: in this disorder, however, the physician is so often unexpectedly foiled by the rapid occurrence of indirect debility, that venesection is almost never adviseable; it lays the foundation for obstinate chronic complaint. Leeches to the inflamed joints. Volatile embrocations after the inflammation has in some measure subsided. Calomel, and opium. Sudorifics. Warm bath. "I have found digitalis an excellent remedy in inflammatory rheumatism, one of the most tedious and intractable of all diseases." Dr. Corrie. Peruvian bark in chronic rheumatism. Volatile tincture of gum guaiacum. Flesh-brush. Sea-bathing. Electricity. Bath waters.

Genus XV. *Odontalgia*, tooth-ach. See SURGERY.

Genus XVI. *Podagra*, gout.

Symptoms. Pain in the joints, principally of the great toe, and especially of the hands and feet, returning at intervals. Previously to the accession of the inflammation the functions of the stomach are generally disturbed. The fits generally come on in the morning.

Causes and peculiarities. Gout is invariably a disease of the asthenic diathesis. It is produced in a system predisposed to its influence by the indirectly debilitating powers; such as a too liberal indulgence in fermented and spirituous liquors, high-seasoned meats, &c. and likewise by the directly debilitating powers of vegetable and watery food, depressing passions, &c. The inflammation of this disease often alternates with, and appears in a manner vicarious of, torpor in other parts of the system; as of the brain producing apoplexy, the stomach constituting dyspepsy, and of the liver giving rise to jaundice: all which symptoms indeed may be considered as part of the disease. On this account gout has been divided into the atonic; that is, where a disposition to the inflammation of the foot is observable, but does not actually take place; the retrocedent, where, after the continuance for some time of such inflammation, it shall seem to be transferred to another part, and thus form a gouty inflammation of the stomach, or other organs; and, lastly, the misplaced, in which the gouty tendency, instead of displaying itself in its ordinary course, falls upon some other organ, as the lungs, the stomach, or the brain. Dr. Darwin supposes "the original seat of the gout to be the liver, which is probably affected with torpor not only previous to the annual paroxysms, but to every change of its situation from one limb to another." For this principle of associate action there does not, however, appear sufficient support; and indeed the sympathy is displayed with more force and frequency between the inflamed foot and the organs we have above-mentioned (the stomach,

mach, the lungs, and the brain,) than the hepatic viscus. It is indeed the nervous system, and not the glandular, with which the paroxysm of the gout appears to have the most intimate connection; and it would have found a more appropriate place under the head of nervous diseases, than where it now stands in the Nosology. It is, however, very often combined with calculary disorders. The predisposition to gout is evidently hereditary; but the attacks of this malady may, in general, be warded off, even from the most susceptible habit, by a temperate mode of living. This principle is illustrated in an extraordinary manner by the history of Dr. Gregory, the present professor of the practice of medicine in Edinburgh. We have often heard him in his lectures produce his own as an instructive case of the beneficial effects of abstinence from fermented and spirituous liquors. Gout has been imagined, like fever, to be a sanative process of nature for the purpose of expelling something from the constitution. The doctrine, in either instance, is equally erroneous.

M. M. In treating gout it should never be forgotten that it is an asthenic disease: while excitement is kept up in the system the paroxysms are suspended. Dr. Beddoes, in his *Hygeia*, says, that one of the greatest martyrs to gout he ever met with informed him, "that his freest year was that of a warmly contested election, at which he was candidate for a county. He both drank and exerted himself at this time more than at any period of his life." This evident principle of the asthenic nature, even of the actual inflammation in gout, ought to render the physician extremely careful in his application of the remedy lately introduced into practice, the application of cold water to the inflamed part. In some violent cases this may be proper; but it should never be extended beyond the limit of pleasurable sensation. To bleed is likewise hazardous in the extreme. Dr. Brown's mode of suspending the paroxysms has already been referred to; and every arthritic experiences temporary benefit from his dinner, his glass, and pleasurable company. It is by acting on the imagination that empirics suspend the threatened attacks of gout. In this, as in numberless other instances, faith in, constitutes the virtue of, remedies; both therefore in chronic rheumatism and gout, we might place among the curative agents metallic tractors, whether authorized by Perkins, or formed of old nails, as in the instructive experiments of Dr. Haygarth. Even a piece of sealing-wax, or stick, when supposed by the patient to be the genuine tractors, operated in a most astonishing manner. (Haygarth on Perkin's Tractors.) The influence of the imagination over the body, whether in health or disease, has not been sufficiently acted upon in the professional practice of medicine. The irregular affections in gout must be combated by stimulants carefully adapted to the excitability; for the spasmodic affections of the stomach aromatics and bitters, as ginger and quassia. If the head is affected canphor, musk, ether, opium; these likewise are remedies for the gouty asthma. The Portland powder, which is a composition of bitters and aromatics, may prove for a time highly useful; but the protracted use of medicines of this class is objectionable, as eventually detrimental to the stomach and general fibre. Regular and steady, and not capricious and merely temporary, abstinence from wine, spirits, and spices. The body to be preserved gently open. Pure air, moderate exercise, encouragement of cheerful habits. Warm and cold sea-bathing. Bath waters. Very small doses of digitalis. Hop (*humulus lupulus*.)

ORDER III. EXANTHEMATA, Eruptions.

The exanthemata are more nearly allied to genuine fever than those disorders of which we have just been treating, as the local affections are consequences rather than causes of the general irritation. They have been called eruptive fevers. They are defined by Cullen contagious diseases, affecting a person only once during the whole of life, commencing with fever, and succeeded by eruption on the skin. The contagious matter upon which these depend may indeed operate upon certain parts more particularly, and thus the disease be entitled to rank among the sensitive, irritative, or symptomatic fevers. This, however, is by no means certain: the primary action of contagion, whether of a specific or general nature, has hitherto escaped the penetration of the pathologist.

Genus I. Erysipelas, St. Anthony's fire.

Symptoms. This disease does not correspond with the whole of

the above definitions; it is not contagious; and it has frequently been found to recur. The face is the more ordinary seat of this affection. After febrile irritation has commenced, and continued for a short time, during which there is often an unusual drowsiness, and sometimes delirium, the face suddenly becomes bloated, the eye-lids swell, and the skin is red and blistered. If the disorder is violent, or ill-treated, the inflammation and redness extend down the neck, and spread sometimes on the shoulders; the tumid appearance of the countenance increases, delirium supervenes, and the patient has been known to die apoplectic. The erysipelas is an erythematic inflammation. Its seat is the rete mucosum. Its tendency is to gangrene rather than to suppuration. A fatal termination is said to be principally on the seventh, ninth, or eleventh days.

M. M. In no other affection is it of more urgent moment to decide on the treatment by the nature of the prevailing diathesis. It has been observed, that in large and populous cities St. Anthony's fire almost always appears in the form of asthenia: and in this case requires wine, bark, opium: while in the hardy constitution of the rustic it assumes a sthenic character, and demands the vigorous employment of what has been called the antiphlogistic regimen. Venesection. Saline purgatives. Diluent drinks. Might not digitalis be employed with a prospect of singular advantage, as the disease has an evident affinity with certain species of dropsy? With respect to external application, it has been customary to use mealy substances, such as flour. Solutions of lead, zinc, or alum, are improper, "as they stimulate the secreting vessels into too great action." (Darwin.) Cold water.

Genus II. Pestis, the plague, is an epidemic typhoid fever.

Genus III. Variola, small-pox.

Symptoms. After the pyrexial symptoms have continued for three days eruptions appear on the skin, which on the eighth day contain pus, and at length fall off in crusts.

Species. The small-pox is divided into the distinct, and confluent: the first has more of the sthenic, the latter of the asthenic, character. In the former the eruptions are of a phlegmonic, in the latter of an erythematic or spreading, nature. The eruption of the distinct small-pox makes its appearance in circumscribed red spots on the face; in the course of two days the body and legs receive their portion. The fever now ceases, the face swells, the pustules enlarge, and on the eighth day are mature. The swelling of the face now goes off, and the hands and feet begin to swell, with a slight return of fever, which however soon declines. In the confluent, or asthenic, species, the fits are not so regular; the eruptions are not circumscribed and prominent, but diffused, and scarcely appearing above the skin; a kind of erysipelas sometimes precedes them, and every symptom denotes debility. The fatal termination is often on the eleventh day.

Inoculation. The advantages of inoculation for the small-pox need not be insisted on. The circumstance, however, upon which depends the more favourable character of inoculated over natural small-pox, does not appear to have been satisfactorily accounted for. The only cautions requisite in preparing for inoculation, are to preserve the bowels free from sordes, and to choose a time for the insertion of the matter when teething, or other irritative processes, are not going on in the system. With respect to the time, it has been well said, that inoculation ought to be performed either before the second month, or after the second year.

M. M. Cold air. The bowels to be preserved open. Animal food to be denied. If the fever runs high, antimonials and nitre. In the confluent species, the alimentary and intestinal canal is with the utmost solicitude to be preserved free from congestions by purgatives, and the power of the system supported by opium, bark, small doses of nitre, wine, pure air; vinegar aspersed about the bed, walls, and floor, of the apartment. Pediluvium. For an account of the vaccine disease, or cow-pox, see the article VACCINATION.

Genus IV. Varicella. The chicken-pox is a very slight disease; the eruptions sometimes assume nearly the character of the distinct small-pox; but there is not much irritation of the system, and they generally disappear in the course of three or four days from their first breaking out.

Genus V. Rubecola. Measles.

Symptoms. Pyrexia, sneezing, inflamed eyes, dry cough, drowsiness; about the fourth day, or later, small red points appear on the

the skin, which in the course of about three days fall off in branny scales. "As the contagious material of the small-pox may be supposed to be diffused in the air like a fine dry powder, and mixing with the saliva in the mouth to infect the tonsils in its passage to the stomach, so the contagious material of the measles may be supposed to be more completely dissolved in the air, and thus to impart its poison to the membrane of the nostrils which covers the sense of smell; whence a catarrh with sneezing ushers in the fever." Zoonomia.

M. M. Measles too often lay the foundation of pulmonary consumption, to prevent which the symptoms denoting inflammation of the lungs are to be with much solicitude obviated; and for this purpose small doses of tincture of digitalis are to be preferred to every other medicine. Venesection cannot with propriety be used in young subjects, however imperiously called for; and digitalis supplies its place without the risk of inducing indirect debility. Steady and cool atmosphere, not cold air in currents. Refrigerant cathartics, with calomel. Animal food not to be given. Digitalis, with a very small quantity of opium, for the cough succeeding to measles.

Genus VI. Miliaria, miliary fever, is merely a symptomatic eruption of small red pimples about the neck and face, which in two days become white pustules, and desquamate. They have a peculiar smell. Much anxiety and difficulty of breathing precede the eruption. This disorder appears to be a consequence of an improper heating regimen in fever.

Genus VII. Scarlatina, scarlet fever.

Symptoms, &c. After pyrexia has lasted about four days a scarlet eruption appears on the skin, sometimes attended with inflamed tonsils and cervical glands: these last sometimes appear without cutaneous eruption, and the disease has been called cyanche maligna. This disorder is apt to be mistaken for measles; but in scarlet fever there are no catarrhal symptoms as in measles. This disorder is very irregular in its aspect; and often, without much care, fatal in its termination. Sometimes, without any alarming symptoms in the onset of the fever, a change takes place, and in the course of a few hours the patient falls into the arms of death. The unfavourable symptoms are the same as in other fevers. It is a disease principally of children. Whether it depend upon specific contagion, like measles and small-pox, is not perhaps fully ascertained.

M. M. Cold affusion. Cold air. Antimonials, opium, bark, wine, saline purgatives or enemas, nitre, blisters. See the section on Fever in this article.

Genus VIII. Urticaria, nettle-rash. After pyrexia for a day, small red spots, like the stinging of nettles, appear on the skin, which almost vanish during the day, but return in the evening. It scarcely requires any medical treatment. The disease does not last more than two or three days.

Genus IX. Aphtha, thrush. Spots on the fauces and tongue, by which this disorder is constituted, are almost always symptomatic of other diseased states.

Genus X. Pemphigus, "a fever attended by successive eruptions of vesicles about the size of almonds, which are filled with a yellowish serum, and in three or four days subside." The treatment is to be regulated by the nature of the attendant fever.

ORDER IV.—*Hæmorrhagie*. Discharges of blood.

The definition of this order is, pyrexia, with profusion of blood, without any external violence; blood when drawn from a vein shewing the buffy coat. Discharges of blood, however, are often unattended with pyrexial irritation, and indeed for the most part are evidences, not merely of local, but also of general weakness. Augmented energy in the larger propelling vessels may indeed overcome the resisting power of the smaller branches, and produce what is called active hæmorrhage; in this case we have only local debility to contend with in the cure. Dr. Darwin divides hæmorrhage into the arterial and venous, the latter of which he attributes to defect of venous absorption; it does not appear, however, that the veins act in the manner of absorbents, according to the opinion of our author. Venous hæmorrhage depends upon general weakness, accidentally directed to the vessels from which the blood is poured out by rupture of their coats. It is always a highly asthenic disease.

Genus I. Epistaxis, bleeding from the nose.

Symptoms. Pain or fullness of the head, giddiness, dimness of vision, drowsiness, irritation of the nostrils. It is the disorder principally of young persons, who have a lax and weak fibre; in some few instances it occurs as vicarious of obstructed menses, and sometimes appears in men when the hæmorrhoidal discharge has been suddenly arrested.

M. M. Cold applied to the neck and head. Mechanical pressure, or absorbing substances, to the nostrils. Acids and astringents internally. Avoiding irritation of the body or mind. The bowels to be kept gently open. Nourishing, but not stimulating, aliment. In the epistaxis of old people, and in cases of much weakness, bark, vitriolic acid, opium. If the disorder is violent, and have depended upon the suppression of some other discharge, such discharge to be restored.

Genus II. Hæmoptysis. Spitting of blood. *Symptoms.* Redness of the cheeks, a sensation of weight in the breast, difficult respiration. Saltish taste in the mouth, irritation in the trachea, coughing up of florid blood. Hæmoptysis more usually appears in individuals with a slender make and contracted chest, who are of an irritable habit, and who have been subjected in their earlier years to epistaxis. It generally comes on at the age of puberty. *Causes.* Violent irritation of mind or body, sudden vicissitudes of heat and cold, too powerful exertion of the lungs, as in singing, coughing, playing upon wind-instruments. Like epistaxis, and indeed more frequently, it immediately originates from obstructed menses. Sometimes it appears vicarious of a gouty paroxysm.

M. M. All irritation and irregularities to be carefully guarded against. Bowels to be kept evacuated by mild purgatives. Manna. Tamarinds. Peruvian or oak-bark, combined with mineral acids, especially the sulphuric. Opium. Digitalis in large doses, so as to occasion nausea. "A table-spoonful of common salt." (Dr. Rush.) "One immersion in cold water, or a sudden sprinkling all over with cold water, would probably stop a pulmonary hæmorrhage." (Darwin.) Procure a return of the obstructed discharge.

Phthisis pulmonalis, consumption of the lungs.

Symptoms. Emaciation, weakness, cough, hectic fever, and for the most part an expectoration of pus. Dr. Cullen has introduced pulmonary consumption into his nosology, as a sequel of hæmoptysis. This common and fatal malady, however, often, and indeed for the most part, originates independently of hæmorrhage from the lungs. Its origin and progress are most usually exceedingly insidious. The persons chiefly obnoxious to phthisis are those of a scrophulous habit, who have been disposed previously to suffer by lymphatic tumours, who are of a slender make, have long necks and narrow chests, who have been liable in their earlier years to bleeding at the nose, who have had frequent catarrhal affections while children, and in whom cough has remained or been ill-treated after the eruptive diseases of infancy, more especially the measles. These predispositions ordinarily break out into actual disease, at, or shortly after, the period of puberty. It is at this time that the pulmonary circulation becomes altered; and the seeds of the disease, hitherto latent, are expanded and developed. In any constitution then at this period, and more especially in those that are characterized by a scrophulous tendency, a short and generally dry cough, succeeding perhaps to a trivial cold, attended with emaciation in the smallest degree, and more especially if the pulse be rapid, and the cheek be marked by hectic redness, alternating with more than usual paleness of countenance, the patient is to be assiduously watched, and the disorder earnestly combated.

Causes. Phthisical ulceration of the lungs, or confirmed consumption, is ordinarily produced through the medium of tubercles, or small bodies, in the cellular texture of these organs, which, by repeated and gradual irritation, at length come to ulcerate and destroy the fabric of the lungs, and produce the symptoms of fully-formed phthisis. The origin and actual nature of these bodies are not perhaps very evident; they were formerly erroneously imagined to be indurated lymphatic glands. The more immediately exciting cause of pulmonary consumption is generally an exposure to cold, which operates in the manner described under the section Catarrh. Consumption, however, may be brought on by amenorrhœa, lues venerea, unseasonably repelled eruptive action on the surface, mental affections, &c.

M. M.

M. M. "The facility," says a modern author, "of repressing the primary symptoms of phthisis pulmonalis, is proportioned to its difficulty of cure when the characters of the disorder are fully confirmed, and the texture of the lungs almost wholly destroyed." (Reid on Consumption.) In no case, perhaps, is neglect or early mismanagement of disease more pregnant with irremediable evils, than in the instance of consumptive affections. Digitalis properly and timely had recourse to is "the anchor of hope." "In families where this fatal disease (phthisis) is hereditary, the use of this remedy as a prophylactic, will, I have no doubt, save many lives that would otherwise have been cut short." (Dr. Currie.) "Digitalis is a remedy in pulmonary consumption in its earlier periods, which, under due regulations, and with sufficient attention to other circumstances of regimen and diet, may be employed with a prospect of almost invariable relief." (Dr. Reid.) Other testimonies, equally decided, might be adduced in favour of this valuable remedy. Warm-bathing. A regular temperature in the air that the person breathes. Warm clothing. Avoiding currents of air. Assiduously guarding against damp, and especially cold application to the feet, as by sitting with the feet on a stone-floor, or an oil-cloth. Milk-diet, of which Hoffman elegantly says, "Quæ per plures phthisicos, in cymba Charontis quasi hærentes, sanatos, pristinaque redditos valetudini, novi." Avoiding all spirituous liquors, and spiced or high-seasoned meats. Keeping the bowels gently open by manna, castor-oil, senna, &c. Uva ursi has recently been recommended by Dr. Bourne. These are the remedies of the first stage, or, more properly speaking, the menacing symptoms of consumption. When the lungs have actually become ulcerated after gradual and protracted irritation, very little expectation of recovery can remain. Griffith's mixture, composed of steel, myrrh, and alkali. Digitalis in larger doses, and combined with the above tonic. Uva ursi? opium and vitriolic acid. Digitalis combined with calomel. Change of climate. If a tendency to absorption from the surface of pulmonary ulcer could be induced greater than the deposition of it, we might have some prospect of curing the disease in its advanced stages. In order to produce this absorption, sailing so as to occasion seasickness has been had recourse to. Swinging, riding in a carriage, and other modes of occasioning a degree of vertiginous affection, and consequent nausea, have likewise been recommended and practised. Inhalation of a lowered atmosphere, of other modified gases, and even volatile astringent substances, have been also proposed and tried, but not with decided benefit. In the confirmed stages of phthisis, animal diet which is nutritive, without being stimulant, ought to be advised. Bath-waters and cold sea-bathing are improper in every stage of the complaint.

N. B. If consumption be symptomatic of other diseases, while the symptoms are subdued by the above remedies, the attention must necessarily be turned principally towards the original affection.

Caution. All the signs of consumption may be present without the presence of the disease. Debility, emaciation, and cough, may be brought on by nervous, independent of organic, disease, as well as by worms and intestinal viscidities. Hectic fever may be occasioned in certain constitutions by mental affections alone; this likewise is sometimes induced by worms. Purulent expectoration, indeed, is decisive; but the nature of the sputa is not with facility, in every case, to be decided upon.

Genus III. Hæmorrhoids, the piles. Weight and pain of the head, vertigo, pain in the anus and loins, swellings and flux of blood from the anus.

M. M. If symptoms of arterial activity accompany the hæmorrhoids, vitriolic acid, with moderate astringents, such as infusion of roses. Temperance, exercise, abstinence from spirituous liquors and spices. Tamarinds. Lenitive electuary, sulphur, crystals of tartar. Castor-oil. Warm fomentation, by sitting over the steam of heated water. Leeches. These two last remedies, are especially serviceable in what are called the blind hæmorrhoids, where there is swelling with pain from congestion in the hæmorrhoidal veins, without any discharge of blood from the anus. When the hæmorrhoidal flux is attended with much debility, while the bowels are kept open with castor-oil and other similar purgatives, the more powerful astringents are to be employed. Steel. Exercise. Generous diet. Cheerful train of thinking. See SURGERY.

Genus IV. Manorrhagia, immoderate menstrual flux.

Symptoms. Pain in the back and loins, vertigo, difficulty of breathing, flushes of heat and cold, frequent pulse; in cases where the disease is more directly from debility, loss of appetite, paleness of countenance, coldness of the limbs, œdematous swellings about the ancles.

M. M. In the first species, the menstrual irregularity generally arises from hysteric or nervous affections, libidinous desires, and other violent passions; in this case attention must be paid to counteract the cause. Avoid stimuli of all kinds, mental or physical. Refrigerant cathartics, if costiveness be present. Moderate astringents, such as infusion of roses, and the sulphuric acid. In the manorrhagia of direct debility, astringents, cordials, and stimulants. Peruvian bark and sulphuric acid, opium, alum, port-wine. External application of cold water, or vinegar. Steel.

ORDER V. Profluvia.

The profluvia are distinguished by Dr. Cullen from hæmorrhages, by the discharges not being naturally sanguinary. This order contains two genera, catarrhus and dysenteria, both of which might have found more appropriate situations even in Dr. Cullen's own nosology.

Genus I. Catarrhus, a cold.

Symptoms. Pyrexia, with increased discharge from the mucous membrane of the nostrils, and in violent cases of the fauces and bronchia, with cough. The term cold, which is made use of, in common language, principally to denote an inflammatory condition of the mucous membrane of the nose, is exceedingly incorrect; it not only confounds the effect with the cause of the disorder, but conveys an erroneous idea of the mode in which such disorder is created. The operation of cold, unless through the medium of the sensations, is invariably negative; it is merely an abstraction of the stimulant power of heat, and by its application to the living body (from an invariable law of organic existence) renders the frame in a more than ordinary measure susceptible of such, and other stimulant powers. For example: suppose an animal to exist in a medium-temperature of 60°, let 10° be subtracted for a short period, and afterwards precipitately added, the 60° will now act as with a power, perhaps, of 65, on account of the previous abstraction of stimuli producing, as it has been very properly expressed, "an accumulation of excitability." In this manner then is explained the agency of cold, in engendering inflammatory disorders, among which that we are now considering is one of the most frequent; an explanation founded upon a principle for the development of which we are unquestionably indebted to the genius of Dr. Brown. This author, however, made an improper use of his own discovery; he did not sufficiently take into account the complicated and combined functions of the animal œconomy; and the very first position which he deduced from the detection of this important, and indeed characteristic, quality of living existence, is practically incorrect. "Cold applied to the animal system never proves injurious unless succeeded by heat;" frigus unquam nocet, nisi ubi ejus actionem calor excipit. In endeavouring to support this assumption, Dr. Brown and his disciples have aimed to prove that those symptoms which are usually characterised by the appellation of a cold, as well as rheumatism, and all other diseases arising from exposure to cold, are not occasioned until the same or a superior degree of external heat be restored; forgetting that the "accumulation of excitability" immediately resulting from diminished temperature is acted upon, and thus inflammatory irritation engendered, by the remaining stimuli of the frame, external and internal. Thus an individual, while still exposed to the catarrh-producing temperature, while, for example, his feet remain wet and cold, shall have inflammation in the mucous membrane of the nose and fauces, febrile irritation, and all the usual phenomena of catarrh; the balance of excitement being overturned, and turbulent irritant action being established in its stead. Further, the existence of a cold does not suppose the presence of a sthenic disease: indeed the exact contrary is the fact, for the malady will be occasioned with most facility when the frame is weak and irritable. Why the membrane of the nostrils, &c. should be the readiest to suffer more particularly, does not seem to admit of an easy explanation; it is important, however, to recollect what has been pointed out in an explicit manner by Dr. Beddoes, and since by Dr. Reid, that this membrane is a part

of the same expansion with that which lines the windpipe and enters the lungs; so that in fact a common inflammatory cold is a degree of the same disease with an inflammation of the lungs.

M. M. Moderate and equal temperature. The bowels to be kept gently open. If the febrile irritation is considerable, sudorifics. Antimonials, nitre. Oleaginous substances may be used to allay the cough; but irritating balsams, such as cough-medicines are generally composed of, are in the highest degree detrimental; they too often increase the disposition to, and sometimes actually produce, confirmed consumption. Liqueurice, honey, boiled fig, almond-emulsion. If the phthisical tendency is conspicuous, digitalis (see the section on phthisis pulmonalis).

Genus 11. *Dysentery*, dysentery.

Symptoms. Frequent stools, mixed with mucous, and sometimes with blood, attended with griping and tenesmus, the proper urvine excretions being retained; pyrexia, pulse quick and feeble. The disease is sometimes contagious and epidemic.

Causes. Dysentery depends upon the irritability of weakness, determined by particular circumstances to the alimentary canal; its predisposing and exciting causes are alternations of heat and cold, more especially when accompanied by damp, as when an army is encamped on marshy ground; the putrid miasma arising from the marshes; the contagious effluvia proceeding from the discharge in the disease; and, according to Sir John Pringle, from lead bodies left unburied in the field of battle. The immediate cause of the symptoms seems to be, a spasmodic constriction of the larger intestines, retaining the faeces.

M. M. Calomel, opium, and rhubarb, to relieve the spasm, and discharge the contents of the bowels. Mucilaginous clysters, of starch with tincture of opium. Emetics. Small doses frequently repeated of ipecacuanha. Calumba. Peruvian bark. Warm-bathing.

CLASS II.

NEUROSES, Nervous diseases. Depraved perception and interrupted motion, are the essences of nervous diseases: the percipient, however, is to be distinguished from the motive faculty; or we have a class of living actions, which, although equally under the influence of nervous power with those over which the will presides, are nevertheless, in a state of health, incessantly carried on without perception or consciousness; thus, by impeding the functions of the nerves of the stomach, we may interrupt the function of digestion. Digestion, however, is a process performed without design, and independently of volition; on the other hand, the intellect may be impaired by a derangement in the nervous system, while the digestive power shall proceed without the smallest hindrance. The orders of this class (neuroses) are four:

1. *Comata*. A diminution of voluntary motion, with sleep or impaired senses.

2. *Adynamia*, a diminution of the involuntary motions of either natural or vital functions.

3. *Spasmi*, morbid motions of muscular fibre.

4. *Vesaniz*, disorders of the judgement or intellect without primary pyrexia, or observable affection of any particular part of the body.

ORDER I. *Comata*.

Genus I. *Apoplexia*, apoplexy.

Symptoms. Abolition of the sentient and loco-motive faculties, the sleep in general attended with snoring. The respiration, motion of the heart, and other involuntary actions, remaining.

Causes. Epilepsy, palsy, and apoplexy, were contended by Brown to originate from the mere irregularity of nervous power consequent upon debility or deficient excitement; and to be occasioned without either an unusual impetus of circulation to the vessels of the brain, or impeded return of blood from this organ. We believe, however, that although the cause of apoplexy often is in one sense mere deficiency of excitement directed to the sentient organization, the immediate occasion of the apoplectic symptoms is for the most part the state of the vessels of the brain. Apoplexy, for the sake of illustration, may be divided into sthenic and asthenic. If a vigorous and plethoric man, sitting down to his dinner and his glass, suddenly, during the excitement of conviviality, of mirth, and of alcohol, fall on the floor with deprivation of sense and apoplectic stertor, it must be evident that the fit has

been induced by a greater flow of arterial blood into the vessels of the brain, than the veins of this organ could, in due time, convey away. The apoplexy has been induced in the manner of a sthenic disease. If, on the other hand, a debauched and debilitated individual be the subject of an apoplectic attack, at the time when the excitement of intoxication shall have been succeeded by the condition of indirect debility, the disease will here have been brought about in a different manner; the impetus in the vessels of the brain shall have partaken of the general diminution of power throughout the whole system; sluggish vascular action shall have caused congestion; which congestion, in union with the deficient excitement on which it had depended, shall have induced that sudden suspension of the sentient faculty which constitutes the apoplectic paroxysm. Apoplexy often immediately succeeds to a full meal: what more natural than, under such circumstances, to attribute the fit to a distended stomach pressing upon the aorta or large descending blood-vessel, and consequent determination of the vital fluid in an inordinate measure to the head? Such conclusion however, will not bear the scrutiny of strict enquiry. Upon this principle, the apoplectic stertor and insensibility ought to be induced with most readiness, as in oneorrdynia or night-mare, while the body is in a recumbent posture, and the stomach is most distended from the extrication of gas which takes place in consequence of the weakened digestive power; in place of this, however, the fall is immediate; the attack is made while the body is in an erect position, and often before the stomach has become in a very great degree distended; the fit then arises, in this last case, from that degree of excitement which the digestive powers have called off to their aid, leaving the brain in a condition of insufficient energy, properly to propel the vital fluid through its own vessels; congestion of blood is the consequence, and this last the proximate or immediate cause of the fit.

M. M. The strictest attention to the manner in which the disorder has been brought on. If the disease is sthenic, and the physicians are called in while the paroxysm still continues, immediate and copious bleeding from the arm, the jugular veins, or the temporal artery. Every ligature about the patient's body, especially about the neck, to be loosened immediately. Press hard with the thumb and fore-finger upon the carotid arteries, taking care to avoid the jugular veins. Place the head of the patient high on his pillow, or seat him erect in a chair. Preserve the apartment cool. Cold water may in some cases be applied vigorously to the forehead and temples. Afterwards saline purges, and subacid drinks. Enemas. Careful preservation from irregular and violent excitations, either of body or mind. In the asthenic, and by far the most usual form, of the complaint, bleeding with much less freedom, and only during the paroxysm; in general, it is not at all proper. It is better to open the temporal artery, if convenient, than to bleed from the arm or jugulars. The application of cupping-glasses still preferable; apply blisters to the neck. When the power of deglutition has returned, cordials and stimulants. Opium and wine in very small doses. Volatile alkali. Sprinkle vinegar about the room. To prevent the returns of the fits; tonics, particularly bitters, as calumba, gentian, quassia; exercise and mental amusement, without violent excitation. Journeys to Bath or elsewhere. Preserve the body regularly open, without violent purgations. Avoid sudden exposure to cold, especially cold and wet feet. If the fit has followed the suppression of any accustomed discharge, or cutaneous eruption, let them, if possible, be restored.

Genus II. *Paralysis*, palsy. Partial interruption of the loco-motive faculty, sometimes with a degree of apoplectic stertor. This is partial apoplexy, arising from similar causes operating in a less degree. It sometimes succeeds to a full fit of apoplexy, and continues for months, or during life. The palsy often affects the whole of one side, and is confined to that side; hence it has been supposed, that the injury of the brain is likewise partial; and from the decussation that has been imagined traceable of the nerves from the encephalon, Dr. Darwin and others have concluded, that the origin of the disease is on that side of the brain opposite to the affected side. Palsy, however, certainly originates at times (even if genuine apoplexy does not) from interrupted excitement, without any congestion in the brain, as its more immediate source; as when it results from the poison of lead and other causes.

M. M. Ascertain the exciting cause, and, if possible, counteract it. Emetics, purgatives, preceding stimulants and tonics. Tonics and stimulants the same as in asthenic apoplexy. Volatile embrocations to the paralysed side or limb. Warm-bath. Bath-waters. Electricity. Galvanism.

ORDER II. *Adynamia*.

Genus I. *Syncope*, fainting.

Symptoms. A diminution, or even, for a time, a total cessation, in the action of the heart. Fainting may arise from passions of the mind; from sudden reduction of stimulus, as from bleeding, or drawing off the waters in dropsy; violent pain; the irritation of worms, or other crudities, in the stomach and bowels; much heat, offensive effluvia, &c.: in these cases the disorder has been called *syncope cerebialis*. When fainting arises from deficiency of oxygen in the circumambient air, as in a crowded assembly, the cessation of the heart is produced nearly upon the same principles as in actual suffocation, drowning, or strangling. It is then termed *syncope pulmonea*.

M. M. Immediately obviate, if possible, the exciting cause. Endeavour to restore sensation by aspersing cold water on the face and neck; attempt to force down a small quantity of brandy; and in all cases, but more especially when the affection arises from impure air, throw open the windows, and prevent compassionate spectators from crowding round the insensible patient. If fainting, or palpitation, recur frequently, and without any manifest cause, either predisposing or exciting, there will be reason to suspect that the disorder is not nervous, but depends upon some malconformation in the heart, or neighbouring blood-vessels. In this last case it is irremediable.

Genus II. *Dyspepsia*, indigestion.

Symptoms. Deficient, or depraved, appetite; nausea; vomiting; inflation from flatulence; heartburn; pain in the stomach, especially when the body is in a bent position; oppressed breathing; costiveness. This disease evidently arises from deficient action in the muscular fibres of the stomach, which in violent cases amounts to inverted motion and vomiting. It acknowledges the same sources as other affections of weakness: these are, intemperate use of spirituous liquors, and of tea; exposure to damp and cold; irregular hours of repose; intense study; mental depression and anxiety; when originating from this last source the disorder has an equal claim to the appellation of *hypochondriasis*, or low spirits, as with that of *dyspepsia*.

M. M. Purgatives, with calomel, previously to giving tonics. An emetic. Calumba, gentian, quassia. Magnesia, in order to neutralise the acidity, and ease the consequent pain of heartburn. Chalk, which is used with the same intention, is improper, on account of that neutral compound which it forms with the acid of the stomach being insoluble, and tending to increase the costive state. "The dyspeptic must be persuaded that a horse is the best physician; and that temperance of every kind, with reasonable dissipation and exercise in a dry healthy air, will do more for him than all the medicines in the world." (Townsend.) Cold, or shower, bath, in very warm, and warm-bathing, in cold weather. A glass of warm water after dinner and supper.

Genus III. *Hypochondriasis*, low spirits. Indigestion, with languor, and causeless apprehension of evil, more especially as it relates to the patient's state of health. This disease and *dyspepsia* only deserve to be distinguished by separate names, inasmuch as the mental depression in *hypochondriasis* appears especially to increase the disease by which it is, in part, constituted; and such disease is again magnified beyond measure by the morbid imagination of the invalid. Thus, in some cases of confirmed *hypochondriasis*, the dyspeptic sensations shall be attributed by the sufferer to the immediate agency of a malevolent power.

M. M. Aim at converting solicitude and apprehension into confidence and hope; not by deriding the feelings of the *hypochondriac*, and treating them as fanciful, but by breaking the chain of diseased associations. Procure a gradual change of scene and of habits. Journeys to Bath, or elsewhere, according to the previous disposition of the patient. Bath-waters. Warm-bathing. Preserve carefully the alimentary canal free from colluvies and viscidities by drastic purges and calomel. Maintain a regular moisture of the skin, without copious perspiration. Tonics with aromatics. Dr. Darwin particularly insists, and with justice, on

the advantage of uniformity in the hours of meals: this uniformity should even extend to medicinals, the same hour of repetition being invariably observed. "Siesta, or sleep after dinner."

Genus IV. *Chlorosis*, green-sickness. *Dyspepsia*; paleness of the skin and of the lips; lassitude; difficult breathing, and palpitation of the heart, after using more exercise than usual, especially in going rapidly up stairs; pulse small, feeble, and sometimes very quick; coldness of the extremities; appetite deficient, and oftentimes depraved; pain in the back and loins; costiveness; œdematous ancles, especially towards evening; and obstructed menstruation. "Chlorosi laborat debilis puella totum corpus, laxo œdemate tumet; pallent et frigent omnia." (Van Swieten.) Dr. Cullen has improperly classed this among the nervous diseases; it ought to have been transferred to the next leading division of disease, or rather regarded as an affection of the lymphatic and absorbent system. The immediate cause is evidently an inactive state of the absorbent vessels, more especially of those which supply the chyle: hence deficiency of red blood in the vessels, want of propelling power in the heart and arteries: hence want of menstruation, œdematous swellings of the feet, "pallent et frigent omnia."

M. M. Almost as certainly as some kinds of pains yield to opium, does even obstinate *chlorosis* fall before the power of steel. "Dum hoc utitur, incipit oriri major calor." To steel, then, must the physician principally trust in every case of genuine green-sickness. It is necessary, however, frequently to commence with an emetic; and in almost all cases it is proper to give a purgative, joined with calomel, before the administration of steel. Tonic bitters. Aromatics. Moderate exercise in a pure atmosphere. Flesh diet. "A bath of about eighty degrees, as Buxton;" not by any means colder. Marriage.

ORDER III. *Spasmi*, Spasms.

If in any animal the nerve supplying a limb be denuded, and a violent stimulus be applied to its surface, the whole member shall be immediately thrown into convulsive agitations: a fact which is perhaps too often demonstrated in galvanic and other experiments. When then such convulsive movements appear, without experiments, and sometimes without apparent cause, a similar change is justly inferred to take place in the nerve or nerves passing to the organ which may be the subject of the disease. There is one circumstance with respect to spasm that, both in theory and practice, ought always to be retained in the memory; this is, that the spasmodic or convulsive state of parts, invariably implies debility. To act irregularly, is in all instances to act with deficient vigour; for the sum total of these disorderly movements, performed in a given time, will not amount to the quantum of power displayed in the same time by healthy and steady action. This fact appears to be a sufficient refutation of Dr. Darwin's hypothesis, that convulsions are voluntary exertions of the muscles to relieve pain, even if we concede to this author, that the strict definition of volition ought to be "the active state of the sensorial faculty in producing motion, in consequence of desire or aversion, whether we have the power of restraining that action or not;" for, according to this principle, convulsion should be an actual and positive increase of vigour, which it is not; for while the utmost agitation is carrying on in the convulsed member or organ, if a due quantity of stimulus be thrown in, excitement will immediately follow, and in consequence of this excitement, quiescence and firmness; in the same manner, but upon a different principle, as tightening the sail of a ship arrests its vibratory motions, but increases its actual and integral force. If it appear difficult to conceive why a stimulant or exciting agent should produce this debilitated action, we must refer to the invariable law of living existence, that excitation, carried beyond a certain point, is immediately productive of indirect debility: thus when the galvanist convulses the leg of a frog, he throws in more of stimulus than is adapted to the fibrous excitability of the organ in question; he exhausts the irritability of the part; and the convulsion that follows is the consequence of such exhaustion, exactly upon the same principle that half a pint of wine shall give steadiness to the tongue, and firmness to the step, while a quart of this stimulus, taken in the same time, shall produce a temporary paralysis of the limbs, and render the speech faltering and inarticulate. In attempting to overcome a spasm or convulsion, the leading principle of cure must be stimulative; the

the disease in question, however originating, invariably implying debility, or more properly, perhaps, deficiency of excitement.

SECT. I. *Spasmodic affections in the animal functions.*

Genus I. *Tetanus*. A spasmodic rigidity of a great part of the body: in some instances it is drawn violently backward, at others forwards, and in both cases the disease is generally followed or attended by trismus or lock-jaw; these symptoms may last with greater or inferior violence from twenty-four hours to a month or more. The immediately exciting causes of tetanus are, wounds or pricks of tendons; the sudden application of cold after extreme heat; great intemperance, or other vices; the disease may likewise be consequent upon viscid mucus, worms, and other irritating substances, in the alimentary passages.

M. M. As in fevers, it is highly necessary to preserve the alimentary canal free from colluvies, in order that the return of due and orderly excitement may not be prevented by this cause; so is it especially necessary in nervous and spasmodic affections carefully to keep in mind the incalculable importance of this principle. Indeed, among the actually exciting causes of the malady now under notice, these intestinal crudities are perhaps the most frequent. Let the practitioner then, in every spasmodic disorder, pay solicitous attention to the condition of the stomach and bowels: it is in these organs "that the archer may be seated," in whatever direction he may send out his arrows. It is not, let it be as carefully remembered, by the act of evacuation in reducing the system, that either emetics or purgatives operate thus beneficially; but by the disposition that a freedom in the first passages favours to the due susceptibility of the exciting powers, on the agency of which the return of health depends. Indeed, as far as either purging or vomiting are in themselves immediately instrumental in dissolving spasm, as it has been expressed, independently of the source just referred to, it is by virtue of the agitation and stimulus, not by the discharge of which they are productive. Emetics, cathartics with calomel. Pouring large quantities of cold water over the body during the spasm, in order forcibly to sever the catenated motions by which it is constituted. Warm-bathing. Very large quantities of opium. More than four hundred drops of the tincture have been given in some violent tetanic affections in the course of twenty-four hours, and without producing any intoxicating effect.

Genus II. *Convulsio*, convulsions. On the cause and treatment of these, we need not enlarge, after the remarks we have introduced on the nature, predisposing and exciting causes, of convulsive and spasmodic disorders in general.

Genus III. *Chorea*, St. Vitus's dance.

Symptoms. Convulsive agitations of the limbs, in general almost confined to one side of the body. When the patient attempts to walk, he produces involuntary gesticulations.

M. M. Emetics, cathartics with calomel; anthelmintics; bark, steel, and other tonics; electricity, galvanism, tepid bathing, sea-bathing.

Genus IV. *Raphania*, contractions in the joints.

Symptoms. Spastic contractions of the joints, with excruciating pain, and convulsive motions, returning periodically, and continuing for many days. It appears to be a species of rheumatism.

M. M. Purges, followed by tonics; mercury combined with opium.

Genus V. *Epilepsia*, epilepsy. Violent convulsions of the muscles, attended with sleep. Epilepsy in its nature and causes appears to hold a kind of intermediate situation between apoplexy and convulsion; it has the sudden fall and sopor of the one, with the irregular muscular action of the other. Epilepsy, in a greater or less degree, is a disease of extreme frequency: indeed, all the convulsions of children may be called epileptic. In its full and formidable shape, it is not so frequently met with as several other diseases. A physician, however, may denominate, with propriety, all fits epileptic, of which alternate or combined convulsions and sleep constitute the characters, especially if these are connected in any degree with an increased action of the salivary glands.

M. M. Epileptic fits are sometimes congenital, hereditary, and depend upon some occult state of the nervous system. In these cases the disorder is generally irremediable. All that can be done by art is merely to ascertain, and endeavour, if possible, to obviate, the exciting causes of the disease; and during the paroxysm to loosen every bandage about the neck and head, pre-

serve the apartment in which the fall is made as airy as possible, and be careful that the patient do not inflict injury upon himself by the violence of his agitation. In some cases, indeed, the individual can obviate the full formation of the paroxysm by tying a ligature round the limb in which the sensation threatening the attack is perceived, between the point at which such sensation commences and the brain. This sensation constitutes what is called the epileptic aura: its abstract cause is obscure; but no less so than the phenomena of spasm in general. In treating the complaint, particular attention is to be given to the predisposing and exciting cause or causes, which are extremely numerous; such as youthful intemperance, indulgence in secret vices, mental passions and affections, imitation of other epileptics, lively recollections of previous impressions, repelled eruptions or discharges, sudden alterations of the extremes of temperature, unpleasant odours, and, as by far the most common source of those epileptic fits which scarcely amount to absolute epilepsy, worms. These causes must all necessarily be removed before the physician can have the least prospect of overcoming the disease. Emetics, cathartics, with calomel; anthelmintics: suddenly dis sever the chain of associations, by plunging the patient in the cold-bath, or dashing with violence cold water over his naked body. Induce a new disease, as the itch; a plan which Dr. Darwin adopted with success in the treatment of St. Vitus's dance, with which the present has a great affinity. Patients have likewise been cured of epilepsy, by the accidental occurrence of a quartan ague. These are instructive cases to the reflecting and speculative. Tonics. Galvanism.

Of Worms, and Anthelmintics. Worms we have just stated to be among the most frequent of the exciting causes of epileptic fits. As the order of our nosology no where leads us to notice them in an especial manner, it may not be improper in this place to introduce one or two remarks respecting their nature and treatment. Intestinal worms are of three kinds; the ascaridis, or small thread-like worm; the lumbricus teres, or round worm; and the tenia, or tape-worm. The first of these are principally confined to the rectum: they are divided by Mr. Darwin into two species, viz. "the common small one, like a thread, which has a very sharp head, as appears in the microscope, and which is so tender that the cold air soon renders it motionless; and a larger kind, above an inch long, and nearly as thick as a very small crow-quill, and which is very hard in respect to its texture, and very tenacious of life." The symptoms by which the presence of these may be suspected, are an uneasiness and itching in the rectum, especially urgent towards evening: this, if violent, disturbs sleep, and occasions febrile irritation, and sometimes tenebrius, with mucous discharge from the anus, indigestion, and itching of the nostrils.

M. M. Clysters of lime-water, injection of tobacco-smoke. Mercurial ointment introduced into the anus. Aloes and steel, both by the mouth and in the form of enema. Saline purgatives. Harrowgate water, so as to induce six or seven stools every morning.

The lumbricus is the most common. Lumbrici are of very different lengths and magnitude; they are principally found in the smaller intestines, but are situated occasionally both in the stomach and larger intestines. These worms have been known to pierce through the coats of the alimentary canal, and have thus occasioned the most excruciating pains and death. The tape-worms are sometimes voided of an enormous length: they have been stated to be from two to forty feet long. They properly consist of an united chain of separate animals; as, when broken, each portion has the power of reproduction. "The worms of this genus possess a wonderful power of retaining life. Two of them, which were voided by a pointer-dog in consequence of violent purgatives, each of which was several feet in length, had boiling water poured on them in a basin which seemed not much to inconvenience them. When the water was cool, they were taken out, and put into gin or whisky of the strongest kind, in which their life and activity continued unimpaired, and they were at length killed by adding to the spirit a quantity of corrosive sublimate." The symptoms are much the same with those of the lumbrici, but more urgent.

Spasmodic Affections continued.

SECT. II. *In the vital Functions.*

Genus I. *Palpitatio*, palpitation. See SYSCOPE.

Genus II. *Asthma*.

Symptoms.

Symptoms. Difficult respiration returning at intervals, with a sense of tightness across the breast. Wheezing at the commencement of the asthmatic fits; scarcely any cough but what is hard: towards the close of the paroxysm it however becomes more free, attended with a discharge of mucus. These symptoms certainly arise from a spasmodic constriction of the bronchial fibres, "which is communicated by consent to the larynx and diaphragm." The causes of asthma are numerous, while its predisposition is often hereditary, and dependent upon a peculiar conformation and temperament; the actual disease may be excited by intemperance either in eating or drinking, violent exercise, mental agitation, eruptions or discharges abruptly or unseasonably repelled; the fumes of metallic poison, as of lead, &c.

M. M. Spasmodic asthma, when fully established, scarcely admits of a radical cure. The paroxysms to be relieved by opium and ether; coffee; tonics in the intervals, principally of the class of bitters and aromatics. Avoid distending the stomach inordinately. Emetics; enemas previous to the expected accession; gentle horse-exercise; pure air; oxygen gas. If eruptions have been repelled, endeavour to restore them.

Genus III. Dyspnœa, difficulty of breathing. This is improperly introduced into the nosology as a genus, it being merely a symptom of other diseases, consequent upon defective formation of the chest, or brought on by evident causes, which being removed, the disorder immediately declines.

Genus IV. Pertussis, whooping-cough.

Symptoms. Convulsive strangulating cough, with noisy inspiration or hooping, and sometimes attended with vomiting. It is contagious. The precise nature, or, as physicians express themselves, the proximate cause of whooping-cough does not seem to have been accurately ascertained. Dr. Darwin supposes it to be "an inflammation of the membranes which line the air-vessels of the lungs, and that it only differs from peripneumonia superficialis in the circumstance of its being contagious." He, on this account, enumerates it among the sensitive irritated fevers: we are inclined, however, to think that the infection principally operates upon the stomach; and that the inflammatory disorder of the mucous membrane is merely a consequence of the protraction, or erroneous treatment, of the complaint. It is not attended, in the first instance at least, with the symptoms of inflammatory irritation; and the vomiting, by which the violent fits are often relieved, proves that the stomach, in pertussis, is in a morbidly irritable state. It deserves, however, to be remarked, that the membrane in question is very apt to partake of the prevailing irritation, to become inflamed, and thus, like the inflammation after small-pox, and measles more especially, to lay the foundation of consumption of the lungs.

M. M. Antimonial emetics. Very small doses. Warm bathing. Above all, digitalis; in no disease, perhaps, is the power of this valuable medicine displayed more forcibly and evidently than in whooping-cough. Its effects are generally almost instantaneous. After the violence of the disease has subsided, and even before, change of air. *Cicuta* (*conium maculatum*) has been much employed in this complaint.

SECT. III. In the animal functions.

Genus I. Pyrosis. Water-brash of Scotland. Water-qualm.

Symptoms. Sudden eructation of watery fluid with or without heartburn; the fluid brought from the stomach sometimes insipid.

M. M. "A grain of opium twice a-day, soap, iron-powder, a blister." (Darwin.)

Genus II. Colica, colic.

Symptoms. Permanent and excruciating pain in the belly, with a sensation as of twisting about the navel, constipation, and sometimes vomiting.

Causes. These symptoms evidently originate from spasmodic constriction in some part of the intestinal canal, which may be occasioned by various causes; such as indigestible food, the sudden application of cold; acrid substances received into the stomach; poisons especially lead; hence colic is a kind of epidemic disease among painters, attended with paralysis of the arms, &c. It is likewise common in cyder-countries.

M. M. Opium. Cathartics, principally of castor-oil. Warm bathing. Anodyne clysters. Fomentations and blisters to the part. In obstinate cases of the painters' colic, Bath waters. Carefully obviate the exciting causes of the disease.

Genus III. Cholera.

Symptoms. Vomiting and purging of bilious matter, violent pains in the stomach and bowels, with great anxiety and irritability. Cholera is one of the diseases of the autumnal months; it is very often produced by the sudden succession of cold to unusually warm weather; it sometimes follows the taking of indigestible substances, as of much cold cucumber, especially at the period of the year above-mentioned, when the directly debilitating power of cold abruptly succeeds the indirectly debilitating operation of heat, and the biliary secretion is more than ordinarily copious.

M. M. During the violence of the vomiting and purging, give water-gruel, and inject starch-clysters, to each of which add tincture of opium. After the disorder has in some measure subsided, restore due excitement by cordial and nourishing diet, with stomachic medicines. If febrile irritation is induced, the saline draught, composed of salt of wormwood and lemon-juice.

Genus IV. Diarrhœa.

Symptoms. Frequent stools, without primary pyrexia, and not induced by contagion. A morbid action in the excretories of the intestines constitutes this disease: sometimes, however, and frequently purging arises from mere loss of excitability in the intestinal fibre, without increase either of bile or any other excretion. It is immediately occasioned by acrid matter in the intestines: by acidities, by mental passions, or by the sudden application of cold, more especially to the feet.

M. M. According to the exciting causes. If there is reason to suspect the lodgment of acrid matter, calomel, with jalap, senna, or rhubarb. Afterwards astringents, of which one of the best is good red wine. Opium. Chalk, if acidity prevails. An emetic, if the disorder continues obstinate.

Genus V. Diabetes.

Symptoms. Superabundant discharge of urine, in some cases amounting to fifty pounds in twenty-four hours, limpid and sweetish to the taste, with urgent and perpetual thirst, dry skin, weakness, emaciation. This disease often, perhaps, exists to a very considerable extent without being detected. It is not an uncommon complaint among the poor, especially of the north of Britain. The principal circumstances that have attracted the notice of the pathologist in reference to this complaint, are the saccharine quality of the urine evacuated, and the attendant emaciation. One of the principal ingredients in the nutrition of the body has been supposed to be the saccharine principle; from the inordinate discharge of this principle in the diabetic urine, the disorder has been, therefore, referred by some to a deficiency of assimilating power in the stomach and digestive organs, while others have imagined it to originate entirely from altered action in the kidneys. Perhaps both of these causes may operate in producing diabetes. Upon dissection, the kidneys are always found flaccid. (Dr. Darwin.)

M. M. Animal diet. Dr. Rollo and others have observed that when the patient lives on animal food, the saccharine quality of diabetic urine abates. Alkaline and astringent medicines, such as nut-galls and lime-water. Bark. Steel. Opium. Alum-whey.

Genus VI. Hysteria. The hysterical disease.

Symptoms. A gurgling of the bowels, followed by globus hystericus, or a sensation of a ball ascending to the throat, and menacing suffocation. Convulsive agitations, alternate laughing and crying, a general fickleness and irritability of mind. A large quantity of straw-coloured or limpid urine. Hysteria, like epilepsy, is in a certain degree extremely common; it generally first occurs in females about the time of puberty. It is, like all other convulsive affections, a symptom of lax habit, and is consequent upon the irritability of weakness. It may be brought on by mental agitation, or by irritations in the stomach, bowels, uterine organs, &c. The discharge of urine which attends or precedes hysterical paroxysm, is attributed by Dr. Darwin to the inverted motions of the lymphatics about the mouth of the bladder, as in diabetes; a temporary torpor, or spasm of these vessels, would appear sufficient to account for the superabundant excretion, the watery part of the urine not being taken up.

M. M. Avoid every occasional and exciting cause of the disease. Bark, quassia, and other tonics. To remove the present symptoms, camphor, assafoetida, castor, opium; if this last, from idiosyncrasy, disagrees with the patient, the hyoscyamus will generally be found an excellent substitute. This has not the constipating tendency

tendency of opium; and in hysteric cases is of importance, while much evacuation is guarded against, to preserve a freedom both in the alvine and cutaneous discharges. Emetics. N. B. The customary plan of bleeding in hysteric affections is extremely detrimental to the general health, and disposes to the return of the paroxysm. If it is judged necessary in some cases of hysteria to withdraw a small quantity of blood, it should be done, not by venesection in the ordinary mode, but by the application of a cupping-glass.

Genus VII. *Hydrophobia*.

A dread of water as exciting painful convulsions of the pharynx, caused for the most part by the bite of a mad dog, violent spasms, furious insanity, death.

M. M. "When the contagion of a putrid fever is taken by the saliva into the stomach and bowels, which is its constant road, (query), if the patient, the moment he finds himself attacked with a sense of chilliness, loss of appetite, and an unpleasant taste in his mouth, has recourse to two emetics at proper intervals, and after the operation of the first emetic takes a cathartic, he has certainly got rid of the infection: in the same manner, even after three days, or perhaps a week, if the part bitten by the dog be cut out with the knife, the danger is escaped." (Townsend.) Dr. Thornton advised the application of hot vinegar, sharpened with vitriolic acid, to the wounds of five men who had been bitten by a rabid animal, and this application was attended with seeming success. Mercury: this by some has been extolled as a specific for hydrophobia.

ORDER IV. *Vesania*.

Disorders of the intellect, independent of pyrexia or coma. "Every nervous disease (says an author whom we have before quoted) is a degree of insanity." If, however, imagination carried to the height of sentient perception, or, as it has been expressed by Dr. Batty, the raising up in the mind of images not distinguishable from impressions on the senses, is the proper definition of the insane state—"the cardinal point on which madness turns"—the above apophthegm of Dr. Reid may be regarded as rather bold and impressive than strictly accurate. It were surely improper to denominate the apoplectic, the paralytic, the hysteric, the tetanic, insane; yet an individual under these maladies, is as truly affected with a nervous disorder as one who, like the lunatic astronomer in *Rasselas*, conceiting himself to possess the mastery of the elements, commands rain to shed fertility on the barren soil. That the disorders of the intellect are disorders of the nerves we readily admit; it is the converse of the proposition that we presume to question; and in so doing, we justify Dr. Cullen, in considering the *vesania*, or mental affections, as a distinct order of nervous diseases. The pathology of such diseases is peculiarly perplexing. We find by experience, that an increase of vascular action in a tender organ will give rise to the feeling of pain; we have ascertained by the conjunctive and mutually reflective aid of casual observation and direct experiment, that convulsive movements in the muscular fibre are occasioned by an interruption of nervous excitement in whatever they may consist; we see the brain pressed upon, and the apoplectic stupor follow; but in endeavouring to trace deranged consciousness to disordered organization, temporary or permanent, an increase of intricacy appears in a manner to grow out of labour and research. Dissection does not afford that assistance to the pathologist in this, as in many other departments of his inquiries; for, independently of the great want of uniformity that has been observed in the brains of the unfortunate victims to mental derangement, it is impossible to judge from an inspection of this organ, how far the altered structures and appearances have been causes, and how far consequences, of the malady. Dr. Cullen has four genera in his order *vesania*, viz. *amentia*, *melancholia*, *mania*, and *oneirodynia*, on each of which we shall introduce a few remarks.

Genus I. *Amentia*, ideocy.

Amentia is defined an imbecillity of judgement, preventing the perception or the recollection of the relations of things. Man is born with merely a susceptibility of knowledge, a capacity of acquisition; he is conducted from observation to comparison, and from comparison to principle. Place an infant in a spacious apartment, give him for the first time the free use of all the senses with which nature has furnished him, and he will stretch out his hand to perhaps the most distant object in the room, with a full

persuasion of his being able to grasp it. Like the youth couched by Cheselden on Epsom Downs, every thing within the scope of his vision appears in a manner to touch his eye, he has not the smallest conception either of distance or magnitude; and the same total ignorance prevails in respect to objects which have relation to all his other senses. Knowledge then is the result of experience, which is another word for comparison or observation of "the relations of things." As man, however, essentially differs from the brute, by the more extended compass of his intellectual grasp, the superinduction of the moral sense, and the anticipation of future events, so different individuals have varied susceptibilities of acquiring information; and this variation, which constitutes every shade of difference in intellectual character, must necessarily arise either from difference in the perceptive organs, or combining and retaining faculty. When then, without any apparent deficiency of the external senses, which are the inlets to knowledge, we find an individual not to have arrived at a given standard of intelligence, by the constant employment of such senses, not to have obtained a due knowledge of "the relations of things," we place him out of the range of intelligent existences, have an obscure conception of something defective in the interior structure of his sentient organization, and denominate him an idiot. This is the *amentia congenita* of Cullen, ideocy from birth. Ideocy, however, may be produced. Fattuity may succeed to intellectual vigour, and the whole fabric of acquired knowledge be undermined and overthrown. Thus man may be literally reduced to the humiliating condition of second childhood. This state may be engendered abruptly and visibly, or gradually, and almost in an imperceptible manner. It may follow violent agitations of the frame, as desolation succeeds to tempest, or may be brought about by the gradations of natural decay. The causes of ideocy, when it is not the result of original malconformation, are, all kinds of intemperance, more especially indulgences in the use of spirituous liquors: "it has been traced up to somnolence too much indulged." The media through which it is principally occasioned are mania, apoplexy, and above all epilepsy. When firmly established, even in youth, very little hope can be entertained by the friends of the unfortunate victim to his own imprudence. The condition of ideocy is a condition beyond the reach either of physical or moral influences!

Genus II. *Melancholia*.

Genus III. *Mania*.

These affections cannot with strict propriety be considered as distinct. *Melancholia* is defined "partial madness without dyspepsia." From this mode of reasoning, mania, instead of being distinguished by the character of universal madness, would have been with as much propriety denominated partial madness without fever. Insanity is intensity of idea, converting imagination into implicit belief, and thus producing an incongruity of action; incongruity as it respects former, consistency as it relates to present, impressions and associations. It partakes of the character of mania or melancholia, of violent rage or gloomy despondency, according to the previous temperament of the sufferer, and the nature of the prevailing idea. In each the disordered associations are engendered upon precisely the same principles. Madness differs from ideocy, as the conclusions derived from erroneous principles, in philosophising, differ from the conceptions of ignorance: the one is correct reasoning from erroneous premises, the other is defective judgement from defective information. How this intensity of idea is produced, we have no means of ascertaining: we do not indeed feel it difficult to comprehend, that an absorbing attachment to one object, or an exclusive attention to one particular pursuit, may come at last to make shipwreck of the understanding; but it is the susceptibility of being carried away by this idea, that constitutes the difficulty in question. Like the development of intellectual character, the disposition to run into the state of insanity may perhaps depend upon the most minute circumstances of accidental associations: "Il ne faut qu'un léger accident, qu'un atome déplacé, pour te faire périr, pour te dégrader, pour te ravir cette intelligence dont tu parois si fier!" So precarious is the tenure, even of the most exalted possessions of man! Madness, however, like ideocy, may be produced through the medium of bodily disorders; thus, fever will often occasion delirium, which is a species of temporary insanity. Thus, an obstruction of the menstrual discharge will frequently be the means of developing the

the latent disposition to maniacal disorder, occasioned by previous disease, resulting from erroneous education, or depending upon hereditary conformation. Indeed, almost the whole range of nervous diseases may, under predisposing circumstances, come to be exciting causes of genuine insanity. When lunacy has been brought on by bodily disorder, the complexion of the derangement shall be formed by the previous temperament, or natural disposition, of the sufferer; thus, the favourite ideas of health shall, in their increase, be the predominant and overwhelming ideas of madness; again, when the insane state has more immediately proceeded from passions of the mind, or moral rather than physical causes, the idea that has vanquished the intellect shall continue to reign. The imaginary monarch shall preserve his dominions and sway, and through the medium of his distempered fancy, shall observe menials and attendants in the persons who surround him: the melancholy lover shall require but a female form to pass before his cell, to be persuaded of the actual presence of the object of his affections; and the religious enthusiast shall read a special embassy from heaven, in the countenance of every compassionate visitor.

Prognosis. "The chances of recovery are against those madmen who can trace their indisposition to lunatic ancestry. When the causes are accidental, or obviously corporeal, a favourable termination may be expected. "The insanity subsequent to parturition, is generally curable if the curative attempts be rational." (Cox.) "Patients who are in a furious state recover in a larger proportion, than those who are depressed and melancholic. When the furious state is succeeded by melancholy, and after this shall have continued a short time the violent paroxysm returns, the hope of recovery is very slight. Indeed whenever these states of the diseased frequently change, such alteration may be considered as unfavourable. When insanity supervenes on epilepsy, or where the latter disease is induced by insanity, a cure is very seldom effected." (Haslam.) "When a person becomes insane who has a family of small children to solicit his attention, the prognostic is very unfavourable, as it shews the maniacal hallucination to be more powerful than those ideas that generally interest us the most." (Darwin.) "Though individuals of every temperament become insane, it has been observed that those of the sanguine more frequently recover."

M. M. Endeavour to draw off the mind from the prevailing idea, or otherwise to convince the maniac of the errors of his conceptions, and fallacy of his pretensions, by relating the incongruous conceits of other maniacs which have some affinity with his own. M. Pivel states, that in the Bicêtre of Paris, a maniac was cured of the hallucination of supposing his head had been taken off by the guillotine, and that another had been placed on his shoulders, by a person judiciously ridiculing in his hearing the miracle of St. Dennis, who was said to carry his head under his arm, and to kiss it. When the maniac was endeavouring to prove the possibility of the fact by an appeal to his own case, the narrator of the story suddenly exclaims, "Why, how, you fool, could he kiss his own head? was it with his heel?" In incipient and equivocal madness, cautiously abstain from expressing suspicions in the hearing of the patient. "Nothing is more calculated to make a person mad than the idea of being thought so." (Reid.) On this account, premature confinement is to be deprecated, not merely as cruel, but as injudicious in the extreme. Those who are placed over the insane as guardians, should unite decision and firmness of character with tenderness of disposition and gentleness of manners. In strong plethoric habits, venesection. Cathartics. These last, especially in melancholy, often require to be of the drastic kind, and united with calomel. "Diarrhœa very often proves a natural cure of insanity." (Haslam.) Vomits. Camphor. Opium in large doses. Cold-bathing during the violence of the paroxysms, and in some cases warm-bathing in the intervals. During the urgency of phrenzy, apply cold water to the head. Clay cap. Blisters to the scalp. In some cases the production of a vertiginous state by a rotatory swing, has lately been found effectual in breaking the morbid associations constituting phrenetic and melancholy paroxysms. Digitalis in very large doses, but regulated with care. Introducing a new disease, which is of a trivial nature, and easy of cure. "I should place considerable hopes on inoculation, had the party not previously had the small-pox, taking care, by proper medicines and management, to increase the symptoms that usually attend this last disease to such a degree, that the whole

system should be considerably affected without the life being endangered." (Cox.) In instances where madness has originated from corporeal diseases, it scarcely requires to be observed, that a considerable part of the treatment must be constituted by the administration of those remedies that in common cases of these affections have been found to be effectual.

Genus IV. *Oncirodynia*. This genus is defined by Dr. Cullen to be "a violent and distressing imagination in time of sleep." It is divided into two species: the active, or that exciting to walking and various other motions; and the gravans, with a sense of weight or pressure on the chest. This last is the incubus of authors, or night-mare, which is doubtless placed erroneously among the disorders of the judgement. The incubus, or night-mare, appears to arise from an interruption of the circulation of blood through the lungs, from defective irritability in these organs, induced by fatigue, mental oppression, "a full supper, and wine!" which last, in some persons, will almost invariably induce the disease.

M. M. Temperance; especially moderate suppers. "To sleep on a hard bed with the head raised." Emetics. Purgatives of aloes and calomel. Tonics. Sleeping in a large airy apartment, and without curtains to the bed.

CLASS III.

CACHEXIE. Cachexies. Previously to an acquaintance with the distinct structure and separate functions of the nervous system, before the important discovery of the circulation of the blood, and the more recent, but hardly less important, development of the anatomy and physiology of the secreting and absorbent vessels, the notions of pathologists on the mode in which disease, local and general, is occasioned, were indistinct and erroneous. When, for example, on the surface of the body appeared a peculiar eruption, which, after a certain time, broke through the outer skin, and discharged an offensive matter, it was natural to infer that such discharge was engendered from a depraved condition of the solids or fluids of the living system, nearly in the same manner as exhalations proceed from dead and putrid animal or vegetable substance, or as wort is formed in the fermenting vat. Hence the use of the terms bad habit of body, foulness of blood, peccancy of humours, cachexies. These gross and indiscriminate opinions respecting the actual nature and immediate cause of disease are now retained alone by the vulgar; and as the nomenclature should keep pace with the advances of science, the word cachexy, as descriptive of those affections we are now to notice, ought to be banished from the phraseology of the nosologist, and a generic title substituted, indicative of disordered or deranged action in the secreting, absorbing, and glandular, organs.

ORDER I. *Marcores*.

A wasting of the body, or general emaciation.

Genus I. *Tubes*. Asthenia, emaciation, and hectic.

Genus II. *Atrophia*. Asthenia, and emaciation without hectic.

Dr. Cullen has properly distinguished the emaciation connected in its origin with hectic fever, from that independent of this as a primary and essential character. The latter, however, or atrophia, should not appear in the last class of diseases. When, for example, in consequence of mental affection, of sudden and too copious evacuation of any of the fluids, of deficiency in the quantity or depravation in the quality of the articles of diet, a loss of flesh and strength is perceived, the effect shall have been occasioned without any default in the absorbent vessels, and consequently without hectic; for let it be retained in the recollection, as a principle of the utmost importance in practice, that where hectic fever is present, a greater or less degree of derangement in the lymphatic vessels is likewise present. Hectic fever is a disease of the absorbent system. For the purpose of illustrating this distinction between tabid and atrophic disorders, let two individuals be supposed equally emaciated and equally weak; but this weakness and emaciation in one shall have been induced by an indisposition to take a due quantity of nourishment, in order to supply the requisitions of the frame; in the other, perhaps, notwithstanding the loss of bulk and of strength, an equal, or even greater, quantity of aliment shall have been received into the stomach. Now, in this latter case, the tabid state has been occasioned by a torpid condition or improper action of those vessels whose office it is to separate

rate the nutritive part of the food, and convey it, properly prepared, to the blood-vessels (see the article *DIGESTION*). In the former the mischief has proceeded from a want of those materials upon which these vessels exercise their functions. In the one the hectic flush from the very onset of the malady shall imprint the cheek; in the other, hectic will not be occasioned until the absorbents, from not being properly exercised, come at length to be disordered. The one complaint is the tabes of Dr. Cullen; the other is the atrophica of the same author.

M. M. In atrophica, a supply of nourishment, equivalent to the loss that may have been sustained; if emaciation has arisen from mental disturbance, the remedies must chiefly be made to apply to the mind. Tonics from the vegetable class, such as calumba, quassia, and gentian; not steel. Abate the febrile irritation, by keeping the bowels gently open by the milder purgatives, such as manna, senna, and castor-oil. Preserve a slight moisture of the skin by small doses of antimonial. Regular and moderate, not violent or agitating, exercise. Shower-bath in very warm, tepid-bathing in cold weather. Pure air.

In tabes, or emaciation, accompanied by primary hectic. An emetic, to accomplish the double purpose of forcibly expelling ventricular and intestinal acidities, and exciting the languid absorbents. Drastic purgatives, as jalap or aloes, with calomel, with the same intention. Steel, in conjunction with Peruvian bark, or bitters. Horse-exercise. Warm bathing.

ORDER II. *Intumescencie, General swellings.*

SECT. I. *Adiposa, fatty swellings.*

Genus I. *Polysarcia*, obesity. This arises from the deposition of oil in the adipose membrane becoming disproportionate to the requisitions of the body. It proceeds, in general, from indolence and intemperance.

M. M. Temperance, exercise, less animal food, early rising.

SECT. II. *Flutiosa, windy swellings.*

Genus I. *Pneumatosis*, a tense elastic swelling of the body, crepitating under the touch. Pneumatosis is constituted by a distension of the cellular membrane from air; it may arise without any evident cause, and in this case is denominated by Dr. Cullen the spontaneous pneumatosis; or the distending air may be introduced by means of an external wound, as of the thorax, in compound fracture of the ribs; sometimes elastic swellings of the whole body follow, from the application of poison; and at others, pneumatosis appears as an attendant upon the hysteric disorder.

M. M. Scarifications, compresses, tonics.

Genus II. *Tympanites*, a windy swelling of the abdomen, tense, elastic, painful, and attended by costiveness. Tympanitic swellings, both of the intestinal canal and of the cavity of the abdomen, often take place in conjunction with anasarca, or other disorders of debility, and frequently arise from sedentary habits, hypochondriac ailments, and innutritious diet.

M. M. Carminatives, emetics, tonics, and a generous diet, with exercise. Tympanites is sometimes connected with obstructed menstruation, and in this case is seldom overcome but with the return of the menstrual discharge.

Genus III. *Physometra*, an elastic swelling in the hypogastrium, consequent upon flatulent distension of the womb.

SECT. III. *Aquosa, watery swellings.*

Dropsical enlargement is distinguished from pneumatosis by its being inelastic, or pitting from the pressure of the finger, and slowly recovering its former fulness. While considerable obscurity attends the nature and proximate cause of windy swellings, the theory of dropsical affections is sufficiently evident. Dropsy is a collection of serous fluid, either in the cellular membrane, or in the cavities of the body. It is invariably occasioned by exhalation being disproportionate to absorption; this increase of exhalation and diminution of absorption result from debility, which may be either direct or indirect; the latter follows increased action of the vessels, as in the dropsy succeeding to intemperance; the former arises out of deficient excitement in the lymphatic system, as when an individual becomes dropsical from indolence, inactivity, mental depression, and poverty of diet. Partial dropsies, or anasarca swellings of the cellular membrane, as well as effusions into cavities, may also originate from pressure on the veins, independently of original debility in the lymphatic vessels, such pressure obstruct-

ing the free reflux of blood through the venous system, and by consequence occasioning a more than ordinary determination to the exhalant arteries in the vicinity. Such are the dropsical accumulations which sometimes occur in pregnancy, and which are relieved by delivery. In this manner likewise, that swelling of the abdomen, constituting ascites, partly originates, when it is caused or attended by an obstructed circulation through the liver, the blood in the vena porta accumulating in an inordinate measure, and by consequence supplying the lymphatic vessels of the part with more than their due proportion of fluid. Lastly, without universal debility in the exhalant and absorbent vessels, dropsical swellings may arise from inflammation, as is illustrated in the anasarca collections following erysipelas, in the hydrocele succeeding to a blow on the testicle, in the dropsy of the chest resulting from inflammation of the lungs, and in ascites following peritoneal inflammation. In whatever mode, and to whatever extent, dropsy may be occasioned, the accumulation of serous fluid by which it is constituted, always argues debility in the lymphatic vessels of the part in which this accumulation occurs. This debility, perhaps, is primarily and principally seated in the lymphatic exhalants; for we do not find hectic fever a characteristic of hydropic, as it is of other affections, in which an original torpor of the absorbents is evidently the cause of the morbid symptoms. Hectic only comes on in the last stages of dropsy, when the absorbents are worn out with constant exertion to absorb the effused fluid.

Genus I. *Anasarca*. General dropsy.

Dropsy of the cellular membrane immediately under the skin appears principally in the lower extremities, on account of the depending situation of these members, and the universal connection between the cells of which the membrane is constituted; and partly on account of the deficiency in lymphatic excitement, from which it originates, being more conspicuous in those vessels which are the furthest removed from the centre of the circulation. Anasarca, as it arises from exhausted excitability in the lymphatic vessels, is always a disorder indicating much danger.

M. M. Those stimuli which are found to exert their influence on the absorbent vessels, particularly steel, digitalis, calomel. Diuretics, such as squills, juniper, nitrous ether, cantharides, crystals of tartar, and nitre. Emetics and cathartics are less proper in anasarca than in dropsy of cavities. The physician must be especially careful while evacuating the fluid by means of diuretics, to support the general excitement, in order to prevent its reaccumulation; from want of solicitous attention to this particular, the waters, after an apparent cure of anasarca, often again collect to an increasing extent. Punctures and scarifications of the extremities are seldom advisable, on account of the prevailing debility and tendency to gangrene. The sparing use of liquids is generally proper in dropsy; instances, however, have been known of copious draughts of water producing a termination of the complaint.

Genus II. *Hydrocephalus*, dropsy of the brain, is a collection of serum, either between the bones and common integuments, when it is called external; or between the bones and membranes of the brain, when it is termed internal. As the former mostly affects infants, and generally proves fatal, we shall treat only of the latter species, which, timely attended to, may frequently be removed.

Symptoms. The head of the patient is enlarged, irregularly shaped, and almost quadrangular; the sutures are open; the bones thin and painful; the eyes appear starting from their sockets, and cannot bear the light; the countenance is pale; the skin delicate; the respiration difficult; with alternate flushings in the face, uneasiness, and dulness: in short, all the common signs of rickets are discernible; few of such hapless persons attaining a considerable age; and being, in general, remarkably stupid.

Causes. Mal-conformation of the head, which is frequently occasioned by the incautious use of emetics, opiates, and other active medicines, both during gestation, and when indiscriminately given to infants; farther, excessive evacuations which occasion debility; over-feeding, as well as improper food; spirituous and fermented liquors, especially punch; and even strong tea; lastly, violent exercise; falls, and bruises on the head.

M. M. The first object will be to promote the resorption of water, by means of sudorifics, and diuretics; which are to be succeeded by tonics. Next, cold fomentations and lotions, made by infusion,

infusions of malt, ought to be applied, together with frictions; and afterwards an ointment prepared of one ounce of pulverized fox-glove, and one drachm of calomel; a small portion of which should be rubbed in every day. Prof. Stark has successfully employed the valerian, with rob of juniper and elder; antimonial wine; and completed the cure with the Peruvian bark, quassia, and dandelion. Blisters, setons, and other artificial discharges, have occasionally been found useful; and the experienced Dr. Rowley recommends an ointment of savin to be applied to the crown of the head, for three or four weeks. Where this formidable malady arises from suppressed perspiration, the head should be shaved, rubbed with a brush, and afterwards covered with a blister, or, at least with flannel. Cupping has also frequently proved of service. Independently of external remedies, however, the patient ought to take such diuretics, and sudorifics, as are conformable to the nature of his complaint; which always requires medical attendance.

Genus III. *Hydrorachitis*, dropsical tumour in the spine. See SURGERY.

Genus IV. *Hydrothorax*, dropsy of the chest.

Symptoms. Difficulty of breathing, especially in a horizontal position, paleness of countenance, starting in sleep, palpitation of the heart, numbness of the arms, especially when elevated, and in the advanced stages of the malady an evident fluctuation of water in the cavity of the chest. The hydrothorax, or hydrops pectoris, "is distinguished from the anasarca pulmonum, as the patient in the former cannot lie down half a minute; in the latter, the difficulty of breathing, which occasions him to rise up, comes on more gradually; as the transition of the lymph in the cellular membrane, from one part to another of it is slower than that of the effused lymph in the cavity of the chest." (Darwin.) We have already said, that in the anasarca pulmonum the disease is often attended with swelled legs. Dr. Darwin suspects that even this species of dropsy of the chest is in the greater number of instances a disease merely of the cellular membrane of the part, not of a general torpor of the lymphatic system, and that the legs do not swell till the patient, from the protraction of the local malady, becomes universally weak. We often, however, meet with ascitic and anasarca swellings commencing in the extremities, which, in their course towards a fatal termination, rise up into the chest, and in this manner occasion the pulmonary affection. Here the general paralysis of the lymphatics precedes the primary disorder of the thorax.

Causes. Where the universal has preceded the local affection, the malady is most frequently to be traced to intemperance in the use of fermented and spirituous liquors. The most usual source of genuine hydrothorax, or hydrops pectoris, is the sudden application of cold, while the body is in a state of perspiration and debility, from previous heat and exercise. Young people, during perspiration and fatigue from dancing, "if they drink freely of cold lemonade or water are apt to bring on a dropsy of the chest." (Townsend.)

M. M. Digitalis in considerable doses is especially indicated in dropsy of the chest, and its effects are more visible as well as more certain in the anasarca pulmonum than in the hydrops pectoris, because this medicine influences powerfully the whole extent of the absorbent system. Squill, in combination with calomel, for the hydrops pectoris: and if the cellular membrane be anasarcaous, connect steel with both the above medicines. Crystals of tartar, especially in the anasarca pulmonum. Diuretics of other kinds, the same as in general anasarca. Opium. In hydrothorax, or dropsy of the chest, without anasarca, paracentesis, or puncture in the side. "It is sometimes impossible even to relieve the dropsy of intemperance; and the dropsical from this cause can never expect again to enjoy the pleasures of existence in full measure." (Beddoes.)

Genus V. *Ascites*. Dropsy of the abdomen. The swelling of the abdomen is tense, scarcely elastic, but fluctuating; the fluctuation can sometimes be perceived by spreading one hand on one side of the abdomen, and striking with the other hand on the opposite side. Ascites is attended with scarcity of urine, thirst, and after some time a degree of hectic fever. Ascites most usually originates through the medium of a diseased liver; and such disease is, in the greater number of instances, itself induced by intemperance in spirituous liquors. Like the disease, however, of the lungs preceding dropsy in the chest, liver-complaints productive of ascites, may be brought on by the precipitate appli-

cation of cold succeeding to the extremes of heat, by indolence, mental affections, and other causes. Ascites sometimes originates from debility in abdominal lymphatics, without the intervention of any hepatic disease.

M. M. Ascertain by enquiry into previous and present symptoms, whether any degree of liver-complaint has preceded the dropsical accumulation; whether there is any disposition to jaundice of the skin; whether the alvine excretions are insufficient, whitish, and slimy; whether there has been any pain in the region of the liver, difficulty of lying on the side, especially on the left side, high colour of the urine, pain in the right shoulder, &c. and adapt the treatment accordingly. If the water is independent of disease in the liver, crystals of tartar, digitalis, other diuretics, and steel, may be immediately had recourse to, without the intervention of calomel-purgatives and of emetics, which last are almost always indicated in the more usual form of ascites, that form a morbid affection of the biliary organs. Emetics in hepatic ascites are often attended with most beneficial effects. "Per vomitus solvuntur cuncta tenacia, concutiuntur obstructa, expelluntur stagnantia, unde mirabiliter in hoc morbo prosunt." (Boerhaave.) In the administration of ascitic purgatives, care must be taken that, from the violence of excitement which they occasion, they do not induce peritoneal inflammation. A combination of gamboge, elaterium, and calomel, is frequently employed as a purgative in ascites. Mercurial ointment to the region of the liver. Tonics, especially steel. The inhalation of vital air, as recommended and employed by Dr. Thornton and others. Tapping. This is to be regarded in general as merely a palliative: if however there has not been any very considerable disease of the liver, or the debility is not extremely urgent, tapping may be devised with a prospect of effecting a radical cure, provided due care is at the same time employed to maintain a proper excitement, or, as it is generally expressed, to restore and preserve the tone of the system.

Genus V. *Hydrometria*. Dropsy of the womb. This, as well as the physometra, often assumes a deceitful resemblance to pregnancy. It is characterized by dropsical swelling, confined to the region of the uterus, not being accompanied by other symptoms of dropsy. It is a disease to which the unmarried and the barren are principally obnoxious; sometimes it follows abortion.

M. M. Stimulant fomentations. Drastic purgatives. Aromatic fetid gums. Emmenagogues.

Genus VII. *Hydrocele*. Dropsy of the scrotum. See SURGERY.

SECT. IV. *Slide*. Swellings of solid parts.

Genus I. *Physconia*. A swelling chiefly occupying a portion of the abdomen, increasing gradually, and neither tense nor sonorous as in pneumatosis, nor fluctuating as in dropsy. This disease is principally formed by a schirrous state of the several parts, and viscera, which form its seat. These schirrous enlargements are generally incurable.

Genus II. *Rachitis*. Rickets, a disease peculiar to infants from the age of nine months, to the third year; and which seldom continues till they attain to puberty. Its principal systems are, a large head, a prominent forehead, a relaxed skin, and swelling of the belly. The joints acquire an unnatural size; the bones, especially those of the legs and arms, become curved; and the cartilages of the ribs being deprived of their elasticity, are unable to support the chest; in consequence of which, it projects and grows deformed. In the progress of this malady, the belly is extremely tumid and hard to the touch, particularly on the right side; the teeth become black and carious; and the general emaciation is such as to leave the patient almost inanimate, having power only to move the neck and head. The proximate cause of the disorder is now understood to be a deficiency of the phosphate of lime, or animal gluten in the bones: hence the latter are deprived of that necessary strength and solidity, in consequence of the prevailing debility in the vessels, so that the former, instead of being conveyed to the bones, is deposited in other parts of the body. Thus, we find particles of lime often evacuated by the urine, or sometimes lodged in the genitals. Although the rickets do not, in general, prove fatal, when timely attended to, yet this affection is not unfrequently followed by a curvature, and even a decay, of the bones, particularly those of the arms, legs, spine, &c.

M. M. In the cure of this malady, mild, opening, and strengthening medicines have been found useful; of the former, we recommend

mend small doses of ipecacuanha, to act as a gentle emetic; rhubarb and manna, with the addition of nutmeg, or fennel-seed. Among the safest astringents, are quassia, Peruvian bark, and calcined zinc, in very small proportions, to be frequently repeated; but the cold bath, fresh air, and moderate exercise, are eminently beneficial. Iron-filings, though considered a specific cure for this complaint, should be prescribed only by the faculty.

ORDER III. *Impetiginos.*

Deformities and discolourations of the external surface from general disease.

Genus I. *Scrophula*. King's evil. Swellings of the lymphatic glands, terminating in ulcer, are perhaps the only proper characteristics of actual scrophula: the thick upper lip, transparent skin, and other appearances which are considered as symptoms of the disease, are merely marks of peculiar predisposition. A scrophulous habit is merely a susceptibility of disease, arising from torpor in the lymphatic vessels, and when brought on by the agency of exciting causes, consists in a peculiar action of the lymphatic glands, by which inflammation, and at length ulceration, with a discharge of grumous matter, are induced. Its exciting causes are those which encourage the original debility, and the disease may almost certainly be avoided by attention to diet and regimen; by nutritious food, a pure oxygenous atmosphere, cleanliness, exercise, &c. When by neglect, the predisposition has been permitted to break out into disease, calomel-purges, steel, small doses of digitalis, warm and sea-bathing, muriates and phosphates of barytes; above all cleanliness; ventilation, stimulating nutritious diet. Let the mind be preserved free from the erroneous idea, that to cure scrophula is to purge away gross humours. See SURGERY.

Genus II. *Syphilis*. Venereal disease. After impure connection, a disorder of the genitals, ulcers in the mouth and nose. Eruptions on the skin of a copper-colour, terminating in ulceration; these are principally situated near the margin of the hair; blotches on the surface of the body, especially on the surface of the face. Nocturnal pains in the centre of the bones.

M. M. Mercurials. Nitric acid. Tonics. N. B. For the local application to venereal ulcers, the more particular treatment of the complaint, and the mode of curing gonorrhœa virulenta, see SURGERY.

Genus III. *Scorbutus*, scurvy. Indolence and lassitude; gloomy and tumid countenance; gums livid, and disposed to bleed spontaneously, or from the slightest irritation; skin dry, and covered with livid spots; œdematous swellings of the ancles. Scurvy appears to originate from want of, or exhausted excitement, both in the venous and absorbent system; it is produced by a protracted course of salt food, and by mental depression.

M. M. Fresh animal and vegetable diet. Juice of lemon. Bark. Steel. Terrene atmosphere. Mental excitement. The elephantiasis, lepra, frambsæia, and trichoma, forming the fourth, fifth, sixth, and seventh genera of this order, are diseases of such rare occurrence in this country, as not to require any particular description. For the more common eruptions which require local application, see SURGERY.

Genus III. *Icterus*, jaundice.

Symptoms. Yellowness of the skin and eyes; white and slimy fæces; high-coloured urine, tinging linen yellow; languor, lassitude, and extreme depression of spirits. The yellow colour of the skin, which constitutes jaundice, arises from the diffusion through the system of that bile, which, in the natural course, would pass through the biliary ducts into the intestinal canal. This impregnation of the system with bile has been supposed to be effected in three ways, viz. through the medium of the lacteal vessels and the thoracic duct, when the obstruction is in the duodenum; and by regurgitation through the hepatic veins, or absorption by the lymphatics of the liver, when the obstruction is in some part of the bile's course previous to its arrival in the duodenum. This interruption of the biliary secretion may originate from a spasmodic affection near the duct; from chronic inflammations, or other diseases of the liver interfering with the secretion; from certain concretions lodging in some part of the hepatic organs, called gall-stones; and, as pointed out by Mr. Townsend, from acid mucus stopping up or obstructing the biliary passages. Indeed, whatever hinders the bile from pressing into the duodenum may prove a

source of jaundice. The first of the above species of jaundice is generally of a temporary nature; it occurs principally in those who have much irritability of habits, in consequence of violent passions, and other sources of spasmodic affections. The second species is not so decided a nature; it follows upon a long course of intemperance in spirituous liquors, and is only to be remedied by removing the disease of the liver itself. The biliary calculi, which give rise to the third species of jaundice, appear, like urinary concretions, to arise from some defective action in the secretory or absorbing vessels of the parts in which they are formed or lodged; their production, like the stone in the bladder, is evidently favoured by a retention of fluid, from which they are formed. It may therefore be inferred, that gall-stones are never, or seldom, produced without some previous jaundice having taken place. Thus they are both the cause and consequence of the disease. Their presence may be ascertained from jaundice frequently disappearing and returning, from the appearance of biliary concretions among the fæces, and from the disease being attended with shooting pains in the epigastric region, and right hypochondrium. Nausea, difficult respiration, and sickness, often likewise accompany this species of jaundice. The icterus mucosus of Townsend, which is perhaps the most frequent species of jaundice, is unattended either by pain or spasmodic affections; there are no gall-stones observed in the fæces; but these are generally discharged mixed with much slime and viscidities. It is generally accompanied with, and indeed is most commonly occasioned by, a depression of mind, especially when favoured by sedentary habits, breathing an impure atmosphere, living upon unwholesome inartificial diet, or indulging in the too free use of "spirituous potation." While it is the most frequent, and oftentimes the most protracted, of any of the species of jaundice, it is at the same time most easy of cure when properly understood and managed.

M. M. Emetics. Calomel-purgatives. Bitter. Tonics, especially calumba, with rhubarb. Pure air. Exercise on horseback. Mental excitement. In icterus spasmodicus, opium, asafetida, æther, electricity. If the spasm depends upon any irritations in the stomach or bowels, these to be removed by emetics, purgatives, anthelmintics. In icterus calculosus, emetics to facilitate the passage of the gall-stones. Antispasmodics. Warm bathing. Emollient clysters. Vegetable tonics, and steel.

OF THE MEANS OF PRESERVING HEALTH.

I. RULES for the MANAGEMENT of VALETUDINARIANS.

That part of the medical system, which lays down rules for the preservation of health, and prevention of diseases, termed Hygiene, is not to be strictly understood as if it respected only those people who enjoy perfect health, and who are under no apprehensions of disease, for such seldom either desire or attend to medical advice; but should rather be considered as relating to valetudinarians, or to such as, though not actually sick, may yet have sufficient reason to fear that they will soon become so: hence it is that the rules must be applied to correct morbid dispositions, and to obviate the various things that were shewn to be the remote or possible causes of diseases. From the way in which the several temperaments are usually mentioned by systematic writers, it should seem as if they meant that every particular constitution must be referred to one or other of the four; but this is far from being reducible to practice, since by much the greater number of people have constitutions so indistinctly marked, that it is hard to say to which of the temperaments they belong. When we actually meet with particular persons who have evidently either, 1. Too much strength and rigidity of fibre, and too much sensibility;—2. Too little strength, and yet too much sensibility;—3. Too much strength, and but little sensibility;—or, 4. But little sensibility joined to weakness; we should look on such persons as are more or less in the valetudinarian state, who require that these morbid dispositions be particularly watched, lest they fall into those diseases which are allied to the different temperaments. People of the first mentioned temperament being liable to suffer from continued fevers, especially of the inflammatory species, their scheme of preserving health should consist in temperate living, with respect both to diet and exercise; they should studiously avoid immoderate drinking, and be remarkably cautious lest any of the natural discharges be checked. People of this habit bear evacuations well, especially bleeding: they ought not, however, to lose blood,

blood, but when they really require to have the quantity lessened; because too much of this evacuation would be apt to reduce the constitution to the second mentioned temperament, wherein strength is deficient, but sensibility redundant. Persons of the second temperament are remarkably prone to suffer from painful and spasmodic diseases, and are easily ruffled; and those of the softer sex who have this delicacy of habit, are very much disposed to hysterical complaints. The scheme here should be, to strengthen the solids by moderate exercise, cold bathing, the Peruvian bark, and chalybeate waters; particular attention should constantly be had to the state of the digestive organs, to prevent them from being overloaded with any species of saburra which might engender flatulency, or irritate the sensible membranes of the stomach and intestines, whence the disorder would soon be communicated to the whole nervous system. Persons of this constitution should never take any of the drastic purges, nor strong emetics; neither should they lose blood but in cases of urgent necessity. But a principal share of management, in these extremely irritable constitutions, consists in avoiding all sudden changes of every sort, especially those with respect to diet and clothing, and in keeping the mind as much as possible in a state of tranquillity; hence the great advantages which people of this frame derive from the use of medicinal water drunk on the spot: because of that freedom from care and serious business of every kind, which generally obtains in all the places laid out for the reception of valetudinarians. The third temperament, where there is an excess of strength and but little sensibility, does not seem remarkably prone to any distressing or dangerous species of disease; and therefore it cannot be supposed that persons so circumstanced will either of themselves think of any particular scheme of management, or have recourse to the faculty for their instructions: such constitutions, however, we may observe, bear all kinds of evacuations well, and sometimes require them to prevent an over-fulness, which might end in an oppression of the brain, or some other organ of importance. But the fourth temperament, where we have weakness joined to want of sensibility, is exceedingly apt to fall into tedious and dangerous diseases, arising from a defect of absorbent power in the proper sets of vessels, and from remissness of the circulation in general: whence corpulency, dropsy, jaundice, and different degrees of scorbutic affection. To prevent these, or any other species of accumulation and depravation of the animal fluids, people of this constitution should use a generous course of diet, with brisk exercise, and be careful that none of the secretions be interrupted, nor any of the natural discharges suppressed. These constitutions bear purging well, and often require it; as well as emetics, which are often necessary to supply the place of exercise, by agitating the abdominal viscera; and are of service to prevent the stagnation of bile, or the accumulation of mucous humours, which hinder digestion, and clog the first passages. The free use of mustard, horse-radish, and the like stimulating dietetics, is serviceable in these torpid habits. When the general mass of fluids is accumulated beyond what is conducive to the perfection of health, there arises a plethora, which may prove the source of different diseases; and therefore when this over-fulness begins to produce languor and oppression, care should be taken in time to reduce the body to a proper standard, by abridging the food and increasing the natural discharges, using more exercise, and indulging less in sleep. But in opposite circumstances, where the fluids have been exhausted, we are to attempt the prevention of further waste by strengthening stomachics, nourishing diet, and indulgence from fatigue of body or mind. Vitiated fluids are to be considered as affected either with the different kinds of general acrimony, or as betraying signs of some of the species of morbid matter, which give rise to particular diseases, such as gout, rheumatism, calculus, scurvy, &c. During infancy, we may sometimes observe a remarkable acidity, which not only shews itself in the first passages, but also seems to contaminate the general mass of fluids. As it takes its rise, however, from weak bowels, our views, when we mean to prevent the ill consequences, must be chiefly directed to strengthen the digestive organs, as on their soundness the preparation of good chyle depends; and hence small doses of rhubarb and chalybeates are to be administered; and the diet is to be so regulated as not to add to this acid tendency: brisk exercise is likewise to be enjoined, with frictions on the stomach, belly, and lower extremities. Where the fluids tend

to the putrescent state, which appears by fetid breath, sponginess, and bleeding of the gums, a bloated look and livid cast, the diet then should be chiefly of fresh vegetables and ripe fruits, with wine in moderation, brisk exercise, and strengthening bitters. Where acrimony shews itself by itching eruptions, uncommon thirst, and flushing heats, nothing will answer better than such sulphureous waters as the Harrowgate and Moffat in Britain, or the Lucan and Swadlinbar in Ireland; at the same time using a course of diet neither acid nor heating. So far with respect to those kinds of morbid matter, which do not invariably produce a particular species of disease; but there are others of a specific nature, some of which are generated in the body spontaneously, and seem to arise from errors in diet or other circumstances of ill management with respect to the animal economy; and hence it is sometimes possible, in some degree, if not altogether, to prevent the ill consequences. Thus, there are instances where returns of the gout have been prevented by adhering strictly to a milk-diet. The rheumatism has also been sometimes warded off by wearing a flannel-shirt, or by using the cold bath without interruption. Calculus may be retarded in its progress, and prevented from creating much distress, by the internal use of soap and lime-water, by soap-lees taken in milk or in veal-broth, or by the use of aerated alkaline water; which may perhaps be considered as being both more safe and more efficacious, and at the same time more pleasant, than any of the other practices. The scurvy may be prevented by warm clothing and perseverance in brisk exercise, by drinking wine or cyder, and eating freely of such vegetables as can be had. In constitutions where there is an hereditary disposition to scrofula, if early precautions be taken to strengthen the solids by cold bathing, a nourishing course of diet, and moderate use of wine, the acrimony which gives rise to the disease will probably be prevented from producing any very bad effects. The other kinds of morbid matter, which are of the specific nature, are received into the body by infection or contagion. The infection of a putrid fever or dysentery is best prevented by immediately taking an emetic on the first attack of the sickness or shivering; and if that do not completely answer, let a large blister be applied between the shoulders; by this method the nurses and other attendants on the sick in the naval hospitals have often been preserved. As to other infectious morbid matter, we must refer to what has already been said when treating of hydrophobia, poisons, &c. The ill effects which may arise from the different species of saburra, are to be obviated, in general, by the prudent administration of emetics, and carefully abstaining from such kinds of food as cause the accumulation of noxious matters in the first passages. Crude vegetables, milk, butter, and other oily substances, are to be avoided by persons troubled with a sourness in the stomach; brisk exercise, especially riding, is to be used, and they are to refrain from fermented liquors; the common drink should be pure water; or water with a very little of some ardent spirit. Seltzer and Vahls water are to be drunk medicinally; and aromatic bitters, infusions, or tinctures, with the acid elixir of vitriol, from 10 to 20 drops, will be found serviceable, to strengthen the fibres of the stomach, and promote the expulsion of its contents, thereby preventing the too hasty fermentation of the alimentary mixture. To procure immediate relief, magnesia alba, or creta preparata, will seldom fail; the magnesia, as well as the chalk, may be made into lozenges, with a little sugar and mucilage; and in that form may be carried about and taken occasionally by people afflicted with the acid saburra. In constitutions where there is an exuberance or stagnation of bile, and a troublesome bitterness in the mouth, it is necessary to keep the bowels always free, by taking occasionally small doses of pure aloes, oleum ricini, cream of tartar, some of the common purging salts, or the natural purging waters. When there is a tendency to the empyreumatic and rancid saburra, people should carefully avoid all the various kinds of those oily and high-seasoned things generally termed made dishes, and eat sparingly of plain meat, without rich sauces or much gravy; and in these cases the most proper drink is pure water.

II. RULES for those who enjoy perfect HEALTH.

In general, temperance is the surest foundation of health; and yet the ancient physicians, as we may see in the rules laid down by Celsus, did not scruple to recommend indulgence now and then,

then, and allowed people to exceed both in eating and drinking; but it is safer to proceed to excess in drink than in meat; but excess in either way generally produces pain or sickness, and a temporary fever; when this should happen to take place, there are two ways of shaking it off, either to lie in bed and encourage perspiration, or to get on horse-back and by brisk exercise restore the body to its natural state. The choice of these two methods must always be determined by the peculiar circumstances of the parties concerned, and from the experience which they may before have had which agrees best with them. If a person commit excess in eating, especially of high seasoned things, with rich sauces, a draught of cold water, acidulated with vitriolic acid, will take off the sense of weight at the stomach, and assist digestion, by moderating the alimentary fermentation, and thus preventing the generation of too much flatus. The luxury of ices may be here of real service at the tables of the great, as producing similar effects with the cold water acidulated. Persons in these circumstances ought not to lay themselves down to sleep, but should keep up and exercise until they are sensible that the stomach is unloaded, and that they no longer feel any oppressive weight about the præcordia. If a man be obliged to fast, he ought, if possible, during that time, to avoid laborious work: after suffering severe hunger, people ought not at once to gorge and fill themselves; nor is it proper, after being overfilled, to enjoin an absolute fast: neither is it safe to rest totally immediately after excessive labour, nor suddenly fall hard to work after having been long without motion. In a word, all changes should be made by gentle degrees; for though the constitution of the human body be such, that it can bear many alterations and irregularities without much danger, yet, when the transitions are extremely sudden, they cannot fail of producing some degree of disorder. Celsus advises to vary the scenes of life, and not confine ourselves to any settled rules: but

as inaction renders the body weak and listless, and exercise gives vigour and strength, people should never long omit riding, walking, or going abroad in a carriage: fencing, playing at tennis, dancing, or other similar engagements, which afford both exercise and amusement, as each shall be found most agreeable or convenient, are to be used in their turns, according to the circumstances or tendency to any particular species of disease. But when the weakness of old age shall have rendered the body incapable of all these, then dry frictions with the flesh-brush will be extremely requisite to preserve health, by accelerating the flow of humours through the smallest orders of vessels, and preventing the fluids from stagnating too long in the cellular interstices of the fleshy parts. Sleep is the great restorer of strength; for, during this time, the nutritious particles appear to be chiefly applied to repair the waste, and replace those that have been abraded and washed off by the labour and exercise of the day; but too much indulgence in sleep has many inconveniencies, both with respect to body and mind, as it blunts the senses, and encourages the fluids to stagnate in the cellular membrane; whence corpulency, and its necessary consequences languor and weakness. The proper time for sleep is the night, when darkness and silence naturally bring it on: therefore day-sleep in general is not so refreshing; and to some people is really distressful, as creating an unusual giddiness and languor, especially in persons addicted to literary pursuits. Custom, however, frequently renders sleep in the day necessary; and in those constitutions where it is found to give real refreshment, it ought to be indulged. With regard to diet, it has always been held as a rule, that the softer and milder kinds of aliment are most proper for children; that grown persons should eat what is more substantial; and old people lessen their quantity of solid food, and increase that of their drink.

MEDICINES, substances that serve to restore health. They are either simple or compound; the former being prepared by nature alone; the latter by the industry of man, in variously mixing the simple together. See **MATERIA MEDICA**, and **PHARMACY**.

MEDICINES are likewise distinguished from the manner of using them, into external and internal; and with regard to their effects, they are said to be emetic, cathartic, astringent, &c. See **MATERIA MEDICA**.

MEDICINES, **POCKET**, in surgery, those which a surgeon ought always to carry about with him, in a box or convenient case. These according to Helster, are the common digestive ointment, and some detergent ointment, for cleansing and digesting foul ulcers; a plaster or two for defence or adhesion; a piece of blue vitriol for taking down luxuriant flesh, and stopping hemorrhages; burnt alum, red precipitate, the internal stone, or any other corrosive medicine, may supply its place; the last will also serve to open abscesses, and make issues, &c. With these there should always be kept in readiness a quantity of scraped lint, and suitable bandages, that the surgeon may be able to give immediate assistance to wounded persons; lest they should be taken off by an hemorrhage.

MEDICIS, **COSMO DE**, the elder, by some called the Great, son of John de Medicis, was born at Florence, Sept. 1389. Although in a private station, he appeared with the splendor of the most powerful sovereign; and his fortune, accumulated by successful commerce, was surpassed by the revenue of few princes. He was partial to the sciences, and liberal to men of genius. His library consisted of a vast number of books of his own collecting, and he enriched it with many scarce and valuable MSS. Banned from his native country by the envy which his riches inspired, he went to Venice, where he was received with the honours due to a sovereign prince. His countrymen soon perceived their error, and recalled him. For 34 years he was supreme judge of the republic; and his advice was solicited by the greater part of the cities and sovereignties of Italy. He died in August 1464, full of glory, aged 75. On his tombstone he is styled, "Father of the people, and deliverer of his country."

MEDICIS, **LAURENCE DE**, styled the Great and the Father of learning, was born A. D. 1448. He was the son of Peter, the grandson of Cosmo, and the brother of Julian de Medicis. These two brothers, who were in possession of absolute power at Florence, excited the jealousy of Ferdinand of Naples and Pope Sixtus IV. The former hated them, because they had ruined his influence in Florence; and the latter because they opposed the advancement of his nephew. It was at their instigation that the Pazzi conspired against them. Julian was murdered while hearing mass, April 26, 1478; and Laurence, who was only wounded, was carried back to his house in the midst of the shouts and acclamations of the people. Heir to the greater part of his grandfather's virtues, he was, like him, the Mæcenas of his age. By his unbounded liberality, he drew to his court a great number of learned men. He sent John Lascaris into Greece to recover MSS. with which he enriched his library. He was author of the following works: 1. *Des Poesies Italiennes*, Venice, 1554, 12mo. 2. *Canzonne a bello*, 1568, 4to. 3. *La Compagnia del Mantellaccio Beoni*; with the sonnets of Burchiello, 1558 or 1568, 8vo. He was so universally admired, that the princes of Europe submitted their differences to his decision. This illustrious man died April 9th, 1492, aged 44. His reputation was sullied by his passion for women and by his infidelity.

MEDIETAS LINGUÆ, in law, signifies a jury, or inquest impannelled, of which the one half are natives of this land and the other foreigners. This jury is never used, except where one of the parties in the plea is a stranger and the other a denizen. In petit treason, murder, and felony, foreigners are allowed this privilege; but not in high treason, because an alien in that case shall be tried according to the rules of the common law, and not by a medieta lingua. A grand jury ought not in any case to be of a medieta lingua; and the person, that would have the advantage of a trial in this way, is to pray the same, otherwise it will not be permitted on a challenge of the jurors.

MEDIMNOS, in Grecian antiquity, a measure of capacity. See **MEASURE**.

MEDINA, or **MEDINA TALNERI**, a city of Arabia Petraea,

træa, between Arabia Deserta and Arabia Felix, famous for being the burial-place of Mohammed. It is seated in a plain abounding with palm-trees. Lon. 39. 53. E. Lat. 25. 0. N.

MEDINA CELI, an ancient town of Spain, in Old Castile, near the river Xalon. Lon. 2. 9. W. Lat. 41. 15. N.

MEDINA DEL CAMPO, a town of Spain, in Leon. Lon. 4. 20. W. Lat. 41. 22. N.

MEDINA DEL RIO SECCO, a town of Spain, in Leon. Lon. 4. 38. E. Lat. 42. 8. N.

MEDINA SIDONIA, a duchy of Spain, in Andalusia.

MEDINA SIDONIA, a town and castle in the above duchy, 20 miles E. of Cadiz. Lon. 5. 36. E. Lat. 36. 40. N.

MEDINE, an Egyptian piece of money, of iron, silvered over, and about the size of a silver threepence.

MEDIOLANUM, an ancient city of Italy, the capital of the Insubres, built by the Gauls, now called Milan. See MILAN.

MEDIOLANUM AULERCORUM, an ancient town of Gallia Celtica, afterwards named Ebuovicum Civitas (Antonine,) corrupted to Civitas Ebroicorum, and this last to Ebroica; whence the modern name Evreux. See EVREUX.

MEDIOLANUM GUGERNORUM, an ancient town of Gallia Belgica; now called Moyland, near Cologne.

MEDIOLANUM ORDOVICUM, an ancient town of Britain, now called Llan Vethlin, in Montgomeryshire in Wales.

MEDIOLANUM SANTONUM, an ancient town of the Santones, in Aquitain, called also Santonica Urbs, Santones, and Santoni; now called Saintes, on the Charente.

MEDIOMATRICI, an ancient territory of Gallia Belgica; comprehending the diocese of Metz.

MEDITATION is an act by which we consider any thing closely, or wherein the soul is employed in the search or consideration of any truth. In religion, it signifies a consideration of the objects and grand truths of the Christian faith. Mystic divines make a great difference between meditation and contemplation: the former consists in discursive acts of the soul, considering methodically and with attention the mysteries of faith and precepts of morality; and is performed by reflections and reasonings, which leave behind them manifest impressions on the brain. The pure contemplative have no need of meditation, as seeing all things in God at a glance, and without any reflection.

MEDITERRANEAN, [*medius* and *terra*, Lat.] a large sea which flows between the continents of Europe and Africa, entering by the straits of Gibraltar, and reaching into Asia, as far as the Euxine sea and the Palus Mæotis. The Mediterranean was anciently called the Grecian and the Great sea. It is now cantoned out into divisions, which bear several names. To the west of Italy it is called the Ligustic or Tuscan sea; near Venice, the Adriatic; towards Greece, the Ionic and Ægean; between the Hellespont and the Bosphorus, the White sea, as being very safe; and beyond, the Black sea, its navigation being dangerous; that part which lies east of Candia, is called the Levant.

MEDITULLIUM, is used by anatomists for that spongy substance between the two plates of the cranium, and the interstices of all laminated bones. See ANATOMY.

MEDIUM, in logic, the mean or middle term of a syllogism, being an argument, reason, or consideration, for which we affirm or deny any thing; or, it is the cause why the greater extreme is affirmed or denied of the less in the conclusion. See LOGIC.

MEDIUM, or MEAN, GEOMETRICAL, ARITHMETICAL, and HARMONICAL. See MEAN.

MEDIUM, any substance through which light is transmitted.

MEDIUM, in philosophy, that space or region through which a body in motion passes to any point: thus æther is supposed to be a medium through which the heavenly bodies move; air, the medium wherein bodies move near our earth; water, the medium wherein fishes live and move; and glass is also a medium of light, as it affords it a free passage. That density or consistency in the parts of the medium, whereby the motion of bodies in it is retarded, is called the resistance of the medium; which, with the force of gravity, is the cause of the cessation of the motion of projectiles.

MEDIUM, SUBTILE, or ÆTHEREAL. Sir Isaac Newton considers it probable, that, besides the particular aerial medium, wherein we live and breathe, there is another more universal one, which he calls an æthereal medium, vastly more rare, subtle, elastic, and active than air, and by that means, freely permeating the

pores and interstices of all other mediums, and diffusing itself through the whole creation; and by the intervention hereof, he thinks it is that most of the great phenomena of nature are effected. This medium he seems to have recourse to, as the first and most remote physical spring, and the ultimate of all natural causes. By the vibrations of this medium, he takes heat to be propagated from lucid bodies, and the intenseness of heat increased and preserved in hot bodies, and from them communicated to cold ones. By this medium, he takes light to be reflected, inflected, refracted, and put alternately in fits of easy reflection and transmission, which effects he elsewhere ascribes to attraction; so that this medium appears the source and cause even of attraction. Again, this medium being much rarer within the heavenly bodies than in the heavenly spaces, and growing denser as it recedes further from them, he supposes the cause of the gravitation of these bodies towards each other, and of the parts towards the bodies. Again from the vibrations of this same medium excited in the bottom of the eye, by the rays of light, and thence propagated through the capillaments of the optic nerves into the sensory, he takes vision to be performed; and so hearing from the vibrations of this or some other medium excited in the auditory nerves by the tremors of the air, and propagated through the capillaments of the nerves into the muscles; and thus contracting and dilating them. The elastic force of this medium, he shews, must be prodigious. Light moves at the rate of 95,000,000 miles in about eight minutes, yet the vibrations and pulses of this medium, to cause the fits of easy reflection and easy transmission, must be swifter than light, which is 700,000 times swifter than sound. The elastic force of this medium, therefore, in proportion to its density must be above 490,000,000,000 times greater than the elastic force of the air in proportion to its density; the velocities and pulses of the elastic mediums, being in a subduplicate ratio of the elasticities and the rarities of the mediums taken together; and thus may the vibrations of this medium be conceived as the cause of the elasticity of bodies.

MEDLAR, in botany. See MESPILUS.

MEDOC, a peninsula, and late territory of France, in the department of Gironde, situated between the Gironde and the Bay of Biscay, near the tower and light-house of Cordovan.

MEDULLA, MARROW. See ANATOMY.

MEDULLA CEREBELLI, and MEDULLA CEREBRI, the white soft part of the brain and cerebellum, the outside covered with the cortical substance, which is of a more dark or ashy colour. See ANATOMY.

MEDUSA, in mythology, one of the three gorgons, and the only one subject to mortality. She was celebrated for her personal charms and the beauty of her locks. Neptune became enamoured of her, and obtained her favours in the temple of Minerva. This profanation provoked Minerva, who changed the beautiful locks of Medusa, into serpents, the sight of which turned the beholders into stones; but Perseus, armed with Mercury's ax, cut off Medusa's head, from whose blood sprang Pegasus and Chrysaor, together with the innumerable serpents that infest Africa. He placed Medusa's head on the ægis of Minerva, which he had used in his expedition; and the head still retained its petrifying powers.

MEDUSA, in zoology, a genus of vermes, of the order mollusca. Body gelatinous, roundish, depressed; mouth in the centre of the under part of the body. There are 44 species, many of which, on being handled, affect with a nettle-like burning, and excite a redness. Their phosphoric quality is well known; nor was it overlooked by the ancients. Pliny observes, that if rubbed with a stick it will appear to burn, and the wood to shine. Two species, *M. pelagia*, and *M. capillata*, are represented on Plate XCVIII.

MEDUSA'S HEAD, or ALGOL, in astronomy, see ALGOL, where the singular variations in splendor of this star, are noticed, and accurate Tables given to ascertain the times of these variations for any year of the present century.

MEDWAY, a river of England, which rises in the Weald of Sussex, and entering Kent near Ashurst, runs by Tunbridge, and thence continues its course towards Maidstone: after which it divides into two branches, one enters the Thames, and the other falls into the German ocean.

MEERSCHAUM, in mineralogy, a species of the talc genus, is generally of a yellowish white colour; it occurs massive; internally it is dull; it adheres to the tongue, feels greasy, and the specific

specific gravity is 1.6. It is infusible before the blow-pipe without addition. The constituent parts are,

Silica.....	41
Magnesia.....	18.25
Linie.....	0.5
Water.....	39.0
Carbonic acid.....	39.0
	98.75
Loss.....	1.25
	100.00

It is principally found in Nafolia, in Lesser Asia: and the island of Samos: also in Greece, Hungary, and Moravia; in Spain and in some parts of America. It is chiefly used for the manufacture of tobacco-pipes. It is used in various parts of the Turkish dominions as fuller's earth is used here.

MÆSIA, in botany, a genus of the cryptogamia musci class and order. Capsule oblong; peristome double; outer with sixteen short blunt teeth; inner with as many sharp cilia, distinct or connected by net-work; males approaching the females, or discoid on a different plant.

MEGERA, in the mythology, one of the three furies, daughters of Acheron and Night. Her office was chiefly to punish crimes arising from envy.

MEGALASCOPE, a species of microscope, for viewing the larger kind of minute objects. See **MICROSCOPE**.

MEGALE POLIS, or **MEGALOPOLIS**, an ancient town of Arcadia, built under the auspices of Epaminondas, after the battle of Leuctra. Strabo says it was the greatest city of Arcadia. It was destroyed by Cleomenes III. king of Sparta.

MEGALESIA, and **MEGALENSES LUDI**, feasts and games in honour of Cybele or Rhea the mother of the gods, held on the 12th of April by the Romans, and famous for great rejoicings and diversions of various sorts.

MEGALONISI, an island in the Mediterranean, two miles E. of St. Maura.

MEGARA, in ancient geography, a noble city, capital of Megaris, which for many years carried on war with the Corinthians and Athenians. It had for some time a school of philosophers, called the Megarici, successors of Euclid the Socratic, a native of Megara.

MEGARIS, in ancient geography, the country of the Megareans, is described as a rough region, like Attica. This territory had Attica on the E. Bœotia on the N. and W. and the Isthmus of Corinth on the S.

MEGEN, or **MEGHEM**, a town of Holland, in the department of Dommel and Scheldt, and late province of Dutch Brabant: 12 miles S. W. of Nimeguen.

MEIGLE, a town in Scotland, in Perthshire, 12 miles N. W. of Dundee.

MEISSEN, or **MISNIA**, a margravate of Germany in Upper Saxony, about 100 miles long and 80 broad; divided into five circles, viz. Meissen, Leipsic Erzeburg, Voigtland, and Lustadt. It is a fertile country, abounding in corn, wine, and rich mines.

MEISSEN, a town and circle in the above margravate. Lon. 13. 33. E. Lat. 51. 15. N.

MEISSENHEIM, a town of France, in the department of Mont Tonnerre, and late duchy of Deux Ponts, 30 miles W.S.W. of Mentz.

MELALEUCA, the **CAYPUTI**, or **CAJEPUT TREE**; in botany, a genus of the polyandria order, and polyadelphia class of plants. Calyx five-cleft, half superior; petals five; filaments many, very long, in five bodies; style one; capsule three-celled. There are eleven species, of which *M. leucadendron*, aromatic melaleuca, is a tree with a black trunk and white branches, whence the name melaleuca; leaves quite entire, almost veinless, petioled; fructifications sessile, agglutinated, scattered below the leaves. It is a native of some parts of the East-Indies and Cochin-China; from it the cajeput oil is obtained: a medicine in very high esteem among the eastern nations, particularly in India.

MELAMPODIUM, in botany, a genus of the polygamia necessaria order, and syngenesia class of plants; natural order, Compositæ. Calyx five-leaved; receptacle chafy, conical; down

one-leaved, involuted, converging. There are three species, annuals, and natives of South America and the West-Indies.

MELAMPUS, in fabulous history, a celebrated soothsayer and physician of Argos. He lived at Pylos in Peloponnesus.

MELAMPYRIUM, **Cow-WHEAT**; a genus of the angiosperma order, and didynamia class of plants; natural order, Personate. Calyx four-cleft; corolla upper lip compressed, with the edge folded back; capsule two-celled, oblique, opening on one side; seeds two, gibbous. There are five species, four of them are natives of Britain, annuals, growing spontaneously in corn-fields.

MELANAGOGUES, [from *μελας*; and *αγω*,] such medicines as are supposed particularly to purge off black choler.

MELANCHOLY, [from *μελας*; and *χολη*,] a partial insanity without any affection of the stomach, is one of those humiliating diseases which are peculiar to mankind. Innumerable are the causes which may induce this most dreadful of human maladies; but there is one material circumstance, which, independently of the mental state, always occurs, and evidently operates in all melancholic patients; namely, an accumulation of impurities in the alimentary canal, consisting chiefly of black bile. Hence originate, want of appetite; a disturbed sleep; obstructions of the intestines; hemorrhoidal and gouty symptoms; irregular circulation of the blood; dulness and gloom of mind, without any apparent cause; at length, stupefaction and insensibility, terminating in madness. See **MEDICINE**.

MELANCTHON, **PHILIP**, one of the wisest and most able among the Reformers, though of a mild temper, and disposed to accommodate rather than to inflame disputes. He was born at Bretten in the Palatinate, in 1495. He made rapid progress in learning, and was made Greek professor at Wirtemberg in 1509, where his lectures upon Homer, and the Greek text of St. Paul's Epistle to Titus, drew to him a great number of auditors, and entirely effaced the contempt, to which his low stature and mean appearance had exposed him. He reduced the sciences to systems; and acquired such reputation, that he had sometimes 2500 auditors. He entered into an immediate friendship with Luther, who taught divinity in the same university; and in 1519 they went together to Leipsic, to dispute with Eccius. The following years he was continually engaged in various employments; he composed several books; taught divinity; took several journeys, to found colleges and visit churches; and in 1530 drew up a confession of faith, which goes by the name of the Augsburg Confession, see **AUGSBURG**, because it was presented to the emperor at the diet held in that city. All Europe was convinced, that he was anxious to accommodate the differences between the various sects of Christians. He hated religious disputes, and was drawn into them only through the necessity of the part he was called to act in the world; and therefore would have sacrificed many things to have produced an union among the Protestants. For this reason, Francis I. king of France, wrote to desire him to come and confer with the doctors of the Sorbonne, in order to put an end to all controversies; but though Luther endeavoured to persuade the elector of Saxony to consent to that journey, and though Melancthon desired it, that prince, whether he distrusted Melancthon's moderation, or was afraid of quarrelling with Charles V. would never grant his permission. Henry VIII. also in vain desired to see him. Melancthon, in 1529, assisted at the conferences of Spire. In 1541, he was at the famous conferences at Ratisbon. In 1543, he went to meet the Archbishop of Cologne, to assist him in introducing the reformation into his diocese; but without effect, and in 1548, he assisted at seven conferences on the subject of the interim of Charles V. and wrote a censure on that interim, and all the writings presented at these conferences. He was extremely affected at the dissensions raised by Flaccus Illyricus. His last conference with those of the Romish communion was at Worms, in 1557. He died at Wirtemberg in 1560, and was interred near Luther. He considered death as a happiness, chiefly because it "delivered him from theological persecutions." Melancthon had a peaceable temper, ill suited to the time in which he lived. His moderation served only to be his cross. He was like a lamb in the midst of wolves. Nobody liked his mildness; he was accused of being lukewarm; and even Luther himself was sometimes angry at it. The number of his works is prodigious; a chronological catalogue of them was published in 1582. But he did not take time to make them correct. He was of a delicate constitution.

MELANITE, in mineralogy, a species of the flint-genus, is of a velvet black-colour, inclining to greyish black. It occurs crystallized, and also in grains. In figure the crystals are six-sided prisms. Externally it is always smooth and shining, approaching to splendid. Internally it is shining, inclining to glistening. Specific gravity 3.7 to 3.8. It is found in Italy near Rome. Its constituents are,

Silica.....	35
Alumina.....	6
Lime.....	32
Oxide of iron.....	25
Manganese.....	2
	100

MELANTHIUM, in botany, a genus of the trigynia order, and hexandria class of plants. Corolla six-petaled; filaments from the elongated claws of the corolla. There are ten species.

MELASTOMA, the **AMERICAN GOOSEBERRY TREE**; in botany, a genus of the monogynia order, and decandria class of plants; natural order, Calycanthemæ. Calyx quinquefid and campanulate; petals five, inserted into the calyx; berry quinquelocular, wrapped in the calyx. There are 67 species, natives of the warm parts of America, and very beautiful from the variegation of their leaves.

MELAZZO, or **MILAZZO**, a fortified sea-port of Sicily, in the valley of Demona, anciently called *MYLÆ*, 18 miles W. of Messina. Lon. 15. 5. E. Lat. 38. 36. N.

MELAZZO, a town of Turkey, in Natolia, 60 miles S. of Smyrna. Lon. 27. 25. E. Lat. 37. 28. N.

MELCHISEDEC, or **MELCHIZEDEK**, [from מֶלֶךְ, king, and צֶדֶק, righteousness, i. e. king of righteousness,] king of Salem, and priest of the Most High. The scripture tells us nothing either of his father, mother, genealogy, birth, or death. And in this sense St. Paul says, he was a figure of Jesus Christ, "who is a priest for ever, after the order of Melchisedec," and not after the order of Aaron, whose original, life, and death, are known. When Abraham returned from his victory over the four confederate kings, (Gen. xiv. 17, 18, 19, &c.), Melchisedec came to meet him, at the valley of Shaveh; presented him with a refreshment of bread and wine, and blessed him, and Abraham offered him the tythes of all the spoils. After this, no mention is made of Melchisedec; only the Psalmist (cx. 4.) speaking of the Messiah, says, "Thou art a priest for ever after the order of Melchisedec." St. Paul, in his epistle to the Hebrews, (vii. 6—10,) unfolds the mystery. An infinite number of difficulties, however, have been started respecting the person of Melchisedec. St. Jerom thought that Salem, of which Melchisedec was king, not Jerusalem, but the city of Salem near Scythopolis, where they still pretended to shew the ruins of his palace. The greatness and extent of these ruins are a proof of the magnificence of this ancient building. He thinks it was at this Salem or Shalem, that Jacob arrived after his passage over Jordan at his return from Mesopotamia. (Gen. xxxiii. 18.) Some believe that Salem, where Melchisedec reigned, is the same as Salim mentioned by John, chap. iii. 23. Various names have been invented for the parents of Melchisedec. But it is generally agreed on by the learned, that when the apostle says, (Heb. vii. 3.) he was "without father and without mother," &c. no more is meant, than that he is introduced into the history of Abraham without acquainting us who he was, where he lived, or when he died. Nevertheless, some have taken St. Paul's words literally, and contended that he was not of human but divine nature. Origen and Didymus took him to be an angel; and the author of the "Questions upon the Old and New Testament" pretends, that he was the Holy Ghost, who appeared to Abraham in a human form. The Arabic Catena, upon the 9th chap. of Genesis, makes Melchisedec to be descended from Shem by his father, and from Japheth by his mother. Cedrenus and others derive Melchisedec from an Egyptian stock. They say his father was called Sidon, and was the founder of Sidon, the capital of Phœnicia. The Jews and Samaritans believed Melchisedec to be the same with the patriarch Shem; which opinion has been followed by many modern writers. M. Jurieu endeavoured to prove that he is the same as Ham. Peter Cunæus and du Moulin assert,

that Melchisedec who appeared to Abraham was the Son of God, and the patriarch worshipped him and acknowledged him for the Messiah. Many modern Christians are of this opinion, and urge very strong arguments in favour of it; the only material objection to which seems to be, that the type and the anti-type are thus made one and the same person. We shall only add one opinion more concerning Melchisedec. The learned Heidegger supposes a twofold Melchisedec; the one historical, of whom Moses gives an account in Gen. xiv. that he was king as well as high-priest of Jerusalem; the other allegorical, whom St. Paul describes, and this is Jesus Christ. Numberless fables have been invented of Melchisedec but which are totally unworthy of notice.

MELCHISEDECIANS, a sect of heretics, who rose in the beginning of the third century, and affirmed that Melchisedec was not a man, but a heavenly power, superior to Jesus Christ.

MELCHITES, in church-history, the name given to the Syriac, Egyptian, and other Christians of the Levant.

MELCK, or **MOLK**, a town of Austria, 47 miles W. of Vienna.

MELCOMB REGIS, a town in Dorsetshire, 8 miles S. of Dorchester, and 129 W. S. W. of London.

MELDERT, a town of France, in the department of the Dyle, and late province of Austrian Brabant, 8 miles S. of Louvain.

MELDOLA, or **MELDELA**, a town of Italy, in the department of the Rubicone, district of Rimini, and late province of Romagna; 7 miles S. of Forlì. Lon. 11. 48. E. Lat. 44. 22. N.

MELDORP, a town of Holstein, 45 miles W. of Hamburg.

MELEAGER, in fabulous history, a celebrated hero, son of Oeneus king of Calydonia, by Althæa daughter of Thestius. The Parææ were present at his birth, and predicted his future greatness.

MELEAGRIS, in ornithology, the **TURKEY**; a genus of birds of the order, gallinæ. Head covered with spongy caruncles; there is likewise a membranaceous longitudinal caruncle on the throat. There are two species. Latham reckons five.

M. GALLOPAVO, the **NORTH AMERICAN TURKEY** of Ray. It has a caruncle both on the head and throat; and the breast of the male is bearded or tufted. He lives upon grain and insects; when the cock struts, he blows up his breast, spreads and erects his feathers, relaxes the caruncle on the forehead, and the naked parts of the face and neck become intensely red. The turkey was unknown to the old world before the discovery of America. It is peculiar to this new continent, and is the commonest wild fowl in the N. parts of it, where they are often met with by hundreds in a flock. In the day-time they frequent the woods, where they feed on acorns; and return at night to the swamps to roost on the trees. They are often taken by dogs, though they run faster for a time; but the dogs persisting, the birds grow fatigued, and take to the highest trees, where they are shot one after another if within gun-shot. Turkeys were first seen in France in the reign of Francis I. and in England in that of Henry VIII. By the date of these reigns the first turkeys must have been brought from Mexico, about A. D. 1521. Ælian mentions a bird found in India, which some writers have suspected to be the turkey; but Mr. Pennant concludes with Gessner, that it was either the peacock, or some bird of that genus.

MELEDA, an island in the Adriatic, 32 miles long, and 4 broad; by some supposed to be the ancient Melita, where St. Paul was shipwrecked.

MELES, in zoology. See **URSUS**.

MELESIGENES. See **MELES**.

MELETIAN, in church history, a considerable party who adhered to the cause of Meletius Bishop of Lycopolis, in Upper Egypt, after he was deposed, about A. D. 306, by Peter Bishop of Alexandria, under the charge of having sacrificed to the gods, and been guilty of other heinous crimes; though Epiphanius makes his only failing to have been an excessive severity against the lapsed. This dispute, which was at first a personal difference between Meletius and Peter, became a religious controversy; and the Meletian party subsisted in the fifth century, but was condemned by the first council of Nice.

MELFI, a considerable town of Naples, 72 miles N. E. of Naples. Lon. 15. 52. E. Lat. 41. 2. N.

MELIA, **AZADERACH**, or the **BEAD-TREE**, in botany, a genus

genus of the monogynia order, and decandria class of plants; natural order, Trihilatæ. Calyx five-toothed; petals five; nectarium cylindrical, as long as the corolla, with its mouth ten-toothed; fruit a plum with a five-celled kernel. There are three species, all exotic trees of the Indies, rising near 20 feet high; adorned with large pinnate leaves. They are all propagated by seeds sown on hot-beds.

MELIANTHUS, HONEY-FLOWER; in botany, a genus of the angiospermia order, and didynamia class of plants; natural order Corydalis. Calyx five-leaved, the lower leaf gibbous; petals four, with the nectarium under the lowest; capsule five-celled. There are three species of this plant, all natives of the Cape of Good Hope.

MELIBŒA, in ancient geography, an island of Syria, at the mouth of the Oronte.

MELICA, ROPEGRASS: a genus of the digynia order, and triandria class of plants; natural order, Gramina. Calyx two-valved, two-flowered, with the rudiment of one or two florets that are abortive, between the two others. There are fourteen species.

MELICERIS, [*meliceris*; 15.] a tumour inclosed in a cystis, and consisting of matter like honey. If the matter resemble milk-curds, the tumour is called antheroma; if like honey, meliceris; and if composed of fat, or a suety substance, steatoma.

MELICERTA, MELICERTES, or MELICERTUS, in mythology, a son of Athamas and Ino. His mother saved him from his father's fury, who prepared to dash him against a wall as he had done his brother Learchus. Neptune changed them both into sea-deities.

MELICOCCA, in botany, a genus of the monogynia order, and octandria class of plants. Calyx four-parted; petals four, bent back below the calyx; stigma subpeltate; drupe or berry coriaceous. There is but one species.

M. BRUGA, a middle-sized tree, native of the East and West Indies.

MELICOPE, in botany, a genus of the octandria monogynia class and order. Calyx inferior, four-leaved; petals four; nectary glands four, twin; capsule four, one-seeded. There is but one species, *M. Ternata*, a native of New Zealand.

MELICYTUS, in botany, a genus of the diœcia pentandria class and order. Calyx five-toothed; corolla five-petaled, three times as long as the calyx; nectary five scales; male anthers five, without filaments, fastened to the inside of the nectary: female stigma flattened out, four or five lobed; capsule berried, one-celled; seeds nestling. The only species, is, *M. Ramiflorus*, a native of New Zealand.

MELILLA, an ancient town of Fez, in the province of Garet. Lon. 2. 9. W. Lat. 35. 20. N.

MELILOT. See *TRIFOLIUM*.

MELINDA, a kingdom on the E. coast of Africa, situated between Lat. 3° and 4° S.

MELINDA, the capital of the above kingdom.

MELINGEN, a town of Switzerland, 43 miles N. E. of Bern.

MELINUM, in natural history, the name of an earth famous in the earliest ages of painting, being the only white of the great painters of antiquity; and, according to Pliny's account, one of the three colours with which alone they performed all their works. It is a fine, white, marly earth, of a very compact texture, yet remarkably light. It is found in the same place from which the painters of old had it, viz. the isle of Milo or Melos, whence it had its name; and is common in most of the adjacent islands.

MELIPILLA, a town and province of South America, in Chili, 200 miles N. of Concepcion. Lon. 63. 38. W. Lat. 33. 28. S.

MELISSA, in the mythology, a daughter of Melissus king of Crete, who with her sister Amalthæa fed Jupiter with the milk of goats.

MELISSA, BAUM, a genus of the gymnospermia order, and didynamia class of plants; natural order, Verticillatæ. Calyx dry, flattish above; upper lip subfastigate; corolla, upper lip somewhat arched, bifid; lower lip with the middle-lobe heart-shaped. There are six species.

M. OFFICINALIS, or COMMON BAUM, is appropriated, by the

writers on the materia medica, to the head, stomach, and uterus; and in all disorders of these parts is said to do extraordinary service. So high an opinion have some chemists entertained of this plant, that they have expected to find in it a medicine which should prolong life beyond the usual period. The present practice, however, holds it in no great esteem; and ranks it among the weaker corroborants. Infusions of the leaves in water smell agreeably of the herb, but have not much taste, though on being inspissated they leave a considerable quantity of a bitterish austere extract. Infusions of baum do not, like other aromatics, offend the head, as is complained of those of sage, &c. Infusions in water or spirit are far better than the cohobated distilled water, and are the best preparations from the plant.

MELISSUS, a king of Crete, the father of Melissa and Amalthæa, and the inventor of bee-husbandry.

MELISSUS OF SAMOS, a Greek philosopher, was the son of Rhagines and the disciple of Parmenides; and lived about 440 B. C. He asserted that the universe is infinite, immovable, and without a vacuum. Themistocles was among his pupils.

MELITA, or MELITE, in ancient geography, an island referred to Africa by Scylax and Ptolemy; but nearer Sicily, and allotted to it by the Romans: commended for its commodious harbours; for a city well built, with artificers of every kind, especially weavers of fine linen. The Phœnicians were the first colonists. It is now called Malta; remarkable for St. Paul's shipwreck, &c.

MELITE, MELITA, or MELITINA INSULA, an island on the coast of Illyricum, in the Adriatic. The Catuli Melitæi were famous. Now called Meleda, the name of the island Samos. See SAMOS.

MELITTIS, BAUM-LEAVED ARCHANGEL, or BASTARD BAUM; in botany, a genus of the gymnospermia order, and didynamia class of plants; natural order, Verticillatæ. Calyx wider than the tube of the corolla; corolla, upper lip flat, lower crenated; anthers crosswise. It has two species, *M. melissophyllum*, bastard baum, and *M. japonica*; the former has a perennial root, sending up three or four stems about a foot and a half in height; leaves opposite, petioled, elliptic, a little pointed; flowers large and handsome, growing principally on one side; peduncles round, hairy, and axillary: much honey is secreted from a gland that encircles the base of the germ, for which reason it is a favourite plant with bees.

MELITUS, a Greek orator and poet, the accuser of Socrates. The Athenians, after the death of Socrates, discovering the iniquity of the sentence they had passed against that great philosopher, put Melitus to death, 400 B. C.

MELLA, a department of Italy, comprehending the late province of Bresciano, and containing four districts; viz. Brescia, Chiari, Verola, and Salò.

MELLATES, in chemistry, a genus of salts formed from the **MELLITIC ACID**, which see.

MELLER, a lake of Sweden, 80 miles long, and 30 broad; on which stands the city of Stockholm.

MELLI, a city and country of the Mandingoes, in Africa.

MELLITE, or HONEY-STONE, in mineralogy, takes its name from its yellow colour like that of honey. Its primitive figure is an octahedron, formed by four-sided pyramids, the common base of which is a perfect square. The crystals are small, their surface is commonly smooth and shining. Internally it is splendid with a lustre between vitreous and resinous. It is transparent, passing into the opaque, and possesses a double refraction. It is softer than amber and brittle. Specific gravity is from about 1.5 to 1.7. It becomes electric by friction, but continues so but a short time. Klaproth, gives the constituent parts as follows:

Silica.....	1.375
Iron	0.125
Alumina.....	14.5
Mellitic acid, Water, and Loss.84.	
	100.

This mineral is scarce, but is sometimes found at Aetern in Thuringia; in the district of Saal; and in Switzerland.

MELLITIC ACID, in chemistry, an acid obtained from mellite,

mellite, by the following process. The mineral is reduced to powder, and boiled with about 72 times its weight of water; the alumina is precipitated in the form of flakes, and the acid combines with the water. By filtration and evaporation, crystals in the form of fine needles are deposited, which are the crystals of mellitic acid. This acid is composed of oxygen, hydrogen, and carbon.

MELMOTH, WILLIAM, Esq., a learned and worthy bencher of Lincoln's Inn, born in 1666. In conjunction with Mr. Peere Williams, he published *Vernon's Reports*, under an order of the court of chancery. But the performance for which he justly deserves to be held in perpetual remembrance is, "The Great Importance of a Religious Life;" of which, after many large editions had been circulated, 42,000 copies were sold within 18 years, although the real author was not then known. From his character prefixed to this work, we shall only quote a few lines:—"the author's life was one uniform exemplar of those precepts which, with an elegant and affecting simplicity of style, he recommends to general practice. He left others to inflame themselves and the world with endless controversy: it was the wiser purpose of his more ennobled aim, to act up to those clear rules of conduct which revelation hath graciously prescribed. He possessed by temper every moral virtue; by religion every Christian grace. He had a humanity that melted at every distress; a charity which not only thought no evil, but suspected none. In a word, few have ever passed a more useful, perhaps not one a more blameless life." He died on the 6th day of April 1743.

MELOCHIA, JEWS MALLOW; in botany, a genus of the pentandria order, and monadelphia class of plants; natural order, Columniferae. Capsule five-celled, one-seeded. There are several species.

M. OLITORIUS, the **COMMON JEWS MALLOW**, is a native of the warm parts of Asia and America. It is an annual plant, which rises about two feet high, dividing into several branches, garnished with leaves of different sizes and forms. They have very long slender footstalks, especially those which grow on the lower part of the branches. This species is cultivated about the city of Aleppo in Syria, and in the East Indies, as a pot-herb; the Jews boiling the leaves, and eating them with their meat. It is supposed by Rauwolf to be the *olus Judaicum* of Avicenna, and the *corchorum* of Pliny.

MELODINUS, a genus of the class and order pentandria digynia. It is contorted; nectary in the middle of the tube, stellate; berry two-celled, many-seeded. There is one species, a shrub of New Caledonia.

MELODY, [*μελωδία*], in music, a succession of simple sounds ranged according to the laws of rhythmus in such a manner that it may please the ear. Vocal melody is called singing; and that which is performed upon instruments may be termed symphonic melody. See **AIR**, **HARMONY**, **MODULATION**, **MUSIC**, **RHYTHMUS**, &c.

MELOE, a small island in the Baltic; 14 miles E. N. E. of Cape Lindesnes.

MELOE, in zoology, a genus of insects of the order coleoptera. Antennae jointed, last joint oval; breast roundish; elytra soft, flexible; head inflexed, gibbous. There are 35 species, divided into two families; 1. without wings, having the elytra shorter than the abdomen; 2. winged, with elytra shorter than the body and wholly covering the wings.

M. PROSCARABEUS, is of a black colour without brightness, though intermixed with a small degree of purple, especially towards the under part of the body. The elytra are as soft as leather, shagreened, and cover but part of the abdomen. There are no wings under the elytra. The abdomen is large, especially that of the female, in which it far exceeds the elytra. This insect makes its abode on the side of wet roads and in woods. Its food is insects, violet-leaves, and delicate herbs. A fat unctuous matter of an agreeable smell oozes from its body. The males are less than the females. Oil, in which insects of this species have been infused, is said to be an excellent remedy for wounds, and the scorpion's sting. It enters also into the composition of salve for plague sores. The insects bruised and mixed with oil or honey, Linnæus says, are commended as a remedy in the rabies canina.

M. VESICATORIUS, the **BLISTERING MELOE**, is nine or ten lines in length, of a shining green colour mixed with azure. It multiplies greatly. They are sometimes seen flying in swarms.

A nauseous smell, not unlike that of mice, bespeaks their approach; which scent leads to the discovery of them when they are sought for in order to make provision. When dried, they are so light, that fifty scarce weigh one drachm. They prey upon the leaves of trees and shrubs, and prefer those of the ash-tree. The odorous particles exhaled by these insects, are extremely corrosive. Great caution should be used in picking them up. People have been known to be seized with violent heat of urine, voiding of blood, for having gathered a quantity of them during the heat of the sun with their hands bare, or for having fallen asleep under trees where swarms of them had settled. They are adorned with the most splendid colours. Green, azure, and gold, render them dazzling to the eyes. This species is the cantharis of the shops; when bruised, it is universally used as a blistering plaster. The largest and most esteemed of this sort come from Italy. See Plate LXXVI.

MELON, in botany, a species of cucumis. See **CUCUMIS**.

MELON-THISTLE. See **CACTUS**.

MELOS, in ancient geography, an island between Crete and Peloponnesus, about 24 miles from Scyllæum.

MELOTIRIA, SMALL CREEPING CUCUMBER; in botany, a genus of the monogynia order, and triandria class of plants; natural order, Cucurbitaceæ. Calyx five-cleft; corolla campanulate, one-petaled; berry three-celled, one-seeded. It has but one species.

M. PENDULA, a native of Carolina, Virginia, and many of the American islands. The plants strike out roots at every joint, which fasten their stalks in the ground, by which means they extend far every way. The flowers are very small, shaped like those of the melon, of a pale sulphur-colour. The plants in this country require artificial heat.

MELPOMENE, in mythology, one of the nine Muses, daughter of Jupiter and Mnemosyne. She presided over tragedy. Horace has addressed the finest of his odes to her, as to the patroness of lyric poetry.

MELROSE, a town of Scotland, in Roxburghshire. Lon. 2. 32. W. Lat. 55. 32. N.

MELTING CONE, in assaying, a hollow cone of brass or cast iron, into which melted metalline substances are thrown, in order to free them from their scoræ.

MELTON-MOUBRAY, a large town of Leicestershire, 15 miles S. by E. of Nottingham.

MELUN, a city of France, capital of the department of the Seine and Marne. Lon. 2. 35. E. Lat. 48. 30. N.

MELYRIS, in natural history, a genus of insects of the order coleoptera. Antennæ entirely perfoliate; head inflexed under the thorax; thorax margined; lip clavate, emarginate; jaw one-toothed, pinnate. There are three species, the *viridis*, the *niger*, and the *lineatus*.

MEMBER, in architecture, denotes any part of a building; as a frieze, cornice, or the like. It is sometimes also used for moulding.

MEMBER, in civil polity, is used to denote some particular order or rank in a state or government: thus we say, "member of a corporation, member of parliament, member of the council," &c.

MEMBER, in grammar, is applied to the parts of a period or sentence.

MEMBERS, in anatomy, the exterior parts, arising from the trunk or body of an animal, like the boughs from the trunk of a tree.

MEMBRANA ADIPOSITA. See **ANATOMY**.

MEMBRANE, a thin, white, flexible, expanded skin. See **ANATOMY**.

MEMECYLON, in botany, a genus of the octandria monogynia class and order; natural order, Calycifloræ. Calyx superior, with a striated base and the margin quite entire; corolla one-petaled; anthers inserted into the side of the apex of the filament; berry crowned with a cylindrical calyx. There are four species, natives of warm climates.

MEMEL, or **MEMMEL**, a town of Prussia, 120 miles N. E. of Dantzic, and 203 N. of Warsaw. Lon. 21. 40. E. Lat. 55. 46. N.

MENTO, [*Lat.*] a memorial-notice; a hint to awaken the memory.

MEMMINGEN,

MEMMINGEN, an imperial town of Germany, in Suabia, 22 miles S. S. E. of Ulm. Lon. 10. 16. E. Lat. 48. 3. N.

MEMNON, in fabulous history, a king of Ethiopia, son of Tithonus and Aurora. He came with a body of 10,000 men to assist his uncle Priam, during the Trojan war.

MEMOIRS, in matters of literature, a species of history, written by persons who had some share in the transactions they relate; answering to what the Romans called *commentarii*, *commentaries*. The journals of the proceedings of a literary society, or a collection of matters transacted therein, are likewise called memoirs.

MEMORANDUM, a term implying a note, or mark, made either on paper or otherwise, with a view to assist the memory. In the present artificial state of society, the convenience of a memorandum-book is obvious to every person engaged in active pursuits. And, though the utility of such a measure be universally acknowledged, yet there is reason to believe that it is not so extensively practised as it justly deserves. Those who reflect on the fleeting nature of human thought, and on the importance of remembering the train of ideas which lead to a certain conclusion, will readily admit, that annotations might be rendered equally interesting and useful, if they were extended to that department of human affairs, which more immediately relates to the operations of the human mind. Thus, if every striking idea, whether of an economical or intellectual tendency, were duly registered, and digested, when a more favourable opportunity offers, incalculable benefit would thence result to society. Hence we presume to suggest to those who are accustomed to reflect and attend to the progress of their reasoning (when in solitude, as well as in the common intercourse of life,) to note and record in a particular journal, all such sentiments and opinions, as appear to be worthy of being preserved.

MEMORY, that faculty of the mind which presents to us ideas of what is past, accompanied with a persuasion, that the things themselves were formerly real and present. What we distinctly remember to have perceived; we as firmly believe to have happened, as what is now present to our senses. The ingenious Dr. Beattie, in his *Elements of Moral Science*, divides memory into two species, active and passive. "When we remember (says he) with little or no effort it is called remembrance simply, or memory, and sometimes passive memory. When we endeavour to remember what does not immediately, and (as it were) of itself, occur, it is called active memory, or recollection." This is a talent of the utmost importance in every situation of life. Many rules have been laid down for its acquisition, direction, improvement, and preservation; but the principal, and perhaps the only effectual method, consists in observing the strictest temperance in eating, drinking, and sleeping; for it is an undoubted fact, that excess in these indulgences is prejudicial to the brain, and gradually impairs the memory. Such, indeed, is the precarious state of our mental powers, and particularly of our recollective faculties, that it often happens, even with the most regular and temperate, that, notwithstanding every effort, those ideas which appear to be the most interesting and desirable to be retained, vanish from the mind insensibly and irrecoverably. To correct this inherent weakness of our nature, various methods have been proposed, which constitute what is called the art of memory. Those of our readers, who are inclined to avail themselves of such assistance, may consult a treatise, intitled, *A New Method of Artificial Memory*. But let them remember that it is not extraneous aid, but a constant attention and exercise, which form the true art of memory. "It is the practice of many readers, (says Dr. Beattie, in his *Elements* above quoted) to note in the margin of their books the most important passages, the strongest arguments, or the brightest sentiments. Thus they load their minds with superfluous attention, repress the vehemence of curiosity by useless deliberation, and by frequent interruption break the current of narration or the chain of reason, and at last close the volume and forget the passages and the marks together. Others are firmly persuaded, that nothing is certainly remembered but what is transcribed; and they, therefore, pass weeks and months in transferring large quotations to a common place-book. Yet, why any part of a book, which can be consulted at pleasure, should be copied, we are not able to discover. The hand has no closer correspondence with the memory than the eye. The act of writing itself distracts the thoughts; and what is read twice is commonly better remembered than what

is transcribed. This method, therefore, consumes time, without assisting the memory. But to write an abridgement of a good book may sometimes be a very profitable exercise. In general, when we would preserve the doctrines, sentiments, or facts, that occur in reading, it will be prudent to lay the book aside, and put them in writing in our own words. This practice will give accuracy to our knowledge, accustom us to recollection, improve us in the use of language, and enable us so thoroughly to comprehend the thoughts of other men, as to make them in some measure our own." "Our thoughts (says the author of the *Idler*) have for the most part a connection; so that the thought which is just now in the mind, depends partly upon that which went before, and partly serves to introduce that which follows. Hence we remember best those things of which the parts are methodically disposed and mutually connected. A regular discourse makes a more lasting impression upon the hearer than a parcel of detached sentences, and gives to his rational powers a more salutary exercise; and this may shew us the propriety of conducting our studies, and all our affairs, according to a regular plan or method. When this is not done, our thoughts and our business, especially if in any degree complex, soon run into confusion." On the whole, the most effectual way to acquire a good memory, is by constant and moderate exercise of it; for the memory, like other habits, is strengthened and improved by daily use. It is indeed hardly credible, to what a degree both active and passive memory may be improved by long practice. Scaliger reports of himself, that in his youth he could repeat above 100 verses, having once read them; and Berthicus declares, that he wrote his *Comment upon Claudian* without consulting the text. The extraordinary memory of Magliabechi is well known. See MAGLIABECHI. That of Jedidiah Buxton was of a peculiar kind, so long habituated to numbers, that it could fix on nothing else. To hope, however, for such degrees of memory as these, would be equally vain as to hope for the strength of Hercules, or the swiftness of Achilles. "But there are clergymen (says the author of the *Idler*) who can get a sermon by heart in two hours, though their memory, when they began to exercise it, was rather weak than strong: and pleaders, with other orators who speak in public and extempore, often discover, in calling instantly to mind all the knowledge necessary on the present occasion, and every thing of importance that may have been advanced in the course of a long debate, such powers of retention and recollection as, to the man who has never been obliged to exert himself in the same manner, are altogether astonishing. As habits, in order to be strong, must be formed in early life, the memories of children should, therefore, be constantly exercised; but to oblige them to commit to memory what they do not understand, perverts their faculties, and gives them a dislike to learning." In a word, those who have most occasion for memory, as orators and public speakers, should not suffer it to lie idle, but constantly employ it in treasuring up and frequently reviving such things as may be of most importance to them; for by these means, it will be more at their command, and they may place greater confidence in it upon any emergency."

MEMORY, ARTIFICIAL, MEMORIA TECHNICA, a method of assisting the memory, by forming certain words, the letters of which shall signify the date or era to be remembered. In order to this, the following series of vowels, diphthongs, and consonants, together with their corresponding numbers, must be exactly learned; so as to be able at pleasure to form a technical word, that shall stand for any number, or to resolve such a word already formed.

a	e	i	o	u	au	oi	ei	ou	y
1	2	3	4	5	6	7	8	9	0
b	d	t	f	l	s	p	k	n	z

The first five vowels, in order, naturally represent 1, 2, 3, 4, 5; the diphthong *au* = 6, as being composed of *a* and *u*, or of 1 + 5 = 6; and for the like reason, *oi* = 7, and *ou* = 9. The diphthong *ei* will easily be remembered for 8, as being the initials of the word. In like manner, where the initial-consonants could conveniently be retained, they are made use of to signify the number, as *t* for 3, *f* for 4, *s* for 6, and *n* for 9. The rest were assigned without any particular reason, unless that possibly *p* may be more easily remembered for 7 or septem, *k* for 8, or *ὀκτω*, *d* for 2,

or duo; *b* for 1, as being the first consonant, and *l* for 5, being the Roman letter for 50, than any others that could have been put in their places. It is farther to be observed, that *z* and *y* being made use of to represent the cypher, where many cyphers meet together, as 1000, 1000000, &c. instead of a repetition of *azyzzyy*, &c. let *g* stand for 100, *th* for a thousand, and *m* for a million. Thus *ag* will be 100, *ig* 300; *oug* 900, &c. *ath* 1000, *am* 1000000, *loun* 59000000, &c. Fractions may be set down in the following manner: let *r* signify the line separating the numerator and denominator, the first coming before, the other after it; as *iro* $\frac{1}{2}$, *urp* $\frac{1}{3}$, *pourag* $\frac{1}{20}$, &c. When the numerator is 1 or unit, it need not be expressed, but begin the fraction with *r*; as *re* $\frac{1}{2}$, *ri* $\frac{1}{3}$, *ro* $\frac{1}{4}$, &c. So in decimals, *rag* $\frac{1}{10}$, *rath* $\frac{1}{100}$. This is the principal part of the method, which consists in expressing numbers by artificial words. The application to history and chronology is also performed by artificial words. The art herein consists in making such a change in the ending of the name of a place, person, planet, coin, &c. without altering the beginning of it, as shall readily suggest the thing sought, at the same time that the beginning of the word, being preserved, shall be a leading or prompting syllable to the ending of it so changed. Thus, in order to remember the years in which Cyrus, Alexander, and Julius Caesar, founded their respective monarchies, the following words may be formed; for Cyrus, *Cyrats*; for Alexander, *Alexita*; for Julius Caesar, *Julios*. *Uts* signifies, according to the powers assigned to the letters before-mentioned, 536; *ila* is 331, and *os* is 46. Hence it will be easy to remember, that the empire of Cyrus was founded 536 years before Christ, that of Alexander, 331, and that of Julius Caesar, 46. This account is taken from a treatise, intitled, "A New Method of Artificial Memory;" where the reader will find several examples in chronology, geography, &c. of such artificial words disposed in verses, which must be allowed to contribute much to the assistance of the memory, since, being once learned, they are seldom or never forgot. However, the author advises his reader to form the words and verses himself, in the manner described above, as he will probably remember these better than those formed by another. We shall here give his table of the kings of England since the Conquest; where one thousand being added to the italics in each word, expresses the year when they began their reigns. Thus,

Will-consau, Rufkoi, Henrag.
Stephbil and Hensechuf, Richbein, Janu, Hethdas, and Eddoid.
Edsetyp, Edtertes, Risetop, Hefotoun, Hefiadque.
Hensifed, Edquarfauc, Efi Rokt, Hensepfeil, Henoclyn.
Edsexlos, Marylut, Elsluk, Jamsyd, Caroprimsel.
Carsecsook, Jamsseif, Wilselk, Anpyb, Geo-bo-doi-sy.

MEMPHIS, an ancient city, and the royal residence of the kings in Upper Egypt; fifteen miles from Delta to the S. according to Pliny: called also Moph and Noph, in scripture.

MEMPIRE MAGOG, a large lake of North America, partly in Vermont, but chiefly in Canada; forty miles long from N. to S. and from two to three broad.

MENACHINITE, in mineralogy, a species of the titanium genus, is of a greyish-black colour, inclining to iron-black; it occurs only in very small flattish angular grains, with a rough glimmering surface; internally it is glistening; specific gravity 4.2 to 4.5. It is attractable by the magnet. Without addition, it is infusible before the blow-pipe; it tinges borax of a greenish colour, which inclines to brown: according to Klaproth it is composed of

Magnetic oxide of iron.....	51
Oxide of menachine.....	45.25
Oxide of manganese.....	0.25
Silica.....	3.50

100.00

MENAGE, the government of a horse. See MANEGE.

MENAI, in botany, a genus of the pentandria monogynia class and order. Calyx three-leaved; corolla salver-shaped; berry four-celled; seeds solitary. There is but one species, *M. topiaria*, a native of South America.

MENAGOGUE, [*μῆνις* and *αἶμα*], a medicine that promotes the flux of the menses.

MENANDER, an ancient Greek poet, born at Athens in the third year of the 109th Olympiad. His introducing the new co-

medy, and refining an art which had been so gross and licentious in former times, quickly spread his name over the world. Pliny says that the kings of Egypt and Macedon sent ambassadors and fleets to bring him to their courts, but without success. Of his works, which amounted to above 100 comedies, only nine are left, besides the four which Terence borrowed from him, and hath preserved in the Roman habit. It is chiefly from Terence that most people form their judgement of Menander, the fragments that remain of him not being sufficient to enable them to do it. The ancients have said high things of Menander. Quintilian, and other old masters of rhetoric, recommend his works as true patterns of every beauty and grace in public speaking. But Caesar has left the loftiest praise of Menander, when he calls Terence only a Half-Menander. Menander died in the third year of the 122d Olympiad. Quintilian censures Menander's morals as much as he commends his writings.

MENANDER, the founder of the heresy of the Menandrians. Some say he was a disciple of Simon Magus. He taught that no person could be saved unless he were baptised in his name; and he conferred a peculiar sort of baptism, which would render those who received it immortal in the next world: exhibiting himself to the world, with the phrenzy of a lunatic, as a promised saviour, Irenaeus, Justin, and Tertullian, say, that he pretended to be one of the æons sent from the pleroma, or ecclesiastical regions, to succour the souls that lay groaning under bodily oppression; and to maintain them against the violence and stratagems of the demons that hold the reins of empire in this sublunary world; a doctrine built upon the same foundation with that of Simon Magus.

MENANDRIANS, the most ancient branch of Gnostics; thus called from Menander their chief.

MENDE, a city of France, capital of the department of Lozere, and late province of Gevaudan, thirty-five miles S.W. of Puy. Lon. 3. 35. E. Lat. 44. 31. N.

MENDICANTS, or BEGGING FRIARS, several orders of religious in Popish countries, who having no settled revenues, are supported by the charitable contributions they receive from others. This sort of society began in the thirteenth century, under Innocent III. who encouraged them, as well as his successors. The members, by the tenor of their institution, were to remain entirely destitute of all fixed revenues and possessions. But they at last increased to such an enormous multitude, that they became a burden not only to the people, but to the church itself. In a general council, therefore, assembled by Gregory X. at Lyons, in 1272, the mendicants were reduced to a smaller number, and confined to the four following societies, viz. the DOMINICANS, the FRANCISCANS, the CARMELITES, and the AUGUSTINES. See these articles. As the pontiffs allowed these four mendicant orders the liberty of travelling wherever they thought proper, of conversing with persons of every rank, of instructing the people wherever they went; and as those monks exhibited, in their manner of life, more striking marks of gravity and holiness than the other monastic societies, they arose to the summit of fame, and were regarded with the utmost veneration through all Europe. They were employed, not only in spiritual matters, but also in temporal and political affairs of the greatest consequence, in composing the differences of princes, concluding treaties of peace, concerting alliances, presiding in cabinet-councils, governing courts, levying taxes, and other occupations, absolutely inconsistent with the monastic character and profession.

MENDIP HILLS, a range of hills in Somersetshire, near Wells, abounding in lead, coals, calamine, copper, manganese, ochre, &c. On their summits are large swampy flats dangerous to cross.

MENDLESHAM, a market-town of Suffolk, twenty-five miles N. of Sudbury, and eighty-two N. E. of London. Lon. 1. 12. E. Lat. 52. 24. N.

MENDOZA, a town and territory of South America in Chili, on the E. side of the Cordilleras. Lon. 44. 7. W. Lat. 33. 25. S.

MENDRISIO, a bailiwick of Italy, now included in the department of the Lario, and district of Varese.

MENDRISIO, the capital of the above territory, lies seven miles W. of Como. Lon. 9. 0. E. Lat. 25. 45. N.

MENECRATES, a physician of Syracuse, who flourished about B. C. 360, famous for his skill in his profession, but much

more

more for his vanity. He affected the character and attributes of Jupiter; made his patients follow him in those of the other gods, and travelled through different countries escorted by these counterfeit deities. He once wrote to the king of Macedon, "Mene-crates-Jupiter to Philip, greeting. Thou reignest in Macedonia, and I in medicine; thou givest death to those who are in good health, I restore life to the sick; thy guard is composed of Macedonians; the gods themselves constitute mine." Philip answered, that he wished him restored to reason. Hearing afterwards that he was in Macedon, Philip sent for him, and invited him to an entertainment. Mene-crates and his companions were placed on rich and lofty couches; before which was an altar, covered with the first-fruits of the harvest: and whilst an excellent repast was served up to the other guests, perfumes and libations only were offered to these new gods, who, greatly affronted, hastily left the palace, and never returned.

MENETROULD, Sr. a town of France, in the department of Marne, and late province of Champagne; twenty miles N. E. of Chalons, and 110 E. of Paris.

MENES, the founder of the Egyptian monarchy, was born at This, a town of Thebais in Upper Egypt. He had three sons, viz. Athotis, who ruled after him at This and Thebes; Curudes, who in Lower Egypt founded the kingdom of Heliopolis, which was afterwards that of Diospoli; and Necherophes, who reigned at Memphis. It is supposed that Menes reigned 117 years after the birth of Peleg, son of Heber, which was the year of the dispersion of mankind throughout the earth. In building Memphis he stopped the Nile near it, by a causeway 100 furlongs broad, and caused it to run through the mountains. Sir Isaac Newton makes Menes the same with Amenophis. Others make him the same with Mizraim.

MENILITE, in mineralogy, is of a chesnut-brown colour, inclining to liver-brown: externally, it is marked with narrow stripes of reddish-brown and pearl-grey, which alternate with each other. It occurs in tuberoso imbedded masses, the surface of which is smooth and ribbed, and sometimes covered with a white crust. It is found near Paris, and is composed of

Silica.....	85.50
Alumina.....	1
Oxide of iron.....	0.50
Calcareous earth.....	0.50
Water and carbonaceous matter.....	11.00

98.50

Loss..... 1.5

100

MENIN, a town of France, in the department of the Lys, and late province of Austrian Flanders, eight miles S. E. of Ypres, and ten N. of Lisle. Lon. 3. 9. E. Lat. 50. 48. N.

MENINGES, [*menin*], two membranes that envelope the brain, which are called the pia mater and dura mater; the latter being the exterior involucre is, from its thickness, so denominated. See **ANATOMY**.

MENINX, an island in the Mediterranean, W. of the Syrtis Minor; supposed by Strabo and Polybius to be Homer's country of the Lotophagi.

MENIPPEAN SATIRE, **MENIPPEA SATIRA**, a kind of satire consisting of prose and verse intermixed; so called from Menippus. Varro wrote satires under the title of Satiræ Menippeæ; whence this satire is also called Varronian satire.

MENIPPUS, a cynic philosopher of Phœnicia. He was originally a slave, but purchased his liberty, and became one of the greatest usurers at Thebes. He wrote thirteen books of satires, which have been lost; and at last killed himself.

MENISCIUM, in botany, a genus of the cryptogamia filices, or ferns. Capsules heaped in crescents, interposed between the veins of the frond. There is but one species, *M. reticulatum*, a native of America.

MENISCUS, in optics, a glass or lens, concave on one side, and convex on the other; sometimes also called lunula. See **OPTICS**.

MENISPERMUM, **MOONSEED**; a genus of the decandria order, and diœcia class of plants; natural order, Sarmenaceæ.

†;

Male petals, four outer; eight inner; stamina sixteen: female, corolla as in the male; stamina eight, barren; berries two, one-seeded. There are thirteen species.

MENNO, **SIMON**, the founder of the sect of the Mennonites, was born at Witmartum, a village near Bolswardt in Friesland, in 1505, and died in 1561, in the duchy of Holstein. At the country-seat of a certain nobleman near the city of Oldesloe, who, moved with compassion by the perils to which Menno was exposed, and the snares that were daily laid for his ruin, took him with certain of his associates into his protection, and gave him an asylum. The writings of Menno, which are almost all written in the Dutch language, were published in folio at Amsterdam in 1651. About 1637, Menno was earnestly solicited by many of his sect, to assume the rank and functions of a public teacher; and as he considered those who made this proposal to be exempt from the fanatical phrenzy of their brethren at Munster, he yielded to their intreaties. From this period to the end of his life, he travelled from one country to another, with his wife and children, exercising his ministry, under pressures and calamities of various kinds, that succeeded each other without interruption, and constantly exposed to the danger of falling a victim to the severity of the laws. East and West Friesland, with the province of Groningen were first visited by this zealous apostle of the Anabaptists; whence he directed his course into Holland, Guelderland, Brabant, Westphalia, and the German provinces on the coasts of the Baltic, and penetrated so far as Livonia. In all these places his ministerial labours were attended with remarkable success, and added to his sect a prodigious number of followers. Hence he is considered as the chief of almost all the anabaptists. He was a man of genius, directed by a very sound judgement; he possessed a natural and persuasive eloquence, and such a degree of learning as made him pass for an oracle with the multitude. He appears also to have been a man of probity, of a meek spirit, gentle in his manners, pliable and obsequious with persons of all ranks, and extremely zealous in promoting practical religion and virtue, which he recommended both by example and precepts.

MENNONITES, a sect in the United Provinces, in most respects the same with those in other places called Anabaptists. They had their rise in 1536, when Menno Simon, who had been a Romish priest, and a notorious profligate, resigned his rank and office in the Romish church, and publicly embraced the communion of the Anabaptists. Though the Mennonites usually pass for a sect of Anabaptists, yet M. Herman Schyn, a Mennonite minister, who has published their history and apology, maintains, that they are not Anabaptists either in principle or by origin. However, nothing is more certain, than that the first Mennonite congregations were composed of different sects of Anabaptists. The Mennonites are subdivided into several sects; whereof the two principal are the Flandrians or Flemings, and the Waterlandians. The opinions, says Mosheim, that are held in common by the Mennonites, seem to be all derived from this fundamental principle, that the kingdom which Christ established upon earth is a visible church or community, into which the holy and just alone are to be admitted, and which is consequently exempt from all those institutions and rules of discipline that have been invented by human wisdom, for the correction and reformation of the wicked. This principle, indeed, was avowed by the ancient Mennonites, but it is now almost wholly renounced; nevertheless, from this ancient doctrine, many of the religious opinions, that distinguish the Mennonites from all other Christian communities, seem to be derived; in consequence of this they admit none to the sacrament of baptism, but such as are come to the full use of their reason; they neither admit civil rulers into their communion, nor allow any of their members to perform the functions of magistracy; they deny the lawfulness of repelling force by force, and consider war, in all its shapes, as unchristian and unjust; they entertain the utmost aversion to the execution of justice, and more especially to capital punishments; and they refuse to confirm their testimony by an oath.

MENOLOGIUM, or **MENOLOGY**, [from *μην*, month, and *λογος*, discourse,] is much the same as martyrology, or calendar, in the Latin. The Greek menologium is divided into the several months in the year: and contains an abridgement of the lives of the saints, with a bare commemoration of the names of such whose lives were never written.

MENSA.

MIENSA, [Lat. a table,] in law-books, a term that includes in it all patrimony, and necessities for livelihood.

MENSES, or **CATAMENIA**. See **MEDICINE**.

MENSORES, among the ancient Romans, harbingers, whose business it was to go before the emperor, and fix upon lodgings for him when he travelled into any of the provinces.

MENSORES, were also land-surveyors, architects, or appraisers of houses and public buildings.

MENSTRUUM, in chemistry, the fluid in which a solid body is dissolved. Thus water is a menstruum for salts and gums, and alcohol for resins.

MENSURATION, in general, denotes the act or art of measuring lines, superficies, and solids; and it is, next to arithmetic, a subject of the greatest use and importance, both in affairs that are absolutely necessary in human life, and in every branch of mathematics; a subject by which sciences are established, and commerce is conducted; by whose aid we manage our business, and inform ourselves of the wonderful operations in nature; by which we measure the heavens and the earth, estimate the capacities of all vessels, and the bulks of all bodies, gauge our liquors, build edifices, measure our lands, and the works of artificers, buy and sell an infinite variety of things necessary in life, and are supplied with the means of making the calculations which are necessary for the construction of almost all machines.

MENSURATION OF LINES AND ANGLES, AS APPLIED TO THE DETERMINATION OF HEIGHTS AND DISTANCES.

Every magnitude is measured by a magnitude of the same kind, called the measuring unit. Thus a line is measured by a line, an angle by an angle, a surface by a surface, and a solid by a solid. Certain magnitudes being given, that is, their measures being determined by an actual application of the measuring unit, it is the business of mensuration to shew how the measures of others, which depend on these may be obtained. By the mensuration and protraction of lines and angles, the lengths, heights, depths, and distances, of objects are determined. Accessible lines are measured by applying to them, some certain measure a number of times, as an inch, a foot, or yard; but inaccessible lines must be determined by a measurement of angles and accessible lines, by means of proper instruments, and the application of methods to be derived from the principles of geometry.

The **INSTRUMENTS** most commonly used for measuring heights and distances are, a chain, a quadrant, a square, and a theodolite.

A **CHAIN** is used for measuring those distances, or lines, which are to be given sides of triangles. The English chain is in length 4 poles, or 66 feet. It consists of 100 equal links made of iron, each link, therefore, should be 7.92 inches long. Every ten links, from one end to the middle of the chain, is distinguished by a mark made of brass.

A **QUADRANT** is used for determining vertical angles; it is made of brass or wood, the radius being of any convenient length; the circumference is divided into ninety equal parts, and these again subdivided as far as the dimensions of the quadrant will admit. Also a plummet is suspended by a thread from the centre, and two sights fixed on one of the radii. See Plate CV. fig. 1.

A **SQUARE**, or **QUADRANT**, is used for finding the proportion of the sides of a right-angled triangle. It is made of the same materials. Two of its sides are divided into a hundred equal parts. This instrument is commonly called a geometrical square. Fig. 2. It is furnished with an index and a plummet.

A **THEODOLITE** is used for measuring horizontal as well as vertical angles. It is a circle of brass divided into degrees, &c. having an index moveable above its centre, and is furnished with sights. See **THEODOLITE**.

PROBLEM 1. To find the height of an accessible object standing upon level ground.

I. By the quadrant, fig. 5. Let any convenient distance, BA, be measured by the chain, in a direct line from the foot of the perpendicular, BC, that falls from the top of the object. Then standing at the point A, let the quadrant be held as represented in the figure, so that the eye at D may see the top of the object C, along the side of the quadrant, DF. Now, if the plummet hang freely, the line FP will be perpendicular to the horizon, and therefore parallel to BC; hence the angles DPP, DCE, are equal, and their complements GFP, CDE, also equal. Thus GN, the arch of the quadrant that is remote from the eye, will shew the

number of degrees in the angle of elevation CDE. Whence, in the right-angled triangle CED, the side DE (= AB), and the angle CDE being given, we may find CE by this proportion; as radius to the tangent of CDE, so is DE to EC, to which DA, the height of the eye above the ground, being added, we get the whole height of the object. If the angle of elevation be 45° , then $DE = EC$; that is, the distance measured is equal to the height of the object above the eye.

II. By the square, fig. 6. Having measured AB as above, hold the square to the eye D, as in the figure. Then, the plummet hanging freely, the line FP cuts off from the square a small triangle similar to CDE. Therefore we shall have the proportion of DE to EC; and the former being given, the latter may be found by the rule of proportion. Let n represent the number of equal parts which the plummet cuts off from the side DH or HG, towards the end D or G. Then, 1. When the plummet cuts the side GH remote from the eye, it is $100 : n :: DE : EC$. Hence, if in this case, $DE = 100$, then $EC = n$. 2. When it passes through the opposite angle H, we have a ratio of equality, $DE = EC$. 3. When it cuts the side DH, contiguous to the eye, it is as $n : 100 :: DE : EC$. And thus, by this instrument the height is found without the assistance of trigonometrical tables.

III. By means of two staffs, fig. 7. Let there be placed perpendicularly in the ground, a longer staff, DE, likewise a shorter one FG, so as the observer may see A, the top of the height to be measured, over the ends D, F, of the staffs; let FH and DC, parallel to the horizon, meet DE and AB in H and C: then the triangles FHD, DCA, shall be equiangular; for the angles at C and H are right ones: likewise the angle A is equal to FDH; wherefore the remaining angles are also equal. Therefore as FH, the distance of the two staffs, is to HD, the excess of the longer staff above the shorter; so is DC, the distance of the longer staff from the tower, to CA, the excess of the height of the tower above the longer staff: and thence CA will be found by the rule of three. To which if the length DE be added, you will have the whole height of the tower BA. Another method may be occasionally contrived for measuring an accessible height, as by the given length of the shadow BD, fig. 8, I find out the height AB; for, let there be erected a staff, CF, perpendicularly, producing the shadow EF: then it will be as EF, the shadow of the staff, is to EC, the staff itself; so is BD, the shadow of the tower, to BA, the height. Though the plane on which the shadow falls be not parallel to the horizon, if the staff be erected on the same plane, the rule will be the same.

IV. To measure an accessible height by means of a plain mirror. Let AB, fig. 9, be the height to be measured; let the mirror be placed at C, in the horizontal plane BD, at a known distance BC: let the observer go back to D, till he see the image of the summit in the mirror, at a certain point of it, which he must diligently mark; and let DE be the height of the observer's eye. The triangles ABC and EDC are equiangular; for the angles at D and B are right angles; and ACB, ECD, are equal, being the angles of incidence and reflection of the ray AC; wherefore the remaining angles at A and E are also equal. Therefore it will be as CD is to DE, so is CB to BA.

Note 1. The observer will be more exact, if at the point D a staff be placed in the ground perpendicularly, over the top of which the observer may see a point of the glass exactly in a line betwixt him and the tower.

Note 2. In place of a mirror may be used the surface of water, which naturally becomes parallel to the horizon.

The angle C, fig. 10, being found by the geometrical quadrant, theodolite, &c. then in the triangle ABC, right-angled at B (BC being supposed the horizontal distance of the observer from the tower) having the angle C, and the side BC, the required height will be found by plane trigonometry. Thus, suppose the angle C $37^\circ 24'$, and the horizontal distance, BC, 116, then the proportion will be as R : $T \angle C :: CB : BA$, the height.

The tangent altitude $37^\circ 24'$	—	9.5834103
Log. CB 116	—	2.0644580
	Added	11.9478683
Radius	—	10.0000000

Height of the object AB 88.6887 1.9478683

Supposing the observation be made on the top of the tower, and the

the height of the tower to be known, to find the distance of any object on the plane below; it is only the converse of the former case. You may also, having the base and angles, easily find the hypotenuse AC, or how far it is from the top of the tower to the station, which is useful in many cases. See TRIGONOMETRY.

V. To measure an inaccessible height by the geometrical quadrant, &c. at two stations.—The limb BC, fig. 3, of the common surveying quadrant, ABC, is divided into 90°, and each of these farther divided into as many equal parts as the space will allow, either diagonally or otherwise. On one of the semi-diameters AC, are fitted two moveable sights; and to the centre is sometimes also fixed a label, or moveable index, AD, bearing two other sights; but in lieu of these last sights there is sometimes fitted a telescope: also from the centre there is hung a thread with a plummet; and on the under-side or face of the instrument is fitted a ball and socket, by means of which it may be put into any position. The general use of it is for taking angles in a vertical plane, comprehended under right lines going from the centre of the instrument, one of which is horizontal, and the other is directed to some visible point. But besides the parts already described, there is frequently added on the face near the centre, a kind of compartment, EF, called the quadrant, or geometrical square; and thus it comprises the last-mentioned instrument. This quadrant may be used in different situations: for observing heights or depths, its plane must be disposed perpendicularly to the horizon; but to take horizontal distances, its plane is disposed parallel thereto: again, heights and distances may be taken two ways, viz. by means of the fixed sights and plummet, or by the label. As to the manner of measuring angles by this quadrant: let there be an angle in a vertical plane, comprehended between a line parallel to the horizon HK, and the right line RA, fig. 4, coming from the sun, moon, a star, or any remarkable point of a tower or hill: now to measure this angle RAH by the quadrant, let the instrument be placed in the vertical plane, so as that its centre A may be in the angular point, and let the sights on the side CA be directed towards the object at R; then the degrees and minutes in the arch BD, cut off by the plummet or perpendicular, AD, will measure the angle RAH: for, from the make of the quadrant, BAC is a right angle; therefore BAR is likewise a right angle, being equal to it. But, because HK is horizontal, and AD perpendicular, to the horizon, HAD will be a right angle; and, therefore, BAR = HAD, and BAR = HAD = HAB = HAD = HAB, or RAH = BAD; but the arch BD is the measure of the angle BAD, consequently it is likewise the measure of RAH. The remaining arch on the quadrant, DC, is the measure of the angle RAZ, comprehended between the foresaid right line, RA, and AZ which points to the zenith; so that the arch DC measures, or is equal to, the zenith-distance = $\angle$ RAZ.

PROB. II. To find the height of an inaccessible object. Fig. 11.

I. By the QUADRANT. From any convenient station B, measure the distance BA in a direct line with the foot of the object, and at both stations A, B, take the angles of elevation DAC, DBC. The difference of these angles will give the angle ADB. Then in the triangle ABD, from the principles of trigonometry we have this proportion; as sine of ADB to sine of DAB, so is AB to DB; next, in the triangle BDC, as radius to sine of B, so is BD to DC; the height of the object as required. If the line measured be not horizontal, as CD, fig. 12, then the angle ACD must be determined.

II. By the SQUARE. At the station A, find by the square the proportion of AC to CD, and at the station B find the ratio of CD to CB; hence the ratio of AC to CB will be given, and consequently that of AB to BC, from which BC, and consequently CD, may be found. Let AB = d , and AC : CD :: m : n ; and

BC : CD :: p : q , then $CD = \frac{n q d}{m q - n p}$. If at both stations

the plummet cut the side of the square remote from the eye, $CD = \frac{n q}{q - n} \times \frac{d}{100}$. If the side contiguous to the eye,

$CD = \frac{100 d}{m - p}$. If the plummet cut the opposite angles of the

square at the first station B, then $CD = \frac{n d}{100 - n}$. If the height of

the tower, AF, fig. 12, be wanted, the angle BCF may be found with the quadrant, which being taken from the angle ACB already known, the angle ACF will remain; but the angle FAC was known before; therefore the remaining angle AFC will be known. But the side AC was supposed found by the last problem; therefore in the triangle AFC, all the angles, and one of the sides AC being known, AF, the height of the tower above the hill, may be found by trigonometry.

PROB. III. To find the distance of a given place from an inaccessible object. Fig. 13.

Let A be the inaccessible object; it is required to find its distance from the given station B. Measure any convenient distance BC, as the base of a triangle, whose vertex is at A. Then, the theodolite being placed at B, let the diameter be directed towards the station C, and the moveable index towards the object A, and the intercepted arch shews the number of degrees in the angle ABC. In like manner let the angle BCA be measured, and the angle at A will be known by subtracting their sum from 180°. Then in the triangle CAB, BA may be found by the following proportion. As sine of A to sine of C, so is BC to BA.

PROB. IV. To find the distance between two inaccessible objects. Fig. 14.

Let a proper distance, CD, be measured as the base of two triangles whose vertices are at the objects A, B. Then the angles at C and D being measured by the theodolite, we find as in the last problem the sides AD, DB; and as the included angle ADB is given, the other angles of the triangle DBA may be found by the following proportion. As the sum of AD and BD, to their difference, so is the tangent of half the sum of the angles DBA, DAB, to the tangent of half their difference. Then half the difference of these angles added to half the sum gives the greater; and half the difference subtracted from half the sum leaves the less. In the triangle BDA we now know all the angles; also two of the sides; hence we may find AB by either of these proportions. As sine of DAB to sine of ADB, so is DB to BA; or, as sine of ABD to sine of ADB, so is DA to AB.

Note. That it is not necessary that the points A, B, C, and D, be in one plane.

To measure any distance, at land or sea, by the quadrant. In this operation, the index AH, fig. 2, is to be applied to the instrument, and the instrument is to be placed horizontally at the point A, fig. 15, then let it be turned till the remote point, F, whose distance is to be measured, be seen through the fixed sights; and bringing the index to be parallel with the other side of the instrument, observe through its sights any accessible mark B, at a distance; then carrying the instrument to the point B, let the immoveable sights be directed to the first station A, and the sights of the index to the point F. If the index cut the right side of the square, as in K, the proportion will be 100 : n (BR : RK) :: BA (the distance of the stations to be measured with a chain) : AF, the distance sought. But if the index cut the declined side of the square, in the point L; then the proportion is n : 100 (LS : SB) :: BA : AG, the distance sought; which, accordingly, may be found by the rule of three. If these admeasurements be accurately laid down on paper by means of the plain scale, &c. the results will be obtained with great ease instrumentally.

MENSURATION OF SUPERFICIES.

A superficies or surface is measured by another superficies, which may be called the standard-measure, or the measuring unit, and may be a square inch, foot, yard, &c. Thus if E, fig. 16, be a square inch, foot, &c. and if, when applied to the surface ABCD, it be found that ABCD contains it a certain number of times, suppose 12, then the figure ABCD is said to contain so many square inches, feet, &c. and if any part of the figure remain above an even number of the measuring units, it is to be measured by a less unit, or estimated in fractional parts. But as such application of a measuring surface would, in almost every practical case, be very inconvenient, the same result may much more easily be obtained, by a determination of certain linear dimensions, and the application of the principles derived from geometry. See

GEOMETRY. For tables of square measure, see ARITHMETIC, and MEASURE.

PROB. I. To find the area of any parallelogram, whether it be a square, a rectangle, a rhombus, or a rhomboid. Fig. 17, 18, 19, 20.

Rule 1. Multiply the length AB, by the perpendicular breadth, or height, and the product will be the area. If two sides and an included angle of a parallelogram are given to find the area, then make use of the following rule.

Rule 2. As radius to the sine of the angle of the parallelogram, so is the product of the sides to the area. $AB \times AD \times \text{nat. sine } \angle A = \text{area.}$

PROB. II. To find the area of a triangle. Fig. 21.

Rule 1. When the base and perpendicular height are given, multiply the base by the perpendicular height, and half the product is the area. $\frac{AB \times CD}{2} = \text{area.}$

Rule 2. When two sides and their contained angle are given, multiply the two sides together, and take half their product: then say, as radius to the sine of the given angle, so is that half product to the area. $\frac{AC \times AB \times \text{nat. sine } A}{2} = \text{area.}$

Rule 3. When the three sides are given, add together the three sides, and take half their sum. Next subtract each side severally from the said half-sum, thus obtaining three remainders. Lastly, multiply the half-sum and those three remainders all together, and extract the square root of the last product for the area of the triangle.

PROB. III. To find the area of a trapezoid, fig. 22, AD, BC. Add together the two parallel sides; then multiply their half-sum by the perpendicular breadth or distance between them, and half the product will be the area. $\frac{(BC + AD) \times BE}{2} = \text{area.}$

PROB. IV. To find the area of any trapezium, fig. 23. Divide the trapezium into two triangles by a diagonal; then find the areas of these triangles, and add them together. Or else let two perpendiculars be drawn to the diagonal, from the opposite angles, the sum of these being multiplied by the diagonal; half the product shall be the area required.

PROB. V. To find the area of any irregular polygon. Fig. 24. Draw diagonals dividing the proposed polygon into trapeziums and triangles. Then find the areas of all these separately, and add them together for the content of the whole polygon.

PROB. VI. To find the area of any regular polygon. Fig. 25. Rule 1. Multiply the perimeter of the polygon, or sum of its sides, by the perpendicular drawn from its centre on one of its sides, and take half the product for the area.

Rule 2. Square the side of the polygon; then multiply that square by the area, or multiplier, set against its name in the following table, and the product will be the area.

N ^o of Sides.	Names.	Areas, or Multipliers.
3	Trigon or Triangle,	0.433013
4	Tetragon or Square,	1.000000
5	Pentagon,	1.720477
6	Hexagon,	2.598076
7	Heptagon,	3.633912
8	Octagon,	4.828427
9	Nonagon,	6.181824
10	Decagon,	7.694209
11	Undecagon,	9.365640
12	Dodecagon,	11.196152

Note. The numbers in the above table express the areas of the regular polygons, when the linear side is unity.

PROB. VII. To find the diameter and circumference of a circle, the one from the other. Fig. 26.

As 7 to 22, so is the diameter to the circumference. Or, as 1 to 3.1416, so is the diameter to the circumference. $AB \times 3.1416 =$

circumference. The ratio of the diameter to the circumference is found by the indefatigable Mr. Abraham Sharp to be as 1 to 3.1415926535897932384626433832795028841971693993751058209749445923078164052 + which is true to the last figure, the value of which amounts to only the ten hundred thousand billionth part of the following very minute fraction

parts of unity, a degree of exactness millions of times more than sufficient for any mathematical question.

PROB. VIII. To find the length of any arc of a circle.

Rule. Multiply the degrees in the given arc by the radius of the circle, and the product again by the decimal .01745 for the length of the arc.

PROB. IX. To find the area of a circle.

Rule 1. Multiply half the circumference by half the diameter. Or multiply the whole circumference by the whole diameter and take $\frac{1}{4}$ of the product for the area.

Rule 2. Square the diameter, and multiply that square by the decimal .7854, for the area.

PROB. X. To find the area of a circular ring.

Rule. Take the difference between the areas of the circles, as found by the last problem. Or, which is the same thing, subtract the square of the least diameter from the square of the greater, and multiply their difference by .7854.

PROB. XI. To find the area of the sector of a circle. Fig. 27.

Rule 1. Multiply the radius, or half-diameter, by half the arc of the sector, for the area. Or, multiply the whole diameter by the whole arc of the sector, and take $\frac{1}{4}$ of the product.

Rule 2. As 360 is to the degrees in the arc of the sector, so is the area of the whole circle to the area of the sector. This is evident, because the sector is proportional to the length of the arc, or to the degrees contained in it.

PROB. XII. To find the area of a segment of a circle. Fig. 28.

Rule. Find the area of the sector, having the same arc with the segment, by the last problem. Find also the area of the triangle, formed by the chord of the segment and the two radii of the sector. Then take the sum of these two for the answer, when the segment is greater than a semicircle: or take their difference for the answer, when it is less than a semicircle. This is evident by inspection.

PROB. XIII. To find the area of an ellipse.

Rule. Multiply the product of the transverse and conjugate axis by the decimal .7854, the result will be the area.

PROB. XIV. To find the area of a parabola, its base and height being given.

Rule. Multiply the base by the height, and $\frac{2}{3}$ of the product will be the area.

OF LAND-SURVEYING.

The most useful instruments for surveying are the CHAIN, PLANE TABLE, and THEODOLITE, see those articles. A statute acre of land being 160 square poles, the chain is made 4 poles, or 66 feet in length, that 10 square chains, or 100,000 square links, may make a square acre. This chain is commonly called Gunter's chain. The plane table is used for drawing a plan of the field, and taking such angles as are necessary to calculate its area. It is of a rectangular form, and surrounded with a moveable frame, by means of which, a sheet of paper may be fixed to its surface. It is furnished with an index, by which a line may be drawn upon the paper in the direction of any object in the field; and with scales of equal parts; by which such lines may be made proportional to the distances of the objects from the plane table, when measured by the chain; and its frame is divided into degrees for observing angles. But the theodolite is the best instrument for taking angles.

PROB. 1. To measure a field with the chain.

Let $AmbCDq$, fig. 29, represent the field to be measured. Let it be resolved into the triangles Amb , ABD , BCD , AqD . Let all the sides of the large triangles ABD , BCD , and the perpendiculars of the small ones, Amb , AqD , from their vertices m , q , be measured by the chain, and the areas calculated: their amount is the area of the whole. But if, on account of the curvature of its sides, the field cannot be wholly resolved into triangles, then either a straight line may be drawn over the curve side, so that the parts cut off from the field, and those added to it, may

may be nearly equal; or, without going beyond the bounds of the field, the curvilinear spaces may be taken so small, that they may be considered as a number of trapezoids and measured accordingly.

PROB. II. To measure a field with the plane table.

Let ABCDE, fig. 30, be the field, and let the plane table be fixed about the middle of it, as at F, and its distances FA, FB, FC, &c. from the several corners of the field be measured with the chain. Let the index be directed from any point assumed on the paper, to the points A, B, C, &c. successively; and the lines Fa, Fb, Fc, &c. drawn in these directions. Let the angles which these lines contain be observed, and the lines themselves be made proportional to the distances measured, by means of a scale of equal parts. Then their extremities being joined, there will be formed a figure *abcde*, similar to that of the field; and the area of the field may be found, by calculating the areas of the several triangles of which it consists.

PROB. III. To plan a field from a given base-line. Fig. 31.

Let two stations A, B, be taken within the field, but not in the same straight line with any of its corners, and let their distance be measured. Then the plane table being fixed at A, and the point *a* assumed on its surface directly above A; let its index be directed to B, and the straight line *ab* drawn along the side of it, to represent AB; also let the index be directed from *a* to an object at the corner C, and an indefinite line drawn in that direction; and so of every other corner successively. Next let the plane table be set at B, so that *b* may be directly over B; and *ba* in the same direction with BA; and let a straight line be drawn from *b*, in the direction BC; then *c* the intersection of that line with the former, it is evident, will determine the position of the point C, and the triangle *abc*, on the paper, will be similar to ABC in the field. In this manner are all the other angular points to be determined; and these being joined, there will be formed a representation of the field. If the angles at both stations were observed, as the distance between them is given, the area of the field might be calculated from these data; but the operation is too tedious for practice. It is usual, therefore, to measure such lines in the figure that has been constructed, as will render the calculation easy. The reader who wishes for further information on this subject will find ample satisfaction from Mr. Crocker's treatise on surveying. It is here also to be observed the work of artificers, as carpenters, glaziers, &c. as far as surfaces are concerned, are to be estimated by the rules given for the mensuration of superficies.

OF THE MENSURATION OF SOLIDS.

By the mensuration of solids are determined the spaces included by contiguous surfaces, and the sum of the measures of these including surfaces, is the whole surface or superficies of the body. The measure of a solid, is called its solidity, capacity, or contents. Solids are measured by cubes, whose sides are inches, or feet, or yards, &c. and hence the solidity of a body is said to be so many cubic inches, feet, yards, &c. as will fill its capacity, or space, or another of equal magnitude. The least solid measure is the cubic inch, other cubes being taken from it, according to the proportion in the following Table:

1728	cubic inches,	make	1 cubic foot.
27	cubic feet,		1 cubic yard.
166 $\frac{2}{3}$	cubic yards,		1 cubic pole.
64000	cubic poles,		1 cubic furlong.
512	cubic furlongs,		1 cubic mile.

PROB. I. To find the superficies of a prism. Fig. 32.

Rule. Multiply the perimeter of one end by the length or height of the solid, and the product will be the surface of all the sides. To which add also the areas of the two ends when required.

Note. The cube and parallelopiped are here to be understood as coming under the general denomination of a prism.

PROB. II. To find the surface of a pyramid or cone. Fig. 34, 35.

Rule. Multiply the perimeter of the base by the slant height, or length of the side, and half the product will be the surface of the sides, or the sum of the areas of all the triangles which form it. To which add the area of the end, or base, if required.

PROB. III. To find the surface of the frustum of a pyramid or cone, being the lower part, when the top is cut off by a plane parallel to the base.

Rule. Add together the perimeters of the two ends, and multiply their sum by the slant height, taking half the product for the answer.

PROB. IV. To find the solid content of any prism or cylinder. Fig. 32, 33.

Rule. Find the area of the base, or end, whatever the figure may be: and multiply it by the length of the prism or cylinder, for the solid content.

Note. The cube and parallelopiped are here to be considered as prisms, as in Prob. I.

PROB. V. To find the content of any pyramid or cone. Fig. 34, 35.

Rule. Find the area of the base, and multiply that area by the perpendicular height: then take $\frac{1}{3}$ of the product for the content.

PROB. VI. To find the solidity of the frustum of a cone or pyramid.

Rule. Add into one sum, the areas of the two ends, and the mean proportional between them, that is the square root of their products: and $\frac{1}{2}$ of their sum will be a mean area; which being multiplied by the perpendicular height, or length of the frustum, will give its content.

PROB. VII. To find the surface of a sphere or any segment of it. Fig. 36.

Rule 1. Multiply the circumference of the sphere by its diameter, and the product will be the whole surface of it.

Rule 2. Multiply the square of the diameter by 3.1416, and the product will be the surface. Thus the surface of the earth, whose diameter is 7954 English miles, will be found to contain very nearly 199 millions of English square miles. If the surface of a segment or frustum be required. Multiply the whole circumference by the height of the part required.

PROB. VIII. To find the solidity of a sphere or globe. Fig. 36.

Rule 1. Multiply the surface by the diameter, and take $\frac{1}{3}$ of the product for the content.

Rule 2. Multiply the cube of the diameter by .5236 for the content.

PROB. IX. To find the solid content of a spherical segment. Fig. 36.

Rule 1. From three times the diameter of the sphere, take double the height of the segment; then multiply the remainder by the square of the height, and the product by the number .5236 for the content.

Rule 2. To three times the square of the radius of the segment's base, add the square of its height; then multiply the sum by the height, and the product by .5236 for the content.

PROB. X. To find the solid content of a spheroid.

Note. A spheroid is a solid formed by the revolution of a semiellipse about either of its axes. Fig. 37.

Rule. Multiply the square of the revolving axis by the fixed axis, and the product again by .5236, and the result is the solidity required.

PROB. XI. To find the solid content of the middle-frustum of a spheroid, the ends being supposed circular, or parallel to the revolving axis. Fig. 37.

Rule. To twice the square of the middle-diameter, add the square of the diameter of either of the ends, and this sum multiplied by the length of the frustum, and the product again by .2618 will give the solidity; where note, that .2618 is $\frac{1}{4}$ of 3.1416.

PROB. XII. To find the solid content of a parabolic conoid, or paraboloid. Fig. 38.

Note. A parabolic conoid is a solid formed by the revolution of a semiparabola about the axis, or principal diameter.

Rule. Multiply the area of the base by half the altitude, and the product will be the content.

PROB. XIII. To find the solid content of the frustum of a paraboloid, when its ends are perpendicular to the axis of the solid. Fig. 38.

Rule. Multiply the sum of the squares of the diameters of the two ends, by the height of the frustum, and the product again by

3927, and it will give the solidity; where it may be observed that 3927 is $\frac{1}{8}$ of 3.1416.

PROB. XIV. To find the solid content of a parabolic spindle. **Fig. 39.**

Note. A parabolic spindle is a solid generated by the revolution of a parabola about its base or ordinate.

Rule. Multiply the area of the middle-section by the length, and $\frac{8}{3}$ of the product is the solidity required.

PROB. XV. To find the solid content of the middle-frustum of a parabolic spindle. **Fig. 39.**

Rule. Add into one sum eight times the square of the middle-diameter, three times the square of the end-diameter, and four times the product of the middle and end diameters; multiply the sum by the length, and by the number .05236, and the result will be the solidity required.

OF GAUGING.

By Gauging is commonly understood the art of measuring the capacities of all kinds of vessels, and determining the quantities of fluids, or other matters contained in them. These are principally pipes, tuns, barrels, &c. also hacks, coolers, vats, &c. The solid contents of vessels of the most common figures may be found from the preceding rules in feet, or inches, &c. and thence their contents in liquid measure may be found, by considering that 231 cubic inches make a wine-gallon, and 282 inches an ale-gallon. See **MEASURE**. It has been usual to divide casks into four varieties of forms, denominated as follows from the supposed resemblance they bear to the frustums of solids of the same names: viz.

1. The middle-frustum of a spheroid.
2. The middle-frustum of a parabolic spindle.
3. The two equal frustums of a paraboloid.
4. The two equal frustums of a cone.

The contents of casks of these different forms, may be found from the rules already given, for the mensuration of the figures which the casks are supposed to resemble the most; and thence their content in gallons, or pints, by dividing the content in cubic inches by the number of cubic inches contained in the respective measures. The form that may be assigned to a cask, it is evident, is altogether hypothetical; and therefore it seldom happens, that the content, as found by experiment, agrees exactly with that found by calculation. The calculations are also very troublesome and inconvenient, and for this reason excise-officers generally determine the contents of casks by means of scales constructed for the purpose. See **GAUGING-ROD**. Dr. Hutton, in his mensuration, gives the following general rule, which he says applies to all casks commonly to be met with; and at the same time is quite easy and very accurate, as having been often verified and proved by filling the casks with a true-gallon-measure.

Rule. Add into one sum, 39 times the square of the bung-diameter, 24 times the square of the head-diameter, and 26 times the product of these diameters; multiply the sum by the length of the cask, and the product by .00034, and this last product divided by 9 will give the content of the cask in wine-gallons, and by 11 will give the content in ale-gallons. The contents of timber, stone, or other bodies, may be obtained by a proper application of the preceding rules. But for a complete system of Mensuration we refer the reader to Dr. Hutton's very excellent treatise where he will find every thing requisite on this useful branch of science.

MENTHA, **MINT**, a genus of the gymnospermia order, and didynamia class of plants; natural order, Verticillate. Corolla nearly equal, quadriid, one segment broader & marginate; stamina erect, standing asunder. There are nineteen species; but not more than three are cultivated for use, namely, the viridis, or common spearmint, the pipërta or peppermint, and the pulegium or pennyroyal. These are well known, and are very easily propagated by cuttings, parting the roots, or by offsets. For culinary purposes, the spearmint is preferred to the other two; but for medicine, the peppermint and pennyroyal have almost entirely superseded it. A conserve of the leaves is very grateful; and the distilled waters both simple and spiritibus, are universally thought pleasant. Dr. Lewis says, that dry mint digested in rectified spirits of wine, gives out a tincture which appears by day-light of a fine dark green, but by candle-light of a bright red-colour. The fact is, that a small quantity of this tincture is green either by day-light

or by candle-light, but a large quantity of it seems impervious to common day-light; however, when held betwixt the eye and a candle, or between the eye and the sun, it appears red. The virtues of mint are those of a warm stomachic, capable of relieving colicky pains, and the gripes, to which children are subject. It likewise proves an useful cordial in languors and faintness. When prepared with rectified spirit, the whole virtues of the mint are extracted. The expressed juice contains only the astringent and bitter parts, together with the mucilaginous substance common to all vegetables. The peppermint is much more pungent than the others. Pennyroyal has the same general characters with the mint, but is more acrid and less agreeable when taken into the stomach. It was long held in great esteem in hysteric complaints, and suppressions of the menses, but its effects are trifling. It is observable, that both water and rectified spirit extract the virtues of this herb by infusion, and likewise elevate the greatest part of them by distillation.

MENTON, a town of France in Italy, in the department of the Maritime Alps, and duchy of Monaco: six miles N. E. of Monaco.

MENTOR, in fabulous history, a faithful friend of Ulysses; a son of Hercules.

MENTZ, a late archbishopric and electorate of Germany, on the banks of the Mayne. It was bounded by the electorate of Trier on the W. the Palatinate on the S. Franconia on the E. and the Wetteraw on the N. being about 60 miles long from N. E. to S. W. and about 50 broad. The chief trading towns are, Mentz, Hockheim, Bingen, Elfeld, and Weisbaden.

MENTZ, a town of Germany in the Lower Rhine. Lon. 8. 20. E. Lat. 49. 51. N.

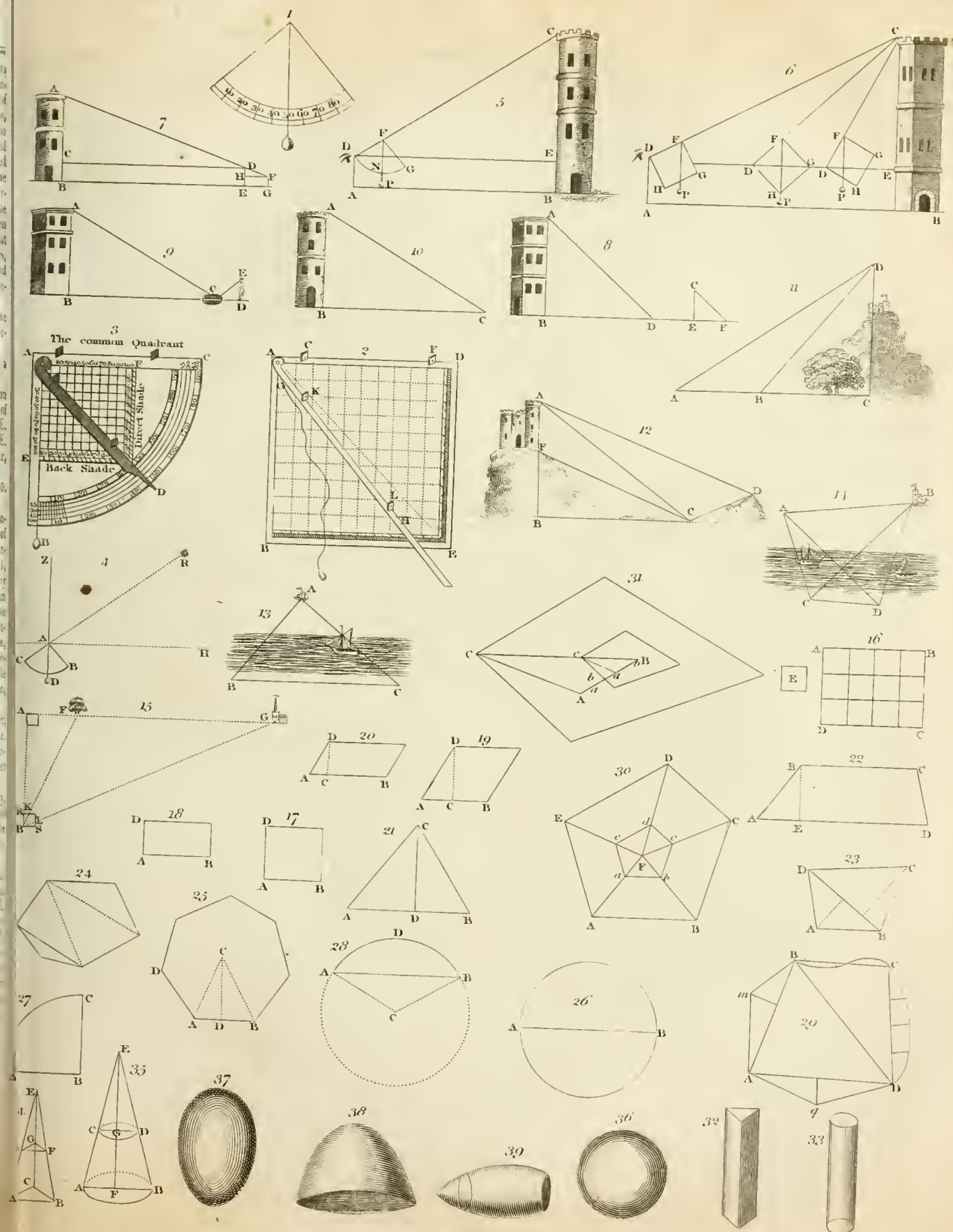
MENTZEL, **CHRISTIAN**, a native of Furstenwald, in Brandenburg, celebrated for his skill in medicine and botany, in pursuit of which he travelled through many countries. He had correspondents in the most distant parts of the world. He died A. D. 1701, about the 79th year of his age. He was a member of the Academy des Curieux de la Nature. His works are, 1. Index Nominum Plantarum, printed at Berlin in folio, 1696; and reprinted with additions in 1715, under the title of Lexicon Plantarum Polyglotton universale. 2. A Chronology of China, in German; Berlin, 1696, in 4to. The following MSS: of his composition are preserved in the royal library at Berlin: 1. Sur l'Histoire Naturelle du Brasil; four vols. 2. Sur les Fleurs et les Plantes du Japon, with coloured drawings; 2 vols. fol.

MENTZELIA, in botany, a genus of the monogynia order, and polyandria class of plants; natural order, Calycanthaceæ. Calyx five-leaved; corolla five-petalled; capsule interior, cylindric, many-seeded. There is but one species, viz. *M. aspera*, an annual plant, native of America.

MENUTHIAS, or **MENUTHIASDE**, in ancient geography, an island adjoining to the N. E. of the promontory Prasum of Ethiopia beyond Egypt. Some take it to be Madagascar, or the island St. Laurence. Isaac Vossius will have it to be Zanzibar.

MENYANTHES, **MARSH-TREFOIL**, or **BUCKBEAN**; a genus of the monogynia order, and pentandria class of plants; natural order, Preciæ. Corolla hairy; stigma bifid; capsule one-celled. There are five species. *M. nymphoides*, fringed buckbean, or water-lily, has a long, stringy, perennial root, the stems are round, smooth, and jointed, producing opposite thick leaves, floating on the surface of the water. It is a native of England and several parts of Europe, growing in ditches and slow streams; it flowers from June to August. The Highlanders esteem an infusion of the leaves a good stomachic. Dr. Withering prescribes it in rheumatism and dropsies; a drachm of them in powder purges and vomits, and destroys worms. In a scarcity of hops, the plant is used as a substitute in the north of Europe. The powdered roots are sometimes used in Lapland instead of bread, but they are unpalatable. From the Upsal Experiments it appears, that though goats eat it, sheep often will not. Cows, horses, and swine, refuse it. Dr. Lewis recommends it, as an efficacious aperient, deobstruent, and gentle laxative. It has great reputation in scurvy and scrophula; and its good effects are warranted by experience. Inveterate cutaneous diseases have been removed by an infusion of the leaves, drank to the quantity of a pint a-day, at proper intervals, and continued for some weeks. Boerhaave relates, that he was relieved of the gout by the juice mixed with whey.

MENZAIAH,



MENZAIAH, or **MENZALEH**, a large lake of Egypt, anciently called Tanis, parallel with the Mediterranean, and divided from it by a narrow slip of land; 60 miles long, and from two to twelve broad, occasionally overflowed by the Nile and by the Sea, which render its waters soft in summer and brackish or salt in winter.

MENZALEH, a town of Egypt, near the above lake 20 miles S. S. E. of Damietta, and 73 N. N. E. of Cairo.

MENZICOFF, **ALEXANDER**, a Russian Prince, who was originally an apprentice to a pastry-cook near the palace of Moscow. By a fortunate circumstance he was drawn from that situation in early life, and placed in the household of Peter the Great. Having made himself master of several languages, and being formed for war and for business, he first rendered himself agreeable, and afterwards became necessary, to his master. He assisted Peter in all his projects; and was rewarded with the government of Ingria, the rank of prince, and the title of major-general. He signalized himself in Poland in 1708 and 1709; but in 1713 he was accused of embezzling the public money, and fined in 300,000 crowns. The Czar remitted the fine; and having restored him to favor, gave him the command of an army in the Ukraine in 1719, and sent him as his ambassador into Poland in 1722. Constantly employed about the means of preserving his influence after the death of his master, who was then evidently on the decline, Menzikoff discovered the person to whom the Czar intended to leave the succession. The Emperor was highly offended, and his penetration cost him the principality of Plescoff. Under Catharine I. however, he was higher in favour than ever; because, on the death of the Czar in 1725, he was active in bringing different parties in Russia to agree to her succession. This princess was not ungrateful. In appointing her son-in-law Peter II. to be her successor, she commanded him to marry the daughter of Menzikoff, and gave the Czar's sister to his son. The parties were actually betrothed; and Menzikoff was made duke of Cozel and grand steward to the Czar. But this summit of elevation was the prelude to his fall. The Dolgoroukis, favourites of the Czar, had the influence to procure his banishment, together with that of his family, to one of his own estates at the distance of 250 leagues from Moscow. But having the imprudence to leave the capital with great parade, a party of soldiers was sent after him, who reduced him to the rank and dress of a peasant, and carried him and his family in waggons to Siberia; where after losing his wife in the journey, and one of his daughters, he died Nov. 2, 1729. His surviving son and daughter, after seeing their persecutor Dolgorouki degraded and banished to the same inhospitable climate, were recalled to Moscow by the Empress Anna; and left Dolgorouki in possession of their cottage. Young Menzikoff was made captain of the guards, and received the fifth part of his father's possessions. His sister was appointed maid of honour to the Empress, and afterwards married to great advantage.

MEPHEN, a town of Germany, in Westphalia, on the Embs, thirty miles N. W. of Munster. Lon. 7. 36. E. Lat. 52. 45. N.

MEPHITIC, or **MEPHITICAL**, a word applied to any kind of noxious vapour; and lately to azote or nitrogen gas.

MEPHITIS, a noisome or pestilential exhalation.

MEPHITIS, the name of the goddess, who presided over the pestilential vapours, and was worshipped in ancient Italy, particularly at Cremona, and by the Hirpini.

MEQUENZLA, a town of Spain in Arragon, 39 miles N. W. of Tortosa, and 180 N. E. of Madrid. Lon. 0. 29. E. Lat. 41. 26. N.

MEQUINEZ, or **MIQUINEZ**, the northern capital of the empire of Morocco, sixty-six miles W. of Fez. Lon. 6. 6. W. Lat. 33. 16. N.

MERAN, a trading town in the Tirolese, on the Adige; two miles S. E. of Tirol. Lon. 11. 18. E. Lat. 46. 44. N.

MERAZION, or **MARKET-JEW**, a town of Cornwall, three miles E. of Penzance, and 283 W. by S. of London. Lon. 5. 30. W. Lat. 50. 12. N.

MERCATOR, **GERARD**, one of the most celebrated geographers of his time, was born at Ruremonde in 1512. He applied himself with such industry to geography and mathematics, that he is said to have often forgot to eat and drink. The emperor Charles V. had a particular esteem for him, and the duke of Juliers

made him his cosmographer. He composed a chronology, some geographical tables, an Atlas, &c. engraving and colouring the maps himself. He died in 1594. His method of laying down charts is still used, and bears the name of Mercator's charts.

MERCATOR, **NICHOLAS**, F. R. S. an eminent mathematician in the 17th century, born at Holstein. He came to England about 1660, where he lived many years. He endeavoured to reduce astrology to rational principles, as appeared from a MS. of his in the possession of William Jones, Esq. He published several works, particularly *Cosmographia*. He gave the quadrature of the hyperbole by an infinite series; which was the first appearance in the learned world of a series of this sort drawn from the particular nature of the curve, and that in a manner very new and abstracted.

MERCATOR'S SAILING. See **NAVIGATION**.

MERCATORUM FESTUM, a festival kept by the Roman merchants on the 15th of May in honour of Mercury, who presided over merchandise.

MERCHANT, a person who buys and sells commodities in gross, or deals in exchanges; or that traffics in the way of commerce, either by importation or exportation. Formerly every one who was a buyer or seller in the retail way, was called a merchant, as they are still both in France and Holland; but here shopkeepers, or those who attend fairs or markets, have lost that appellation. Previous to a person's engaging in a general trade, and becoming an universal dealer, he ought to treasure up such a fund of useful knowledge, as will enable him to carry it on with ease to himself, and without risking such losses as great ill-concerted undertakings would naturally expose him to. A merchant should therefore be acquainted with the following parts of commercial learning. He should write properly and correctly. 2. Understand all the rules of arithmetic that have any relation to commerce. 3. Know how to keep books of double and single entry, as journals, a ledger, &c. 4. Be expert in the forms of invoices, accounts of sales, policies of insurance, charter-parties, bills of lading, and bills of exchange. 5. Know the agreement between the money, weights, and measures, of all parts. 6. If he deals in silk, woollen, linen, or hair-manufactures, he ought to know the places where the different sorts of merchandizes are manufactured, in what manner they are made, what are the materials of which they are composed, and from whence they come, the preparations of these materials before working up, and the places to which they are sent after their fabrication. 7. He ought to know the lengths and breadths which silk, woollen, or hair-stuffs, linen, cottons, fustians, &c. ought to have according to the several statutes and regulations of the places where they are manufactured, with their different prices, according to the times and seasons; and if he can add to his knowledge the different dyes and ingredients which form the various colours, it will not be useless. 8. If he confines his trade to that of oils, wines, &c. he ought to inform himself particularly of the appearances of the succeeding crops, in order to regulate his disposing of what he has on hand; and to learn, as exactly as he can, what they have produced when got in, for his direction in making the necessary purchases and engagements. 9. He ought to be acquainted with the sorts of merchandize found more in one country than another, those which are scarce, their different species and qualities, and the properest method for bringing them to a good market, either by land or sea. 10. To know which are the merchandizes permitted or prohibited as well on entering, as going out of, the kingdoms or states where they are made. 11. To be acquainted with the price of exchange, according to the course of different places, and what is the cause of its rise and fall. 12. To know the customs due on importation or exportation of merchandizes, according to the usage, the tariffs, and regulations, of the places to which he trades. 13. To know the best manner of folding up, emballing, or tuning, the merchandizes for their preservation. 14. To understand the price and condition of freighting and insuring ships and merchandize. 15. To be acquainted with the goodness and value of all necessaries for the construction and repairs of shipping, the different manner of their building, what the wood, the masts, cordage, canons, sails, and all requisites, may cost. 16. To know the wages commonly given to the captains, officers, and sailors, and the manner of engaging with them. 17. He ought to understand the foreign languages, or at least as many of them as he can attain to; these may be reduced to four, viz. the Spanish, which is used not only in

Spain, but on the coast of Africa, from the Canaries to the Cape of Good Hope; the Italian, which is understood on all the coasts of the Mediterranean, and in many parts of the Levant; the German, which is understood in almost all the northern countries; and the French, which is now become almost universally current. 18. He ought to be acquainted with the consular jurisdiction, with the laws, customs, and usages, of the different countries he does or may trade to; and in general all the ordinances and regulations, both at home and abroad, that have any relation to commerce. 19. Though it is not necessary for a merchant to be very learned, it is proper that he should know something of history, particularly that of his own country, geography, hydrography, or the science of navigation; and that he is acquainted with the discoveries of the countries in which trade is established, in what manner it is settled, of the companies formed to support those establishments, and of the colonies they have sent out. All these branches of knowledge are of great service to a merchant who carries on an extensive commerce; but if his trade and his views are more limited, his learning and knowledge may be so too; but a material requisite for forming a merchant is, his having on all occasions a strict regard to truth, and his avoiding fraud and deceit as corroding cankers that must inevitably destroy his reputation and fortune. Trade is a thing of so universal a nature, that it is impossible for the laws of England, or of any other nation, to determine all the affairs relating to it; therefore all nations, as well as Great Britain, shew a particular regard to the law-merchant, which is a law made by the merchants among themselves: however, merchants and other strangers are subject to the laws of the country in which they reside. Foreign merchants are to sell their merchandize at the port where they land, in gross, and not by retail; and they are allowed to be paid in gold or silver-bullion, in foreign coin or jewels, which may be exported. If a difference arises between the king and any foreign state, the merchants of that state are allowed six months time to sell their effects and leave the kingdom, during which time they are to remain free and unmolested in their persons and goods. See TRADE, LAW, ARITHMETIC, BOOK-KEEPING, INSURANCE, &c.

MERCIA, one of the seven kingdoms founded in England by the Saxons. Though the latest formed, it was the largest of them all, and grew by degrees to be the most powerful. On the N. it was bounded by the Humber and the Mersey, which separated it from the kingdom of Northumberland; on the E. by the sea, and the territories of the East Angles and Saxons; on the S. by the Thames; and on the W. by the Severn and Dee. It comprehended about 17 modern counties.

MERCURIALIS, **MERCURY**; in botany, a genus of the enneandria and order, diœcia class of plants; natural order Tricocœa. Calyx of the male tripartite; corolla, none; three-parted; antherie globular, twin; female calyx three-parted; corolla none; styles two; capsule bicocous, two-celled, one-seeded. It has six species.

MERCURIFICATION, in metallurgic chemistry, is the obtaining the mercury from metallic minerals in its fluid form.

MERCURY, **MERCURIUS**, in the heathen mythology, the son of Jupiter and Maia, the daughter of Atlas. No one of all the heathen divinities had so many functions allotted to him as this god; he had constant employment both day and night, having been the common minister and messenger of all Olympus; particularly of his father Jupiter, whom he served with indefatigable labour, and sometimes indeed in a capacity of no very honourable kind. Lucian is very pleasant upon the multitude of his avocations; and, according to the emperor Julian, Mercury was no hero, but rather one who inspired mankind with wit, learning, and the ornamental arts of life, than with courage. He was also the pattern of trade, and even of fraud and theft.

MERCURY, γ in astronomy. See ASTRONOMY.

MERCURY, or **QUICKSILVER**, a metal so remarkable for its fluidity, that it requires the intense cold of 39 degrees below 0, of Fahrenheit's scale, to render it solid. Its colour is white, and similar to that of silver; hence the names hydrargyrus, argentum vivum, and quicksilver, by which it has been known in all ages. It has neither taste nor smell. It possesses much brilliancy; and when its surface is not tarnished, makes a very good mirror. Its specific gravity is 13.568. When it is heated to about 600° of Fahrenheit, it boils and is converted into vapour, which being condensed,

resumes its liquid state. When mixed with other metal, it may by this means be purified. Mercury is not altered by being kept under water. When exposed to the air, its surface is gradually tarnished, and covered with a black powder, owing to its combining with the oxygen of the atmosphere. But this change goes on very slowly, unless the mercury be either heated or agitated. By either of these processes, the metal is converted into an oxide: by the last, into a black-coloured oxide; and by the first, into a red-coloured oxide. Hot sulphuric acid dissolves mercury, and forms a white salt, which when washed with boiling water, becomes a yellow substance called turbith mineral. Nitric acid also dissolves it either with or without heat; in the former case it combines with more oxygen. The oxides of mercury are all reduced by heat alone, without the addition of any combustible substance, and afford oxygen gas. Gold, silver, tin, and other metals, are dissolved by mercury, and if properly combined with it in sufficient quantity, the mercury loses its fluidity, and forms an amalgam. It is observed, that a solid amalgam of lead, and another of bismuth, have the property of becoming fluid. Mercury is the basis of a new fulminating compound. The oxides precipitated from their combination with acids, by the alkalies or earths, especially by ammonia or lime, are capable, when combined with sulphur, of detonating. If triturated with one-sixth part of their weight of sulphur, on being exposed gradually to heat, they explode with considerable force. These materials must be prepared and dried in the open air, and exposed to the light. Mr. Howard has discovered another fulminating powder of mercury, possessed of still greater powers. It is prepared by dissolving 100 grains of mercury in one ounce and a half of nitric acid: the solution, when cold, is to be poured upon two ounces of alcohol: a moderate heat is then to be applied, till an effervescence is excited, when a precipitate is formed, which is to be immediately collected on a filter, well washed with distilled water, and carefully dried in a heat not much exceeding that of a water-bath. From 100 grains of mercury, between 120 and 130 grains of dry precipitate are formed. This preparation fulminates very strongly. If two or three grains only be laid on an anvil, and struck smartly with a hammer, it explodes with a loud report. Four grains will occasion indentation in the hammer and anvil. This powder is found to consist of oxide of mercury, combined with oxalic acid and nitrous etherized gas, the two latter being produced during its formation, by the action of the nitric acid on the alcohol. Its explosion and force are supposed to be owing to the oxygen present suddenly combining with the carbon and hydrogen, forming watery vapour and carbonic acid: azotic gas is also discharged, and much caloric is evolved, so as to volatilize the mercury: to this, conversion of the mercury into vapour, Mr. Howard ascribes its great explosive force. Mercury does not combine with carbon or hydrogen; but it unites readily with sulphur and with phosphorus. When two parts of sulphur and one of mercury are triturated together in a mortar, the mercury gradually disappears, and the whole assumes the form of a black powder, formerly called athiops mineral. It is scarcely possible by any process to combine the sulphur and mercury so completely, that small globules of the metal may not be detected by a microscope. When mercury is added slowly to its own weight of melted sulphur, and the mixture is constantly stirred, the same black compound is formed, and is found to be composed of three ingredients, namely, mercury, sulphur, and sulphureted hydrogen. Such compounds are at present denominated by chemists hydrogenous sulphurets. Athiops mineral of course is an hydrogenous sulphuret of mercury. When this substance is heated, part of the sulphur is dissipated, and the compound assumes a deep violet colour. When heated red-hot, it sublimes; and if a proper vessel be placed to receive it, a cake is obtained of a fine red colour. This cake was called cinnabar; and when reduced to a fine powder, is well known in commerce under the name of vermilion. It is composed of mercury and sulphur, or, is a sulphuret of mercury. This metal is found sometimes in a native state, as in the mines of India, South America, Hungary, &c.; but more generally mixed with other metals, stone, or other substances, from which it is extracted by various processes. In consequence of its uniting with most of the metals, it is employed in considerable quantities, for extracting gold and silver from the earthy matters with which they are mixed. The amalgam, or incorporation of mercury with gold, serves

serves to gild copper or silver, so that these metals assume the appearance of gold: when united with tin, it is employed in the manufacture of looking-glasses, or mirrors. Independently of its utility in various manufactures, mercury is extensively employed in medicine; and, though it is the most violent of poisons, when taken inadvertently in too large quantities, yet, if judiciously administered, it has frequently effected a cure, after all other medicines had failed to procure relief. It ought not however to be administered, except by a judicious physician, and then with due precaution. For the affinities of mercury, see CHEMISTRY.

MERCURY, in heraldry, a term used in blazoning by planets, for the purple colour used in the arms of sovereign princes.

MERCURY, in botany. See MERCURIALIS.

MERCY, a virtue that inspires us with compassion for our brethren, and inclines us to give them assistance in their necessities. Mercy is also taken for those favours and benefits that we receive either from God or man, particularly in the way of forgiveness of injuries or of debts.

MERETRIX, among the Romans, differed from the prostibula. The prostibulae were common courtezans, with bills over their doors, signifying their profession, and were ready at all times to entertain customers; whereas the meretrices entertained none but at night. The meretrices differed in their dress from the matrons; the former wore the toga and short tunics, like those of the men: the latter wore the palla and the stola of such a length as to reach to their feet.

MERGUS, in ornithology, the MERGANSER, a genus of birds of the order, anseres. Bill serrated, slender, and hooked at the point; nostrils small, oval, and near the middle of the bill; feet four-toed, the outer one before longer than the middle one. There are ten species.

M. CUCULLATUS, or CRESTED DIVER of Catesby, has a globular crest, white on each side; and the body is brown above and white below. This elegant species inhabits North America. It appears at Hudson's Bay about the end of May and builds close to the lakes. See Plate CXX.

M. MERGANSER, the GOOSANDER, weighs 4lb. Its length is 2 feet 4 inches; the breadth 3 feet 4. The bill is 3 inches long, narrow, and finely toothed or serrated. The dun diver, or female, is less than the male: the head and upper part of the neck are ferruginous; the throat white: the feathers on the hind part are long, and form a pendent crest. The goosander seems to prefer the more northern situations to those of the south, not being seen in the last except in very severe seasons. It continues the whole year in the Orkneys. It is found in Iceland and Greenland, and breeds there, retiring southward in winter, when it is found about the lake Baikal. It is common in America; inhabits New York in winter, and retires thence in April, to Hudson's Bay. See Plate CXX.

MERIDA, a town of Spain, in Estremadura, 47 miles E. of Elva. Lon. 6. 4. W. Lat. 38. 42. N.

MERIDA, a town of N. America, in New Spain, 120 miles N. E. of Campeachy. Lon. 89. 25. W. Lat. 8. 30. N.

MERIDIAN, [*meridies*, from *medius*, middle, and *dies*, a day, Lat.] in astronomy and geography. See ASTRONOMY, and GEOGRAPHY.

MERIDIANI, in antiquity, a name given by the Romans to gladiators who entered the arena about noon after the Bestiarii had finished; so called from the time when they exhibited their prowess.

MERIDIONAL DISTANCE, in navigation, the same with departure, or easting and westing; being the difference of longitude between the meridian, under which the ship now is, and any other meridian which she was under before.

MERIDIONAL PARTS, MILES, or MINUTES, in navigation, are the parts by which the meridians in a Mercator's chart increase, as the parallels of latitude decrease. See NAVIGATION.

MERIONETH, or MERIONETHSHIRE, a county of N. Wales, bounded on the N. by Caernarvonshire and Denbighshire; on the E. by Montgomeryshire; on the W. by St. George's channel, or the Irish sea; on the S. by Cardiganshire; extending 40 miles in length and 36 in breadth.

MERIT, [*meritum*, Lat.] in theology, signifies desert. This term is used to signify the moral goodness of the actions of men, and the rewards to which those actions intitle them. The Romish

schoolmen distinguish merit into two kinds, viz. merit of congruity, and merit of condignity. The first, which is improperly called merit, is when there is no manner of proportion between the action and the reward, but he who bestows it, supplies, by his goodness, what is wanting in the action. Merit of condignity is when there is a just and strict proportion between the action and the reward, as in the wages of a workman. Protestants disclaim all merit of this kind.

MERLIN, in ornithology. See FALCO.

MERLON, in fortification, is that part of a parapet which is terminated by two embrasures of a battery. Its height and thickness is the same with that of the parapet; but its breadth is generally nine feet on the inside, and six on the outside. It serves to cover those on the battery from the enemy; and is better when made of earth well beat and close, than when built with stone; because these fly about and wound those they should defend.

MERMAID, or MERMAN, is a sea-creature frequently talked of, supposed half human and half a fish. Though naturalists doubt of the reality of mermen or mermaids, there are many testimonies of their existence given by historians.

MERO, a town of Asia, in Pegu, 140 miles S. W. of Pegu.

MEROE, in ancient geography, an island of Ethiopia beyond Egypt, in the Nile, with a cognominal town, the metropolis of the Ethiopians.

MEROPE, in fabulous history, one of the Atlantides. She married Sisyphus the son of Æolus, and like her sisters was changed into a star in the constellation Pleiades after death.

MEROPS, in fabulous history, a king of the island of Cos, who married Clymene, one of the Oceanides. He was changed into an eagle, and placed among the constellations.

MEROPS, in ornithology, a genus of birds of the order, picæ. Bill quadrangular, somewhat curved, compressed, and pointed; nostrils small, at the base of the bill; tongue slender, and in some species ciliated; the outer toe somewhat connected with the middle one. Gmelin enumerates twenty-six species, and Latham twenty.

M. APIASTER, the BEE-EATER, has an iron-coloured back; the belly and tail are of a bluish green; and the throat is yellow. This species inhabits various parts of Europe, on the continent, though not in England. They are common in Italy and the S. of France; and in Candia and other islands of the Mediterranean, they are in plenty, as well as in Palestine and Arabia, where they are called Schaghgha. It takes the name of bee-eater from its being very fond of those insects; it will also catch gnats, flies, cicadae, and other insects, on the wing, like the swallow. Willoughby tells us, from Belon, "that its singular elegance invites the Candy boys to hunt for it with cicadae, as they do for swifts, in this manner: bending a pin like a hook, and tying it by the head to the end of a thread, they thrust it through a cicada (as boys bait a hook with a fly), holding the other end of the thread in their hands: the cicada, so fastened, flies nevertheless in the air; which the Merops spying, flies after it with all her force; and catching it, swallows pin and all, wherewith she is caught."

M. ERYTHROPTERUS, the RED-WINGED BEE-EATER, is six inches long; the bill is one inch, and black: the upper parts of the head, body, wings, and tail coverts, are green brown, deepest on the head and back, lightest on the rump and tail coverts: behind the eye is a spot of the same, but of a very deep colour: the quills and tail are red, tipped with black; the last two inches in length: the throat is yellow; the under parts of the body are a dirty white; and the legs black. This species inhabits Senegal, from which place a well-preserved skin was brought by M. Adanson. See Plate CXX.

MERRIMACK, a river of the United States, formed by the conflux of the Pennigewasset and Winnipiscogee, in Lat. 43. 26. N. It falls into the Atlantic at Newbury Port.

MERSBURG, a town of Suabia, on lake Constance; 6 miles N. E. of Constance. Lon. 9. 26. E. Lat. 47. 45. N.

MERSE, a county of Scotland, Berwickshire. See BERWICK.

MERSE, a district in the above county.

MERSEBURG, a fertile principality in Upper Saxony.

MERSEBURG, the capital of the above principality, 8 miles S. of Halle, and 16 W. of Leipsic. Lon. 11. 50. E. Lat. 51. 18. N.

MERSEY,

MERSEY, a river of England, that runs through Lancashire, and falls into the Irish sea at Liverpool. By the inland navigation, it has communication with the Dee, Ribble, Ouse, Trent, Darwent, Severn, Humber, Thames, Aven, &c.; which navigation, including its windings, extends above 500 miles, in the counties of Lincoln, Nottingham, York, Lancashire, Westmoreland, Chester, Stafford, Warwick, Leicester, Oxford, Worcester, &c.

MERSEY ISLAND, an island of Essex, at the mouth of the Coln, S. of Colchester.

MERTON, a town of Surrey, 7 miles S. W. of London, famous for the murder of Kinulph, king of the West Saxons, in the hut of a harlot, as well as for an ancient monastery founded by Henry I. the ruins of which are still visible; and for a parliament held in it, by Henry III. the day after his coronation, in which were enacted the provisions of Merton, the most ancient body of English Laws after Magna Charta. They consist of 11 articles. It was upon this occasion, that the lay lords negatived a motion of the bishops, by their celebrated answer *Nolumus leges Angliæ mutari*. It has a bleach-field, two calico-manufactories, and a copper-mill, and lies four miles E. of Kingston, and nine S. of London.

MERVILLE, a town of France in the department of the North, on the Lys; 15 miles W. of Lille.

MERUWE, **MERWE**, or **MERVE**, a river of Holland, the N. branch of the Meuse.

MESCHIED, a town of Persia, in the province of Khorassan; fortified with several towers, and famous for the magnificent sepulchre of Iman Risa, of the family of Ali, to whom the Persians pay great devotion. Lon. 59. 25. E. Lat. 37. 0. N.

MESEMBRYANTHEMUM, **FIG MARIGOLD**; in botany, a genus of the pentagynia order, and icosandria class of plants; natural order, Succulenteæ. Calyx five-cleft; petals numerous, linear; capsule fleshy, inferior, many-seeded. There are seventy-five species, chiefly natives of the Cape of Good Hope.

M. CRYSTALLINUM, the **DIAMOND-FICOIDES**, or **ICE-PLANT**, is annual, and the most remarkable of this genus. It rises with a short, thick, succulent stalk, dividing low into many trailing, very spreading, succulent branches, bespangled all over with icy pimples; very pellucid and glittering; oval, undulate, and alternate, papulose or pimply, glittering leaves; and from the sides of the branches, numerous, almost close sitting, white flowers, tinged with red or crimson; succeeded by plenty of seed in autumn. This singular and curious plant, being closely covered with large pellucid pimples, full of moisture shining brilliantly like diamonds, is in great esteem. It is a very tender plant while young; and is raised annually from seed in hot-beds. In June it will endure the open air till October, when it perishes; but if placed in a hot-house in autumn, it will often live all winter. It is commonly planted in pots for the convenience of removing; but if planted in the full ground, it grows considerably stronger, even to luxuriance; however, when confined in pots, it flowers more abundantly. The other species are most durable in stem and foliage. Some are shrubby; others pendulous, with loose straggling stems, and branches inclining to the ground; while others have no stalks at all; their leaves are universally very thick, succulent, fleshy; and of many various shapes, situations, and directions; while some are enriously punctured, or dotted with transparent points, and some have pellucid pimples, as already mentioned: they afford a very agreeable variety at all times in the year, and merit a place in every collection. They are green-house plants, and are propagated by cuttings of their stalks and branches.

MESENTERIC ARTERIES. See **ANATOMY**.

MESENTERY, **MESENTERIUM**, [from *μεσος*, middle, and *εντερον*, intestine,] a thick fat membrane, placed in the midst of the intestines, particularly of the smaller ones, whence it has the name. See **ANATOMY**.

MESNE, or **MESN**, a term in law, signifying him who is lord of a manor, and so hath tenants holding of him; yet he himself holds of a superior lord. The word is derived from *maîsne*, quasi minor natus; because his tenure is derived from another, of whom he holds.

MESNE, a writ, which lieth where there is lord mesne and tenant; and the tenant is detained for services due from the mesne to the superior lord. This is in the nature of a writ of right; and in this case the tenant shall have judgement to be ac-

quitted or indemnified by the mesne lord; and if he makes default therein, or do not appear originally to the tenant's writ, he shall be forejudged of his mesnalty, and the tenant shall hold immediately of the lord paramount himself.

MESÔCIIRI, musicians among the ancients who presided in concerts, and by beating a wooden desk regularly with their feet, directed the measure of the music.

MESOCOLON, in anatomy, that part of the mesentery, which having reached the extremity of the ilium, contracts and changes its name. See **ANATOMY**.

MESOLOGARITHMS, [*μεσος*, 2, and *λογος*,] the logarithms of the cosines and tangents, so denominated by Kepler.

MESOPORPHYRON, a name given by the Greeks to the Roman kaliclave.

MESOPOTAMIA, the ancient name of the province of Diarbeck, in Asiatic Turkey. It is situated between the Euphrates and Tigris; having Assyria on the E. Arabia Deserta with Babylonia on the S. Syria on the W. and Armenia on the N. The Hebrews called it *Padan-aram*, (Gen. xxviii. 2. &c.) and *Aram Naharaim* (title of Psalm lx.) or *Aram* of the two rivers, because it was first peopled by Aram the ancestor of the Syrians, and is situated between the two rivers above mentioned. This country is much celebrated in scripture, as being the first dwelling of men both before and after the deluge; and because it gave birth to Peleg, Heber, Terah, Abraham, Nahor, Sarah, Rebekah, Rachel, Leah, and the sons of Jacob. Babylon was in the Mesopotamia, till, by vast labour and industry, the two rivers of the Tigris and Euphrates were united into one channel.

MESOPTERYGIUS, in ichthyology, a term applied to such fishes as have only one back fin, situated in the middle of the back.

MESPILUS, the **MEDLAR**; in botany, a genus of the pentagynia order, and icosandria class of plants; natural order, Pomaceæ. Calyx five-cleft; petals five; berry inferior, five-seeded. There are nine species.

M. CHAMÆ-MESPILUS, the **DWARF MEDLAR**, or **BASTARD QUINCE**, hath a shrubby, slender, smooth stem, branching weakly four or five feet high, having purplish branches; oval, serrated, smooth leaves, on long foot-stalks; and from the axillæ, purple flowers, collected into round heads, with narrow, purplish, deciduous bractæ; succeeded by small red fruit.

M. GERMANICA, **GERMAN MESPILUS** or **COMMON MEDLAR**, rises with a deformed tree-stem, branching irregularly 15 or 20 feet high; spear-shaped leaves, downy underneath; and large close-sitting, white flowers, singly from the sides of the branches; succeeded by large roundish brown fruit, the size of middling apples, which ripen in October, but are not eatable till beginning to decay. The varieties are, common great German medlar, smaller Nottingham medlar, and spear-shaped Italian medlar. These are all cultivated in the English gardens for the fruit; the two former are the most common; but the latter, though smaller, is preferable for richness of flavour. These kinds are never eatable until they begin to rot; for when firm and sound, they are of a singularly austere disagreeable taste; yet having lain some time after being gathered, till they begin to assume a state of decay and become soft, they acquire a delicious flavour, extremely agreeable to many. They all ripen in the end of October, or beginning of November; when being gathered, some should be laid in moist bran, in several layers, to forward their decay; others on straw in the fruitery: those in the bran will be ready for use in about a fortnight, and those laid on straw will come forward in succession. In their medicinal effects, medlars are very astringent, and have therefore been used with advantage in diarrhoeas: on the contrary, those who are of a costive habit, ought carefully to abstain from this enticing fruit. According to Gleditsch and Bausch, the leaves, branches, and unripe fruit of the medlar-tree, have been successfully employed in tanning. The wood, being hard and tough, resembling that of the pear-tree, is useful for various domestic vessels, as well as for the smaller implements of husbandry.

MESS, in a military sense, implies a manner of soldiers, who, by laying up a certain proportion of their pay towards provisions, mess together: six or eight is generally the number of each mess. Experience proves, that nothing contributes more to the health and sobriety of a soldier, than a regular and well chosen diet.

MESSANA,

MESSANA, in ancient geography, a town of Sicily, now Messina.

MESSENA, or **MESSENE**, an inland town, and the capital of Messenia, a country of Peloponnesus, 24 miles N. E. of Nавarin.

MESSENGERS, certain officers chiefly employed under the direction of the secretaries of state, and always in readiness to be sent with all kinds of dispatches foreign and domestic. They also, by virtue of the secretaries warrants, take up persons for high treason, or other offences against the state.

MESSENGERS OF THE EXCHEQUER, are four officers who attend the exchequer, in the nature of pursuivants, and carry the lord treasurer's letters, precepts, &c.

MESSENGERS OF THE PRESS, persons who, by order of the court, search printing-houses, booksellers shops, &c. to discover the printers or publishers of seditious books, pamphlets, &c.

MESSENIA, a country in the S. of Peloponnesus, mostly maritime, situated between Elea on the W. and Laconica to the E. Anciently a part of Laconica under Menelaus, and called Messene by Homer; interpreted by the scholiast, Messenara Regia.

MESSERSCHMIDIA, in botany, a genus of the monogynia order, and pentandria class of plants. Corolla funnel-shaped, with a naked throat; berry bipartite, suberous. The two species are *M. fruticosa*, and *M. arquuzia*.

MESSIAH, [מָשִׁיחַ, Heb.] signifies one anointed, or installed into an office by unction. It was usual among the Jews to anoint kings, high-priests, and sometimes prophets, at the designation or instalment of them, to signify emblematically the mental qualifications necessary for discharging these offices. Saul, David, Solomon, and Joash, kings of Judah, received the royal unction. Aaron and his sons received the sacerdotal, and Elisha the disciple of Elijah, received the prophetic unction. The name Messiah, or Christ (ΧΡΙΣΤΟΣ), was given to the kings and high-priests of the Jews. The patriarchs and prophets are also called Messiahs, or the Lord's anointed. See 1 Sam. xii. 3, 5. 1 Chron. xvi. 22. Ps. cv. 15. But this name Messiah was principally, and by way of eminence, given by the Jews to their expected great Deliverer; and is a name the Christians apply to Jesus Christ, in whom the prophecies relating to the Messiah were and will be accomplished. The sum of these prophecies is, That there should be a glorious person named Messiah, descended from Abraham, Isaac, and Jacob, who should be born at Bethlehem, of a virgin of the family of David, then in its decline, before the Jews ceased to be a people, while the second temple was standing, and about 500 years after Ezra's time; who, though appearing in mean circumstances, should be introduced by a remarkable forerunner, whose business it should be to awaken the attention and expectation of the people. That this illustrious Person should himself be eminent for the piety, wisdom, and benevolence, of his character, and the miraculous works he should perform: yet, that notwithstanding all this, he should be rejected and put to death by the Jews; but should afterwards be raised from the dead, and exalted to a glorious throne, on which he should through all generations continue to rule, at the same time making intercession for sinners. That great calamities should be brought on the Jews for rejecting him: whereas the kingdom of God should by his means be erected among the Gentiles, and extended unto the ends of the earth; wherever it came, destroying idolatry, and establishing true religion and righteousness. In a word, that this glorious Person should be regarded by all who believed in him as a divine teacher, an atoning sacrifice, and a royal governor: by means of whom God would make a covenant with his people, which should be the exact antitype of that made with Israel of old; in consequence of which they should be restored to, and established in, the divine favour, and fixed in a state of perpetual happiness. See **JESUS CHRIST**, and **CHRISTIANITY**.—The Jews still wait for the coming of the Messiah, being infatuated with the notion of a temporal Messiah, who is to be a mighty conqueror, and to subdue all the world. Most of the modern rabbins, according to Puxtorf, believe that the Messiah is already come, but that he keeps himself concealed, and will not manifest himself because of the sins of the Jews. Some of the Jews, however, to reconcile those prophecies that seem to contradict each other as to the character and condition of the Messiah,

have had recourse to the hypothesis of two Messiahs, who are yet to succeed each other; one in a state of humiliation and suffering; the other of glory, splendor, and power. The first, they say, is to proceed from the tribe of Ephraim, who is to fight against Gog, and to be slain by Annillus, Zech. xii. 10. The second is to be of the tribe of Judah, and lineage of David, who is to conquer and kill Annillus, and restore the kingdom of Israel, reigning over it in the highest glory and felicity. Jesus Christ asserts himself to be the Messiah, in John iv. 25. Several impostors have endeavoured to pass for Messiahs, as Christ himself predicted. J. Lent, a Dutchman, has written a history *De Pseudo-Messia, Of False Messiahs*. The first he mentions was one Barcochab, who appeared under Adrian. The last was rabbi Mordecai, who began to be talked of in 1682. A little before him, viz. in 1696, appeared Sabbatheï Sehi, who was taken by the Turks, and turned Mohammedan.

MESSINA, an ancient, large, handsome, and strong city of Sicily, in the Valley of Demona, with a citadel, several forts, a fine spacious harbour, and an archbishop's see. It is seated on the sea-side, 110 miles E. of Palermo, 260 S. by E. of Rome, and 180 S. E. of Naples. Lon. 15. 50. E. Lat. 38. 10. N.

MESINES, a town of France, in the department of the Lys, and late province of Austrian Flanders; 10 miles N. N. W. of Lille.

MESSENESE, the natives of Messina.

MESSING, a town of Franconia, in Aichstadt, 14 miles N. N. E. of Aichstadt.

MESSUAGE, [*messuagium*, law Lat.] the house and ground set apart for household uses.

MESSUAGE, in English law, is also used for a garden, shop, mill, cottage, chamber, cellar, or the like.

MESSUE, St. a town of France, in the department of Mont Blanc, and late duchy of Savoy; 16 miles E. N. E. of Conflans.

NESTA, a cape on the W. coast of Scio.

MESTERO, a cape of Egypt, 10 miles N. E. of Rosetta.

MESTRE, a town of Maritime Austria, in the province of Trevisano, 8 miles N. W. of Venice.

MESUA, the **INDIAN ROSE CHESNUT**; in botany, a genus of the polyandria order, and monadelphica class of plants. Calyx simple, four-leaved; corolla four-petaled; pistil one; nut four-cornered, one-seeded. The only species is *M. ferrea*, a native of the East Indies.

META, in the Roman circus, was a pile of stones of pyramidal form, intended as a boundary of the stadium, or chariot-course. When the meta was passed the seventh time, the race was concluded.

METABASIS, in rhetoric, a figure by which the orator passes, from one thing to another.

METABOLA, [μεταβολή,] in medicine, a change of time, air, or disease.

METACARPUM, or **METACARPUS**, [from μέτρον, behind, and χεῖρ, hand,] in anatomy, a bone of the arm made up of four bones, which are joined to the fingers.

METAGITNIA, a festival of Apollo.

METAGITNION, the second month of the Athenian year, answering to the latter part of July and beginning of August; so called from the Metagitnia, which was kept in it.

METAL, in natural history. See **METALS**.

METAL, in heraldry. There are two metals used in heraldry, by way of colours, viz. gold and silver, in blazon called or and argent. In painting of arms these metals are represented by white and yellow, their natural colours. In engraving, gold is expressed by dotting the coat, &c. all over; and silver, by leaving it quite blank. It is a general rule in heraldry, never to place metal upon metal, nor colour upon colour: so that if the field be of one of the metals, the bearing must be of some colour; and if the field be of any colour, the bearing must be one of the metals.

METALEPSIS, [μεταληψις,] a continuation of a trope in one word through a succession of significations. See **ORATORY**.

METALLISATION, the natural process by which metals are formed in the bowels of the earth. See **METALLURGY**.

METALLOGRAPHY, [*metallum*, and γράφω,] an account or description of metals.

METALLURGY.

METALLURGY, [*metallum* and *ergon*,] the art of working metals, or separating them from their ore. Metallurgy, according to Boerhaave, comprehends the whole art of working metals, from the glebe or ore to the utensil; in which sense assaying, smelting, refining, parting, smithery, gilding, &c. are only branches of metallurgy. In a more limited sense it is applied to the operations required to separate metals from their ores for the uses of life. Metallic substances form a class of bodies of very great importance in chemistry, medicine, the arts, and the ordinary affairs of life. These substances have very peculiar properties, by which they differ from all other bodies. "Metals," says Mr. Murray, "are perhaps, strictly speaking, inflammable substances, as they are capable of combining with oxygen; and several of them, during this combination, exhibit the phenomena of combustion, or emit light and caloric. But they are distinguished from the inflammable substances, and from every other class of chemical agents, by certain properties,—by a greater specific gravity, more or less ductility, malleability, opacity, lustre, and hardness. They are simple bodies; in other words, have not been decomposed." For an enumeration of the metals, see the article **CHEMISTRY**. Metals are very susceptible of combination. They unite with oxygen, carbon, sulphur, phosphorus, and with each other; and their oxides combine with the acids, the alkalies, and the earths. Of these combinations, that with oxygen is the most important. If a metal is heated to a certain temperature in contact with oxygen gas, or atmospheric air, it loses its brilliancy, tenacity, and hardness; and is converted into a substance generally resembling in its properties the earths. This change is accompanied with an absorption of oxygen, and is nothing but the oxydation of the metal. It was formerly termed calcination, and the product a calx; terms for which those of metallic oxydation, and metallic oxide, have been substituted. It takes place at very different degrees of temperature in the different metals, and with different degrees of rapidity; in some it is accompanied with all the phenomena of combustion; in others there is scarcely any perceptible emission of light or caloric. It is in general more rapid in oxygen gas, than in atmospheric air. The different metals have different forces of attraction to oxygen, and combine with it with different degrees of facility. Some attract it at the temperature of the atmosphere, others cannot be combined with it, even when raised to the most intense heat. It is singular that the combination of two metals is more easily oxydated than either of them separately. The different metals are capable of combining with different quantities of oxygen: some absorb nearly half their weight; others not the tenth or twelfth part. Each metal, too, is capable of various degrees of oxydation, always, however, determinate in each; and at each degree different properties are acquired. Changes of colour, in particular, mark the successive quantities of oxygen combined with the metal; and it is generally from their colour that the different oxides of the same metal are named. The greater number of the metallic oxides, when exposed to heat sufficiently intense, are fused; and instead of retaining the opacity of the metals, form a perfect glass. There are some of them, however, which, when heated to ignition, are decomposed, and part with their oxygen; others part with only a certain portion of it, and remain in the state of oxide. Those, which have a still stronger attraction to their oxygen, may be decomposed by heating them with other inflammable bodies, particularly with those containing carbon; the carbon attracts the oxygen, forms carbonic acid, and the metal is obtained in its metallic state. This operation, in the language of Chemistry, is termed reduction. Besides the oxydation which metals suffer by exposure to atmospheric air, or oxygen gas, they may be made to undergo a similar change, by exposing them to the action of substances already oxydated, and from which the oxygen may be transferred. They may thus be oxydated from the decomposition of nitrate of potash, or oxygenated muriate of potash, of acids, or of water. When a metal is exposed to a red heat, with a quantity of nitrate of potash, it is rapidly oxygenated, and, in general, a large quantity of light is given out; some require to be raised to a

higher temperature than others; and there are three, platina, gold, and silver, which are not oxydated by this process at any temperature. By mere trituration with the oxygenated muriate of potash, the metals are oxydated with delagration or detonation. Those metals which have a stronger attraction to oxygen than hydrogen has, may be oxydated by decomposing water. The oxydation from this decomposition goes on even at the common temperature of the atmosphere, but very slowly: at the temperature of ignition it is rapid, and it is equally so at low temperatures, when promoted by the disposing affinity of an acid. When a metal has been oxydated, it acquires an attraction to the acids and becomes capable of combining with them. Hence, when an acid is poured upon a metal, the first effect is a decomposition of part of the acid, or of the water present, so as to oxydate the metal; and this oxide combines with the remaining acid, and forms a perfect solution. Or if the metal has been previously oxydated, the union of the acid with the oxide takes place with facility. The combinations of the metallic oxides with the acids are of a saline nature, possessing certain general properties, similar to those of the compounds formed by the acids with the alkalies or earths. When the acid is fully saturated with the metallic oxide, its acid powers are lost, the combination is in general soluble in water, and may be made to crystallize. From the analogy of these to the neutral salts, they are termed metallic salts, and the same nomenclature is used with respect to them. Those formed by the sulphuric acid, for example, are termed sulphates; as sulphate of iron, of copper, &c. Mr. Murray, in his *Elements of Chemistry*, further observes, that the metals are found in different states in nature. When in their metallic state, or when one metal is combined with a portion of another, they are said to be native; when combined with other substances, they are mineralised, or in a state of ore. They are thus mineralised by oxygen, sulphur, oxide of arsenic, and the different acids, particularly the carbonic, muriatic, sulphuric, and phosphoric." The substances, therefore, found naturally combined with metals in the earth, are sulphur and arsenic, sometimes separately, but generally conjointly. Metals combined with these substances are called metals mineralised by sulphur, or by arsenic, or by sulphur and arsenic; and these matters are called mineralising substances. Such at least are the names given them by former chemists and mineralogists. Besides the sulphur and arsenic with which metals are strictly combined in the mineral state, they are also pretty intimately combined with earthy substances, of different natures, and more or less divided. These different matters united together form masses which are compact, heavy, brittle, and often of much metallic lustre. These substances are properly called ores, or the matter of mines. These ores are found in earths and stones of different kinds, as sands, flints, crystals, slates, indurated clays, according to the ground in which they are contained. But two kinds of stones in particular seem to accompany ores, and have, therefore, been considered by several mineralogists as matrixes in which metals are formed. These are quartz and spar. Metals and metalliferous ores are found in various places:

I. *Under water*; in beds of rivers, lakes, and seas, and chiefly at the flexures of these: such are the auriferous and ferruginous sands, grains of native gold-ochres, and fragments of ores washed from mines.

II. *Dissolved in water*: such are the vitriolic waters containing iron, copper, or zinc.

III. *Upon the surface of the earth*. Such are many oclres; metalliferous stones, sands, and clays, and lumps of ores. Dr. Gmelin says, that in the northern parts of Asia, ores are almost always found upon or near the surface of the ground.

IV. *Under the surface of the earth*. When the quantity of these collected into one place is considerable, it is called a mine.

Subterranean metals and ores are differently disposed in different places. 1. Some are infixed in stones and earths, forming nodules or spots diversely coloured. 2. Some are equably and uniformly diffused through the substance of earths and stones, to which they give colour, density, and other properties. Such are the

the greatest part of those earths, stones, sands, clays, crystals, flints, gems, and fluors, which are coloured. 3. Some form strata in mountains. Such are the slates containing pyrites, copper-ore, lead-ore, silver-ore, or blend. These lie in the same direction as the strata of stones betwixt which they are placed; but they differ from the ordinary strata in this circumstance, that the thickness of different parts of the same metalliferous stratum is often very various; whereas the thickness of the stony strata is known to be generally very uniform. 4. Fragments of ores are often found accumulated in certain subterranean cavities, in fissures of mountains, or interposed betwixt the strata of the earth. These are loose, unconnected, frequently involved in clay, and not accreted to the contiguous rocks or strata immediately, nor by intervention of spar or of quartz, as the ores found in veins are. Tin and iron mines are frequently of the kind here described. 5. Large entire masses of ores are sometimes found in the stony strata of mountains. These are improperly called cumulated veins, because their length, relatively to their breadth and depth, is not considerable. 6. Some instances are mentioned of entire mountains consisting of ore. Such is the mountain of Taberg, in Smoland; and such are the mountains of Kerunavara and Luosavara, in Lapland, the former of which is 1400 perches long, and 100 perches broad. These mountains consist of iron-ore. 7. Lastly, and chiefly, metals and ore are found in oblong tracts, forming masses called veins, which lie in the stony strata composing mountains. The two grand operations of melting are assaying and smelting.

OF THE ASSAYING OF ORES IN GENERAL.

Assays are chemical operations made in small, to determine the quantity of metal or other matter which is contained in minerals; or to discover the value or purity of any mass of gold or silver. Before assays of ores can be well made, a preliminary knowledge of the nature of the several metallic minerals ought to be attained. Each metal has its proper and improper ores, which have peculiar characters and appearances; hence persons accustomed to see them, know pretty nearly by the appearance, weight, and other obvious qualities, what metal is contained in a mineral. A good assayer ought to be very intelligent in this matter, that he may at once know what the proper operations are, which are requisite to the assay of any given mineral. As metals are very unequally distributed in their ores, we should make false and deceitful assays if we did not use all possible precautions that the proportionable quantity of metal produced by an assay shall be nearly the medium contained in the whole ore. This is effected by taking pieces of the mineral from the several veins of the mine, if there be several, or from different places of the same vein. All these minerals are to be shaken together with their matrixes. The whole is to be well mixed together, and a convenient quantity of this mixture is to be taken for the assay. This is called the lotting of the ore. As assays, particularly the first, are generally made in small, assayers have very small weights corresponding to the weights used in the great; that is, to the quintal or hundred pounds weight, to pounds, ounces, drachms, &c. The assay quintal and its subdivisions vary according to the difference of weights in different countries; and this occasions some confusion when these weights are to be adjusted to each other. Tables of these weights are found in treatises of assaying; and particularly in that written by Schlutter, and translated and rendered more complete by Hellot, which contains all the details necessary for the subject. The custom is to take, for the assay quintal, a real weight of a gross, or drachm, which in France is equal to 72 grains; but as the whole drachm represents 100 pounds, each grain represents a pound and a fraction of a pound; and hence some difficulty and confusion arise in making the subdivisions. A better method is that of Mr. Hellot, which is to make the fictitious or assay quintal equal to 100 real grains, and then each grain represents a real pound. The assay quintal is sufficiently exact for ores of lead, tin, copper, iron, antimony, bismuth, and mercury. But for ores of silver and gold, another representation is convenient: for these metals, as Mr. Hellot says, are generally in so small quantity, that the button or small piece of metal obtained in the assay could not be accurately weighed if 100 real grains were made to represent a quintal; and the difficulty of separating the gold from so small a quantity would be still greater. These notions have induced Mr. Hellot to use for these ores a fictitious quintal 16 times bigger; that is, equal to

1600 real grains, which represent 1600 ounces; that is, 400 pounds or quintal. The ounce being represented by a grain, its several subdivisions must be represented by fractions of a grain. Thus 12 grains of the fictitious quintal correspond with 5-43ths of a real grain; and this latter quantity may be accurately weighed in assay-balances: which when well made are sensible to a much less weight. See BALANCE, and DOCTRINE. When a quintal of an ore to be assayed has been weighed, and lotted, it is to be roasted in a test under a muffle. It is to be washed, if necessary; and, in short, the same operations are to be made in small which are usually done in great. Additions also are to be made, and in proper proportions, according to the peculiar nature of the ore. The fluxes generally mixed with the assays in ore are, 3, 4, or 5, parts of black flux; 1, 2, or 3, parts of calcined borax; and one-half of that quantity of decrepitated common salt. The more refractory the ore is, the more necessary is the addition of these fluxes: then the whole mixture is to be fused either in a forge or in a melting or assay furnace. To make assays well, all possible attention and accuracy are to be employed. This object cannot be too much attended to; for the least inaccuracy in weighing, or loss of the smallest quantity of matter, might cause error, so much greater as the disproportion betwixt the weights employed and those represented is greater. The most minute accuracy, therefore, is necessary in these operations. For instance, the assay-balances ought to be small, and exceedingly just. The ore ought not to be weighed till it has been reduced to gross powder fit for roasting; because some of it is always lost in this pulverization. When the ore is roasted, it ought to be covered with an inverted test; because most ores are apt to crackle and disperse when first heated. To make the fusion good and complete, the precise degree of fire which is requisite ought to be employed; and when it is finished, the crucible ought to be struck several times with some instrument, to facilitate the disengagement of the parts of the regulus from the scoria, and to occasion their descent and union into one button of metal. The crucible ought not to be broken, nor its contents examined, till it is perfectly cold. Upon breaking the crucible, we may know that the fusion has been good, if the scoria be neat, compact, and equal; if it have not overflowed or penetrated the crucible; if it contain no metallic grains; and if its surface be smooth, and hollowed in the middle. The regulus or button ought to be well collected, without holes or bubbles, and to have a neat convex surface; it is then to be separated from the scoria, well scraped and cleaned; and, lastly, is to be weighed. If the operation has been well made, its weight shews the quantity of metal which every real quintal of ore will yield in the great. If the perfect success of this assay be in any respect doubtful, it ought to be repeated; but the best method at all times is, to make several assays of the same ore. Some small differences are always found, however well the assays may have been made. By taking the medium of the results of the several operations, we may approach as nearly as possible the true product of the ore.

OF THE SMELTING OF ORES IN GENERAL.

As ores consist of metallic matters combined with sulphur and arsenic, and are besides intermixed with earthy and stony substances of all kinds, it is necessary to perform several operations upon these compound bodies to separate these different substances from each other. The separating of the different substances from the metals, when performed in the large way, is called smelting. This is effected by several processes, founded on the known properties of those substances. First, the ore is to be separated from the earths and stones accidentally adherent to it; and when these foreign substances are in large masses, and are not very intimately mixed in small particles with the ore, this separation may be accomplished by mechanical means. This ought always to be the first operation, unless the adherent substance be capable of serving as a flux to the ore. If the unmetallic earths be intimately mixed with the ore, this must necessarily be broken and divided into small particles. This operation is performed by a machine which moves pestles, called bocords or stampers. After this operation, when the parts of the mineral are specifically heavier than those of the unmetallic earth or stone, these latter may be separated from the ore by washing in canals through which water flows. But this washing of ores cannot succeed unless the ore is sensibly heavier than the foreign matters. But the contrary hap-

pens frequently, as well because quartz and spar are naturally very ponderous, as because the metallic matter is proportionally so much lighter as it is combined with more sulphur. When an ore is of this kind, it is necessary to begin by roasting it, to deprive it of the greatest part of its sulphur. It often happens, that the pyritous matters accompanying the ore are so hard that they can scarcely be pounded. In this case it is necessary to roast it entirely, or partly, and to throw it red-hot into cold water; by which the stones are split, and rendered much more capable of being pulverised. When the substance of the ore is very fusible, this operation may be dispensed with, and the matter may be immediately fused without any previous roasting, or at least with a very slight one. For, to effect this fusion, it is necessary that it retain a great quantity of its sulphur, which, with the other fluxes added, serves to destroy or convert into scoria a considerable part of the stony matter of the mineral, and to reduce the rest into a brittle substance, which is called the matt of lead or of copper, or other metal contained in the ore. This matt is therefore an intermediate matter betwixt the mineral and the metal; for the metal is there concentrated, and mixed with less useless matter than it was in the ore. But as this matt is always sulphureous, the metal which it contains cannot have its metallic properties. Therefore it must be roasted several times to evaporate the sulphur, before it is remelted, when the pure metal is required. This fusion of an ore not roasted, or but slightly roasted, is called crude fusion. As arsenic is heavier than sulphur, and has nearly the weight of metals, the ores in which it prevails are generally very heavy, and consequently are susceptible of being washed, which is a great advantage. But on the other side, as arsenic is capable of volatilising, scorifying, and destroying, many metals, these ores have disadvantages in the roasting and fusion, in both which considerable loss is caused by the arsenic. Some ores contain, besides arsenic, other volatile semi-metals, such as antimony and zinc. These are almost untractable, and are therefore neglected. They are called mineral rapaces, or rapacious ores. When the metal has been freed as much as is possible from foreign matters by these preliminary operations, it is to be completely purified by fusions more or less frequently repeated; in which proper additions are made, either to absorb the rest of the sulphur and arsenic, or to complete the vitrification or scorification of the unmetallic stones and earth. As ores often contain several different metals, these are to be separated from each other by processes suited to the properties of these metals, of which more particularly afterwards. To facilitate the extraction of metallic substances from the ores and minerals containing them, some operations previous to the fusion or smelting of these ores and minerals are generally necessary. These operations consist of, 1. The separation of the ores and metallic matters from the adhering unmetallic earths and stones, by hammers and other mechanical instruments, and by washing with water. 2. Their division or reduction into smaller parts by contusion and trituration, that by another washing with water they may be more perfectly cleansed from extraneous matters, and rendered fitter for the subsequent operations, calcination, or roasting, and fusion. 3. Roasting or calcination, to expel the volatile, useless, or noxious substances, as water, vitriolic acid, sulphur, and arsenic; to render the ore more friable, and fitter for the subsequent contusion and fusion; and lastly, to calcine and destroy the base metals, for instance the iron of copper-ores, by means of the fire, and of the sulphur and arsenic. Stones, as quartz and flints, containing metallic veins or particles, are frequently made red-hot, and then extinguished in cold water, that they may be rendered sufficiently friable and pulverable, to allow the separation of the metallic particles. Roasting is unnecessary for native metals; for some of the richer gold and silver-ore; for some lead-ores, the sulphur of which may be separated during the fusion; and for many calciform ores, as these do not generally contain any sulphur or arsenic. In the roasting of ores, the following attentions must be given. 1. To reduce the mineral previously into small lumps, that the surface may be increased; but they must not be so small, nor placed so compactly, as to prevent the passage of the air and flame. 2. The larger pieces must be placed at the bottom of the pile, where the greatest heat is. 3. The heat must be gradually applied, that the sulphur may not be melted, which would greatly retard its expulsion; and that the spars, fluors, and stones, intermixed with the ore, may not crack, fly, and be dispersed. 4. The ores not thoroughly roasted by one operation must be exposed to

a second. 5. The fire may be increased towards the end, that the noxious matters more strongly adhering may be expelled. 6. Fuel which yields much flame, as wood and fossil-coals free from sulphur, is said to be preferable to charcoal or coaks. Sometimes cold water is thrown on the calcined ore at the end of the operation, while the ore is yet hot, to render it more friable. No general rule can be given concerning the duration or degree of the fire, these being very various according to the difference of the ores. A roasting during a few hours or days is sufficient for many ores; while some, such as the ore of Rammelsberg, require that it should be continued during several months. Schlutter enumerates five methods of roasting ores. 1. By constructing a pile of ores and fuel placed in alternate strata, in the open air, without any furnace. 2. By confining such a pile within walls, but without a roof. 3. By placing the pile under a roof, without lateral walls. 4. By placing the pile in a furnace consisting of walls and a roof. 5. By roasting the ore in a furnace, in which it must be continually stirred with an iron-rod. Several kinds of fusions of ores may be distinguished: 1. When a sulphureous ore is mixed with much earthy matter, from which it cannot be easily separated by mechanical operations, it is frequently melted, to disengage it from these earthy matters, and to concentrate its metallic contents. By this fusion, some of the sulphur is dissipated, and the ore is reduced to a state intermediate betwixt that of ore and of metal. It is then called a matt (*apis sulphureo-metallicus*); and is to be afterwards treated like a pure ore by the second kind of fusion, which is properly the smelting, or extraction of the metal by fusion. 2. By this fusion or smelting, the metal is extracted from the ore previously prepared by the above operations, if these be necessary. The ores of some very fusible metals, as of bismuth, may be smelted by applying a heat sufficient only to melt the metals, which are thereby separated from the adhering extraneous matters. This separation of metals by fusion, without the vitrification of extraneous matters, may be called eliquation. Generally, a complete fusion of the ore and vitrification of the earthy matters are necessary for the perfect separation of the contained metals. By this method, metals are obtained from their ores, sometimes pure, and sometimes mixed with other metallic substances, from which they must be afterwards separated; to procure this separation of metals from ores, these must be so thinly liquefied that the small metallic particles may disengage themselves from the scoria; but it must not be so thin as to allow the metal to precipitate before it be perfectly disengaged from any adhering extraneous matter, or to pervade and destroy the containing vessels and furnace. Some ores are sufficiently fusible; but others require certain additions called fluxes, to promote their fusion and the vitrification of their unmetallic parts; and also to render the scoria sufficiently thin to allow the separation of the metallic particles. Different fluxes are suitable to different ores, according to the quality of the ore, and of the matrix, or stone adherent to it. The matrices of two different ores of the same metal frequently serve as fluxes to each other; as for instance, an argillaceous matrix with one that is calcareous; these two earths being disposed to vitrification when mixed, though each of them is singly unfusible. For this reason, two or more different ores to be smelted are frequently mixed together. The ores also of different metals require different fluxes. Thus calcareous earth is found to be best suited to iron-ores, and spars and scoria to fusible ores of copper. The fluxes most frequently employed in smelting ores are, calcareous earths, fluors or vitreous spars, quartz, and sand, fusible stones, as slates, basaltes, the several kinds of scoria, and pyrites.

CALCAREOUS EARTH is used to facilitate the fusion of ores of iron, and of some of the poorer ores of copper, and, in general, of ores mixed with argillaceous earths, or with felspar. This earth has been sometimes added with a view of separating the sulphur, to which it very readily unites: but by this union the sulphur is detained, and a hear is formed, which readily dissolves iron and other metals, and so firmly adheres to them, that they cannot be separated without more difficulty than they could from the original ore. This addition is, therefore, not to be made till the sulphur be previously well expelled.

FLUORS, or FUSIBLE SPARS, facilitate the fusion of most metallic minerals, and also of calcareous and argillaceous earths, of steatites, asbestos, and some other unfusible stones, but not of silicious earths without a mixture of calcareous earth.

QUARTZ is sometimes added in the fusion of ferruginous copper-ores,

ores, the use of which is said chiefly to be, to enable the ore to receive a greater heat, and to give a more perfect vitrification to the ferruginous scoria.

The FUSIBLE STONES, as slates, and basaltes, are so tenacious and thick when fused, that they cannot be considered properly as fluxes, but as matters added to lessen the too great liquidity of some very fusible minerals.

The SCORIA obtained in the fusion of an ore is frequently useful to facilitate the fusion of an ore of the same metal, and sometimes even ores of other metals.

SULPHURATED PYRITES greatly promote the fusibility of the scoria of metals, from the sulphur it contains. It is chiefly added to difficultly fusible copper-ores, to form matts, that the ores thus brought into fusion may be separated from the adhering earthy matters, and that the ferruginous matter contained in them may be destroyed, during the subsequent calcination and fusion, by means of the sulphur.

As in the ores called CALCIFORM, the metallic matter exists in

a calcined state; and as calcination reduces the metals of mineralised ores (excepting the perfect metals) to that state also; therefore all calciform and calcined ores require the addition of some inflammable substance, to reduce them to a metallic state. In great works, the charcoal or other fuel used to maintain the fire produces also this effect.

METALS are sometimes added in the fusion of ores of other more valuable metals, to absorb from these sulphur or arsenic. Thus iron is added to sulphurated, cupreous, and silver, ores. Metals are also added in the fusion of ores of other more valuable metals, to unite with and collect the small particles of these dispersed through much earthy matter, and thus to assist their precipitation. With these intentions lead is frequently added to ores and minerals containing gold, silver, or copper.

ORES of metals are also sometimes added to assist the precipitation of more valuable metals. Thus antimony is often added to assist the precipitation of gold intermixed with other metallic matters.

METALS, [*metallum*, Lat.] a class of bodies of great importance in the arts, and ordinary affairs of life; they are distinguished by several properties, but particularly by being capable of combining with oxygen, so as to form oxydes and acids, by their tenacity, opacity, and peculiar lustre, arising from their property of strongly reflecting the rays of light, and by the property of becoming solid and fluid under different temperatures. The metals have not been decomposed, and are therefore accounted simple bodies; and as such are enumerated under the article Chemistry, where their affinities are also noted. See CHEMISTRY, METALLURGY, TENACITY, DUCTILITY, &c.

METAMORPHOSIS, [*μεταμορφωσις*,] in general, denotes the changing of something into a different form; in which sense it includes the transformation of insects, as well as the mythological changes related by the ancient poets; upon which Ovid wrote fifteen books. Mythological metamorphoses were held to be of two kinds, apparent and real; thus, that of Jupiter into a bull was only apparent; whereas that of Lycaon into a wolf, was supposed to be real. Most of the ancient metamorphoses include some allegorical meaning, relating either to physics or to morality: some authors are even of opinion that a great part of the ancient philosophy is couched under them; and Lord Verulam and Dr. Hooke have attempted to unriddle several of them.

MENTANGISMONTES, in church-history, a sect of Christian heretics, who held, that the Son was contained in the Father, as a smaller vessel is within a larger one.

MENTANEA, [*μετανεια*, Gr.] a change of mind.

METAPEDIUM, in anatomy, that part of the foot which answers to the metacarpus in the hand; vulgarly called the instep.

METAPHOR, [*μεταφορα*,] in rhetoric, a trope, by which we put a strange word for a proper word, by reason of its resemblance to it; or it may be defined, a simile or comparison intended to enforce and illustrate the thing we speak of, without the signs or forms of comparison. Thus, if we say, *God is a shield to good men*, it is a metaphor, because the sign of comparison is not expressed, though the resemblance, which is the foundation of the trope, is plain; for as a shield guards him that bears it, against the attacks of an enemy, so the providence and favour of God protects good men from malice and misfortunes: but if the sentence be put thus, *God is as a shield to good men*, then it becomes a simile or comparison. A metaphor differs from a simile, in form only, not in substance: in a simile the two subjects are kept distinct in the expression, as well as in the thought; in a metaphor, the two subjects are kept distinct in the thought only, not in the expression. For example, Homer compares a hero to a lion, and describes all the qualities of a lion that resemble those of the hero. The fundamental pleasure here, that of resemblance, belongs to the thought. An additional pleasure arises from the expression: the poet, by figuring his hero to be a lion, goes on to describe the lion in appearance, but in reality the hero; and his description is peculiarly beautiful, by expressing the virtues and qualities of the hero in new terms, which, properly speaking, belong not to him,

but to the lion. An allegory differs from a metaphor; and a figure of speech differs from both. A metaphor is an act of the imagination, figuring one thing to be another. An allegory requires no such operation, nor is one thing figured to be another; it consists in choosing a subject having properties or circumstances resembling those of the principal subject; and the former is described in such a manner as to represent the latter: the subject thus represented is kept out of view: we are left to discover it by reflection; and we are pleased with the discovery, because it is our own work. See ALLEGORY. In a figure of speech, there is no fiction of the imagination employed, as in a metaphor; nor a representative subject introduced as in allegory. This figure, as its name implies, regards the expression only, not the thought; and it may be defined, the using the word in a sense different from what is proper to it. Thus youth, or the beginning of life, is expressed figuratively by morning of life: morning is the beginning of the day; and in that view it is employed to signify the beginning of any other series, life especially, the progress of which is reckoned by days. See FIGURE. Metaphor, allegory, comparison, and figure, are so much connected, that the rules for distinguishing the good from the bad, are common to all of them. The following particular rules, however, may here be laid down, as proper to be observed respecting metaphors: 1st, No comparison ought to be made, where the resemblance is either too strong or too faint. 2dly, Whatever resemblance subjects may have, it is wrong to put one for another, where they bear no mutual proportion. Upon comparing a very high to a very low subject, the simile takes on an air of burlesque: and the same will be the effect where the one is imagined to be the other, as in a metaphor; or made to represent the other, as in allegory. 3dly, These figures, a metaphor especially, ought not to be crowded with many minute circumstances; for in that case it is scarcely possible to avoid obscurity. A metaphor above all ought to be short. 4thly, In constructing a metaphor, the writer ought to use such words only as are applicable literally to the imagined nature of his subject: figurative words ought carefully to be avoided; for such complicated figures, instead of setting the principal subject in a strong light, involve it in a cloud. 5thly, The jumbling different metaphors in the same sentence, beginning with one metaphor and ending with another, commonly called a mixed metaphor, ought never to be indulged. 6thly, It is improper to join different metaphors in the same period, even where they are preserved distinct: for when the subject is imagined to be first one thing and then another, in the same period without interval, the mind is distracted by the rapid transition. 7thly, It is still worse to jumble together metaphorical and natural expression, so as that the period must be understood in part metaphorically, in part literally; for the imagination cannot follow with sufficient ease changes so sudden and unprepared.

METAPHRENUM, in anatomy, that part of the back which lies below the midriff.

METAPHYSICS.

METAPHYSICS, a science which treats of beings and of whatever belongs to them abstractedly in their own simple natures. Aristotle, after treating on physics, begins his next book (in which he pretends to elevate the mind above corporeal objects, to fix it on the contemplation of God, of angels, and of things spiritual, and to enable it to judge of the principles of sciences by abstraction) with the Greek words *μετα τα φυσικα*, post physicam, *i. e.* after physics. His disciples, and succeeding philosophers, have formed, of these two, one word, metaphysics. This science, which is frequently called ontology, investigates and explains the nature and general essence of all beings, as well as the qualities and attributes that essentially appertain to them, and which we ought to assign them by abstraction, as considering them *a priori*. Hence this doctrine should proceed in its operations from the most simple ideas; such as do not admit of any other qualities of which they may be compounded. These simple ideas are those of being, of essence, of substance, of mode, of existence, as well with regard to time as place, of a necessary cause, of unity, the idea of negation, the difference between beings that are simple or compound, necessary or accidental, finite or infinite; the idea of essential and abstract properties, as of the greatness, perfection, and goodness, of beings; and so of the rest. The use, therefore, of ontology, is to make us acquainted with every kind of being in its essence and abstract qualities, and such as are distinct from all other beings. This knowledge being once established on simple principles, just consequences may thence be drawn, and those things proved after which the metaphysician inquires, and which it is his object to prove. It is easy to conceive, that even a clear knowledge of beings, and their essential properties, would be still defective and useless to man, if he did not know how to determine and fix his ideas by proper denominations, and consequently to communicate his perceptions to those whom he would instruct, or against whom he is obliged to dispute, as they would not have the same perceptions that he has. It is, perhaps, one of the greatest advantages that we have over other animals, to be able so to determine our ideas by signs or denominations, either of writing or speech, as to refer each particular perception to its general idea, and every general perception to its particular idea. To render, therefore, our ideas intelligible to others, we have determinate words or names for each being, and the qualities of each being; and ontology teaches us those terms which are so necessary to fix our ideas, and to give them the requisite perspicuity and precision, that we may not dispute about words when we endeavour to extend the sphere of our knowledge, or when we debate concerning the essence of an object, or endeavour to make it more evident. For this reason ontology was formerly regarded as a barren science, that consisted of technical terms only; as a mere terminology: whereas the best modern philosophers make it a more substantial science, by annexing determinate ideas to those words, and the examination of those objects themselves that these terms imply. But the misfortune is, that in this ontologic determination there is still much uncertainty, and sophistry. For, in the first place, we yet know of no metaphysics where all the definitions are just; and, secondly, the words that are employed in these definitions have always something equivocal in their meaning, and have consequently themselves need of definitions; and in this manner we may recede to infinity, unless we recur to the first impressions that the simple words have made in our minds, and the primitive ideas which they there excite. The words man, love, coach, &c. say more, and make a stronger impression, than all the definitions we can give of them; by ontologic explications they are almost always covered with a dark cloud. When this science is applied to particular beings, or to a particular class of beings, it comes under different denominations. Thus it makes a part of cosmology when it examines into the essence of the world, and all that it contains; its natural Jaws; of the nature of matter; of motion; of the nature of tangible bodies, of their attributes and essential qualities, and of all that

can be known by abstraction, and sometimes also by adding the lights that man acquires concerning them by the experience of his senses. It is a branch of anthroposophy, or anthropology, when it is applied to the metaphysical examination of man, his existence, his essence, his essential qualities and necessary attributes, all considered *a priori*: and this examen leads to another branch. Psychology, which consists in the knowledge of the soul in general, and of the soul of man in particular; concerning which the most profound, the most subtle and abstract researches have been made, that the human reason is capable of producing; and concerning the substance of which, in spite of all the efforts, it is yet extremely difficult to assert any thing that is rational, and still less any thing that is positive and well supported.

OF IDEAS IN GENERAL, AND THEIR ORIGINALS.

Mr. Locke's Essay on the Human Understanding ranks high as a treatise on Metaphysics; we shall present a short abstract from this work. By the term idea, as defined by Mr. Locke, is meant whatever is the object of the understanding when a man thinks, or whatever it is which the mind can be employed about in thinking. To trace the manner by which we acquire these ideas, let us suppose the mind to be, as we say white paper, void of all characters, without any ideas; how comes it to be furnished? whence has it all the materials of reason and knowledge? From experience and observation. This, when employed about external sensible objects, we may call sensation; by this we have the ideas of bitter, sweet, yellow, hard, &c. which are commonly called sensible qualities, because conveyed into the mind by the senses. The same experience, when employed about the internal operations of the mind, perceived and reflected on by us, we may call reflection; hence we have the ideas of perception, thinking, doubting, willing, reasoning, &c. These two, viz. external material things as the objects of sensation, and the operations of our own minds as the objects of reflection, are the only originals whence all our ideas take their beginnings; the understanding seems not to have the least glimmering of ideas, which it doth not receive from one of these two sources. These, when we have taken a full survey of them and their several modes and compositions, we shall find to contain our whole stock of ideas: and that we have nothing in our minds which did not come in one of these two ways. When a man first perceives, then he may be said to have ideas; having ideas, and perception, signifying the same thing.

OF SIMPLE IDEAS.

Of ideas, some are simple, others complex. A simple idea is one uniform appearance or conception in the mind, which is not distinguishable into different ideas. Such are the ideas of sensible qualities which, though they are in the things themselves so united and blended, that there is no separation, no distance between them, yet the ideas they produce in the mind enter by the senses simple and unmixed. Thus, though the hand feels softness and warmth in the same piece of wax, yet the simple ideas thus united in the same subject are as perfectly distinct as those that come in by different senses. These simple ideas are suggested no other way than from the two ways above-mentioned, viz. sensation and reflection. The mind being once stored with simple ideas, has the power to compare, repeat, and unite, all these different ideas to an infinite variety; and so can make, at pleasure, new complex ideas. But the most enlarged understanding of man cannot frame one new simple idea; nor by any force destroy those that are there. Ideas, with reference to the different ways wherein they approach the mind, are of four sorts; 1st, There are some which come into our minds by one sense only. 2dly, There are others conveyed into the mind by more senses than one. 3dly, Others that are had from reflection only. 4thly, There are some suggested to the mind by all the ways of sensation and reflection.

OF SIMPLE IDEAS FROM THE SENSES.

Some ideas enter into the mind only by one sense peculiarly adapted to receive them. Thus colours, sounds, smells, &c. come in only by the eyes, ears, and nose. And if these organs are any of them so disordered as not to perform their functions, they have no other way to bring themselves in view, and be perceived by the understanding. Some ideas we receive by more than one sense; as space, extension, figure, rest, and motion. These are perceivable by the eyes and touch.

OF SIMPLE IDEAS FROM SENSATION AND REFLECTION.

Some ideas are had from reflection only. Such are the ideas we have of the operations of our minds: of which the two principal are, perception, or thinking; and volition, or willing. The powers of producing these operations are called faculties; which are, the understanding, and the will. The several modes of thinking, &c. belong to this head. There are some simple ideas conveyed into the mind by all the ways of sensation and reflection; such are pleasure, pain, power, existence, unity, succession. Pleasure or delight, pain or uneasiness, accompany almost every impression on our senses, and every action or thought of the mind. Existence and unity are two other ideas suggested by every object without, and every idea within. When ideas are in our minds, we consider them as being actually there, as well as we consider things to be actually without us; which is, that they exist, or have existence: and whatever we consider as one thing, whether a real being, or idea, suggests the idea of unity. Power is another idea derived from these sources: for, finding in ourselves that we can think, and move several parts of our bodies at pleasure, and observing the effects that natural bodies produce in one another; by both these ways we get the idea of power. Succession is another idea suggested by our senses, and by reflection on what passes in our minds: for, if we look into ourselves, we shall find ideas always, whilst we are awake, or have any thought, passing in train, one going and another coming, without intermission. Whatsoever is able, by affecting our senses, to cause any perception in the mind, doth hereby produce in the understanding a simple idea; which, whatsoever be the cause of it, is looked upon as a real positive idea in the understanding. Thus the idea of heat and cold, light and darkness, motion and rest, &c. are equally positive in the mind, though some of their causes may be mere privations. That a privative cause may produce a positive idea, appears from shadows; which, though nothing but the absence of light, are discernible, and cause clear and positive ideas. We have indeed some negative names which stand not directly for positive ideas, but of their absence; such as insipid, silence, which denote positive ideas, viz. taste and sound, with a signification of their absence.

OF OUR IDEAS OF QUALITIES.

It is useful to distinguish ideas as they are perceptions in our minds, from what they are in the bodies that cause such perceptions in us; we are not to think the former exact images and resemblances of something inherent in the subject, most of those of sensation being, in the mind, no more the likeness of something existing without us, than the names that stand for them are the likeness of our ideas, which yet, upon hearing, they excite in us. Whatsoever the mind perceives in itself, or is the immediate object of perception, thought, or understanding, is an idea: and the power to produce any idea in our mind, is the quality of the subject, wherein that power exists. Thus, a snowball having the power to produce in us the ideas of white, cold, and round; those powers, as they are in the snow-ball, are called qualities; and as they are sensations or perceptions in our understandings, they are called ideas. These qualities are of two sorts.

I. Original, or primary; such are solidity, extension, motion, or rest, number and figure. These are inseparable from body, and such as it constantly keeps in all its changes and alterations.

II. Secondary qualities; such as colours, smells, tastes, sounds, &c. which, whatever reality we by mistake may attribute to them, are in truth nothing in the objects themselves, but powers to produce various sensations in us; and depend on the qualities before-mentioned. The ideas of primary qualities of bodies are resemb-

lances of them; and their patterns really exist in the bodies themselves; but the ideas produced in us by secondary qualities have no resemblance of them at all; and what is sweet, blue, or warm, in the idea, is but the certain bulk, figure, and motion, of the sensible parts in the bodies themselves, which we call so. Thus we see, that fire at one distance produces in us the sensation of warmth, but at a nearer approach causes the sensation of pain. Now, what reason have we to say, that the idea of warmth is actually in the fire, but that of pain not in the fire, which the same fire produces in us the same way? The bulk, number, figure, and motion, of the parts of fire are really in it, whether we perceive them or not; and therefore may be called real qualities, because they really exist in that body: but light and heat are no more really in it, than sickness or pain: take away the sensation of them; let not the eyes see light or colours, nor the ear hear sounds; let the palate not taste, or the nose smell; and all colours, tastes, odours, and sounds, as they are such particular ideas, vanish and cease, and are reduced to their causes, that is, bulk, motion, figure, &c. of parts.

OF PERCEPTION.

Perception is the first idea we receive from sensation. It is by some called thinking in general: though thinking, in the propriety of the English tongue, signifies that sort of operation of the mind about its ideas, wherein the mind is active; where it considers any thing with some degree of voluntary attention: for in bare perception the mind is, for the most part, only passive; and what it perceives it cannot avoid perceiving. What this is, we cannot otherwise know, than by reflecting on what passes in our minds when we see, feel, hear, &c. Impressions made on the outward parts, if they are not taken notice of within, cause no perception; as we see in those whose minds are intently busied in the contemplation of certain objects. The ideas we receive from sensation are often in grown people altered by the judgement, without our taking notice of it. Perception is also the first step and degree towards knowledge, and the inlet, of all the materials of it; so that the fewer senses any man has, and the duller the impressions that are made by them are, the more remote he is from that knowledge which is to be found in other men.

OF RETENTION.

The next faculty of the mind, whereby it makes a further progress towards knowledge, is called retention; which is the keeping of those ideas it has received. This is done in two ways:

1st, By keeping the idea which is brought into the mind for some time actually in view; which is called contemplation.

2dly, By reviving those ideas in our minds which have disappeared, and have been, as it were, laid out of sight: and this is memory; which is, as it were, the store-house of our ideas; for, the narrow mind of man not being capable of having many ideas under view at once, it was necessary to have a repository to lay up those ideas, which at another time it may have use for. See MEMORY.

OF DISCERNING, AND COMPARING OUR IDEAS.

Another faculty of the mind is that of discerning between its ideas. On this depend the evidence and certainty of several general propositions. In being able nicely to distinguish one thing from another, where there is the least difference, consists, in a great measure, that exactness of judgement and clearness of reason, which is to be observed in one man above another. The comparing of our ideas one with another in respect of extent, degree, time, place, or any other circumstances, is another operation of the mind about its ideas, which is the ground of relations.

OF THE COMPOSITION AND ABSTRACTION OF OUR IDEAS.

Composition is another operation of the mind, whereby it combines several of its simple ideas into complex ones; under which operation we may reckon that of enlarging; wherein we put several ideas together of the same kind, as several units to make a dozen. Abstraction is another operation of the mind, whereby the mind forms general ideas from such as it received from particular objects; which it does by considering them as they are in the mind, such appearances separate from the circumstances of real existence, as time, place, &c. These become general representatives of all of the same kind, and their names applicable to whatever

whatever exists conformable to such abstract ideas. Thus the colour received from chalk, snow, and milk, is made a representative of all of that kind; and has a name given it (whiteness,) which signifies the same quality, wherever to be found or imagined. And thus universals, both ideas and terms, are made.

OF COMPLEX IDEAS.

In the reception of simple ideas the mind is only passive, having no power to frame any one to itself, nor having any idea which does not wholly consist of them. But about these simple ideas it exerts several acts of its own, whereby out of them, as the materials and foundation of the rest, the others are framed. The acts of the mind, wherein it exerts its power over its simple ideas, are chiefly these three: 1st, It combines several simple ideas into one compound one; and thus all complex ideas are made. 2dly, It brings two ideas, whether simple or complex, together, so as to take a view of them at once, without uniting them into one; by which way it gets all its ideas of relations. 3dly, It separates them from all other ideas that accompany them in their real existence; and thus all its general ideas are made. Complex ideas, however compounded or decomposed, though their number be infinite, and their variety endless, may all be reduced under these three heads: 1st, Modes; 2dly Substances; 3dly, Relations.

OF MODES, SUBSTANCES, AND RELATIONS.

I. Modes are such complex ideas as contain not the supposition of subsisting by themselves: but are considered as dependences on, and affections of, substances; as triangle, gratitude, murder, &c. These modes are of two sorts: 1st, Simple; which are combinations of the same simple idea; as a dozen, score, &c. which are but the ideas of so many distinct units put together. 2dly, Mixed; which are compounded of simple ideas of several kinds; as beauty, which consists in a certain composition of colour and figure, causing delight in the beholder; theft, which is the concealed change of the possession of any thing, without the consent of the proprietor. These visibly contain a combination of ideas of several kinds.

II. Substances. The ideas of substances are only such combinations of simple ideas, as are taken to represent distinct particular things subsisting by themselves, in which the confused idea of substance is always the chief. Thus a combination of the ideas of a certain figure, with the powers of motion, thought, and reasoning, joined to substance, make the ordinary idea of man. These again are either of single substances, as a man, a stone; or of collective, or several put together, as an army, a heap. Ideas of several substances thus put together, are as much each of them one simple idea, as that of a man or an unit.

III. Relations consist in the consideration and comparison of one idea with another. Of these in their order.

OF SPACE.

Modes, or modifications of any simple ideas are as perfectly distinct ideas in the mind, as those of the greatest distance or contrariety: thus, two is as distinct from three, as blueness from heat. Space is a simple idea which we get both by our sight and touch. When we consider it barely in length between two bodies, it is called distance; when in length, breadth, and thickness, it may be called capacity. When considered between the extremities of matter, which fills the capacity of space with something solid, tangible, and moveable, it is called extension. And thus extension is an idea belonging to a body; space may be conceived without it. Each different distance is a different modification of space; and each idea of any different space is a simple mode of this idea. Such are inch, foot, yard, &c. When these ideas are made familiar to men's thoughts, they can in their minds repeat them as often as they will, without joining to them the idea of body, and frame to themselves the ideas of feet, yards, or fathoms, beyond the utmost bounds of all bodies; and, by adding these still one to another, enlarge their idea of space as much as they please. From this power of repeating any idea of distance, without being ever able to come to an end, we come by the idea of immensity. Another modification of space is taken from the relation of the parts of the termination of extension or circumscribed space amongst themselves; and this is what we call figure. Another mode belonging to this head is that of place. Our idea of place is nothing but the

relative position of any thing with reference to its distance from some fixed and certain points: Whence we say, that a thing has or has not changed place, when its distance either is or is not altered with respect to those bodies with which we have occasion to compare it; and hence we have the idea of motion.

OF DURATION.

There is another sort of distance, the idea of which we get from the fleeting and perpetually perishing parts of success on, which we call duration. The simple modes of it are any different lengths of it whereof we have distinct ideas; as hours, days, years, time, &c. The idea of succession is got by reflecting on that train of ideas, which constantly follow one another in our minds as long as we are awake. The distance between any parts of this succession is what we call duration; and the continuation of the existence of ourselves, or any thing else, commensurate to the succession of any ideas in our minds, is what we call our own duration, or that of another thing co-existing with our thinking. That this is so, appears hence, that we have no perception of succession or duration, when that succession of our ideas ceases, as in sleep: the moment that we sleep, and awake, how distant soever, seems to be joined, and connected, provided the sleep be quite sound, and not interrupted by dreams. And we see that they whose thoughts are very intent upon one thing, let slip out of their account a good part of that duration, and think that time shorter than it is. But if a man, during his sleep, dream, and a variety of ideas make themselves perceptible in his mind one after another, he hath then, during such dreaming, a sense of duration. A man, having once got this idea of duration, can apply it to things which exist while he does not think; and thus we measure the time of our sleep, as well as that wherein we are awake. Duration, as marked by certain periods and measures, is what we most properly call time; which we measure by the diurnal and annual revolutions of the sun, as being constant, regular, and universally observable by man, and supposed equal to one another. By the same means, and from the same original that we have the idea of time, we have also some idea of eternity: for, having got the ideas of certain lengths of duration, we can in our thoughts add them to one another as oft as we please, without ever coming to an end. And thus it is plain, that from the two sources of all knowledge, sensation and reflection, we get the ideas of duration, and the several measures of it.

OF NUMBER.

The complex ideas of number are formed by adding several units together. The simple modes of it are each several combinations, as two, three, &c. These are of all others most distinct, the nearest being as clearly different from each other as the most remote; two being as distinct from one, as 200. But it is hard to form distinct ideas of every the least excess in extension. Hence demonstrations in numbers are more general in their use, and more determinate in their application, than those of extension.

OF INFINITY.

The idea signified by the name infinity is best examined by considering to what infinity is by the mind attributed, and then how it frames it. Finite and infinite, then, are looked upon as the modes of quantity; and attributed primarily to things that have parts, and are capable of increase or diminution by the addition or subtraction of any the least part. Such are the ideas of space, duration, and number. The next thing to be considered is, How we come by the idea of infinity. Every one that has any idea of any stated lengths of space, as a foot, yard, &c. finds that he can repeat that idea, and join it to another, to a third, and so on, without ever coming to an end of his additions. From this power of enlarging his idea of space, he takes the idea of infinite space, or immensity. By the same power of repeating the idea of any length of duration we have in our minds, with all the endless addition of numbers, we come by the idea of eternity.

OF THE MODES OF THINKING.

When the mind turns its view inwards upon itself, thinking is the first idea that occurs: wherein it observes a great variety of modifications; and thereof frames to itself distinct ideas. Thus, the perception annexed to any impression on the body made by an external object, is called sensation. When an idea recurs without the

the presence of the object, it is called remembrance: when sought after by the mind, and brought again in view, it is recollection: when held there long under attentive consideration, it is contemplation. When ideas float in the mind without regard or reflection, it is called in French reverie; or language has no other name for it: when the ideas are taken notice of, and as it were registered in the memory, it is attention: when the mind fixes its view on any one idea, and considers it on all sides, it is attention and study. Sleep, and dreaming, is rest from all these: and dreaming is the perception of ideas in the mind, not suggested by any external objects, or known occasions; nor under any choice or conduct of the understanding. See DREAM.

OF THE MODES OF PLEASURE AND PAIN.

Pleasure and pain are simple ideas, which we receive both from sensation and reflection. There are thoughts of the mind, as well as sensations, accompanied with pleasure or pain. Their causes are termed good or evil. Pleasure and pain, and their causes, good and evil, are the hinges upon which our passions turn; by reflecting on the various modifications or tempers of mind, and the internal sensations which pleasure and pain, good and evil, produce in us, we may thence form to ourselves the ideas of our passions. Thus, by reflecting upon the thought we have of the delight which any thing is apt to produce in us, we have an idea we call love: and, on the contrary, the thought of the pain which any thing present or absent produces in us, is what we call hatred. Desire is that of uneasiness which a man finds in himself upon the absence of any thing, the present enjoyment of which carries the idea of delight with it. Joy is a delight of the mind arising from the present or assumed approaching possession of a good. Sorrow is an uneasiness of the mind, upon the thought of a good lost, or the sense of a present evil. Hope is a pleasure of the mind, upon the thought of a probable future enjoyment of a thing which is apt to delight. Fear is an uneasiness of the mind, upon the thought of a future evil likely to befall us. Anger is a discomposure of the mind, upon the receipt of injury, with a present purpose of revenge. Despair is the thought of unattainableness of any good. Envy is an uneasiness of the mind, caused by the consideration of a good we desire, obtained by one who we think should not have had it before us. In reference to the passions, the removal or lessening of a pain is considered and operates as a pleasure; and the loss or diminishing of a pleasure, as a pain: and further, the passions in most persons operate on the body, and cause various changes in it; but these being not always sensible, do not make a necessary part of the idea of each passion.

OF POWER.

The mind being every day informed by the senses of the alteration of those simple ideas it observes in things, without reflecting also on what passes within itself, and observing a constant change of its ideas, sometimes by the impressions of outward objects upon the senses, and sometimes by the determination of its own choice; and concluding, from what it has so constantly observed to have been, that the like changes will for the future be made in the same things, by the same agents, and by the like ways, considers in one thing the possibility of having any of its simple ideas changed, and in another the possibility of making that change, and so comes by that idea which we call power. Thus we say fire has a power to melt gold, and make it fluid: and gold has a power to be melted. Power thus considered is twofold, viz. as able to make, or able to receive any change: the one may be called active, the other passive power. Of passive power all sensible things abundantly furnish us with ideas, whose sensible qualities and beings we find to be in a continual flux. Nor have we of active power fewer instances; since, whatever change is observed, the mind must collect a power somewhere able to make that change. But yet, if we consider it attentively, bodies by our senses do not afford us so clear and distinct an idea of active power as we have from reflection upon the operation of our minds. For, as all power relates to action, and there are but two sorts of action, viz. thinking and motion, let us consider whence we have the clearest ideas of the powers which produce these actions. Of thinking, body affords us no idea at all: it is only from reflection that we have that; neither have we from body any idea of the beginning of motion. A body at rest affords us no idea of any active power

to move; and when it is set in motion itself, that motion is rather a passion than action in it. The idea of the beginning of motion, we have only by reflection on what passes in ourselves; where we find by experience, that, barely by willing it, we can move the parts of our bodies which were before at rest. We find in ourselves a power to begin or forbear, continue or end, several actions of our minds, and motions of our bodies, barely by a thought, or preference of the mind. This power which the mind has thus to order the consideration of any idea, or the forbearing to consider it; or to prefer the motion of any part of the body to its rest, and vice versa, in any particular instance, is that we call the will; the actual exercise of that power is that which we call volition or willing. The forbearance or performance of that action, consequent to such order or command of the mind, is called voluntary; and whatsoever action is performed without such a thought of the mind, is called involuntary. The power of perception is that we call the understanding. Perception, which we make the act of the understanding, is of three sorts: 1st, The perception of ideas in our minds. 2dly, The perception of the signification of signs. 3dly, The perception of the agreement or disagreement of any distinct ideas. These powers of the mind, viz. of perceiving and preferring, are usually called by another name; and the ordinary way of speaking is, that the understanding and will are two faculties of the mind. From the consideration of the extent of the power of the mind over the actions of the man, which every one finds in himself, arise the ideas of liberty and necessity: so far as a man has a power to think or not to think, to move or not to move, according to the preference or direction of his own mind, so far is a man free. Wherever any performance or forbearance are not equally in a man's power; wherever doing, or not doing, will not equally follow upon the preference of his mind; there he is not free, though perhaps the action may be voluntary. So that the idea of liberty is the idea of a power in any agent to do or forbear any action, according to the determination or thought of the mind whereby either of them is preferred to the other. Where either of them is not in the power of the agent to be produced by him according to his volition, there he is not at liberty; that agent is under necessity. So that liberty cannot be where there is no thought, no volition, no will; but there may be thought, will, and volition, where there is no liberty. Thus a tennis-ball, whether in motion by the stroke of a racket, or lying still at rest, is not by any one taken to be a free agent. So, a man striking himself or his friend by a convulsive motion of his arm, which it is not in his power by volition or the direction of his mind to stop or forbear; nobody thinks he has in this liberty; every one pities him, as acting by necessity and constraint. Again, suppose a man to be carried while fast asleep into a room where there is a person he longs to see, and to be there locked fast in beyond his power to get out: he awakes, and is glad to see himself in so desirable company; which he stays willingly in, that is, prefers his staying to going away. Is not this stay voluntary? Nobody will doubt it; and yet, being locked fast in, he is not at liberty to stay, he has not freedom to be gone. So that liberty is not an idea belonging to volition or preferring, but to the person having the power of doing, or forbearing to do, according as the mind shall choose or direct.

OF MIXED MODES.

Mixed modes are combinations of simple ideas of different kinds. The mind, being once furnished with simple ideas, can put them together in several compositions, without examining whether they exist so together in nature. And hence these ideas are called notions, as it they had their original and constant existence more in the thoughts of men than in the reality of things: and to form such ideas, it sufficed that the mind put the parts of them together, and that they were consistent in the understanding, without considering whether they had any real being. There are three ways whereby we get these complex ideas of mixed modes.

1st, By experience and observation of things themselves: thus, by seeing two men wrestle, we get the idea of wrestling.

2dly, By invention, or voluntary putting together of several simple ideas in our own minds: so, he that first invented printing had an idea of it first in his mind before it ever existed.

3dly, By explaining the names of action we never saw, or notions

tions we cannot see; and by enumerating all those ideas which go to make them up. Thus the mixed mode, which the word *lie* stands for, is made up of these simple ideas: 1st, Articulate sounds. 2dly, Certain ideas in the mind of the speaker. 3dly, Those words, the signs of these ideas. 4thly, Those signs put together, by affirmation or negation, otherwise than the ideas they stand for are in the mind of the speaker.

Of all our simple ideas, those that have had most mixed modes made out of them, are thinking and motion, which comprehend in them all action; and power, from whence these actions are conceived to flow. For, actions being the great business of mankind, it is no wonder if the several modes of thinking and motion should be taken notice of, the ideas of them observed and laid up in memory, and have names assigned them. For without such complex ideas with names to them, men could not easily hold any communication about them. Of this kind are the modes of actions distinguished by their causes, means, objects, ends, instruments, time, place, and other circumstances: as also of the powers fitted for those actions. Thus boldness is the power to do or speak what we intend, without fear or disorder: which power of doing any thing, when it has been acquired by the frequent doing the same thing, is that idea we call habit; when forward, and ready upon every occasion, to break into action, we call it disposition: thus testiness is a disposition or aptness to be angry. Power being the source of all action, the substances wherein these powers are, when they exert this power, are called causes; and the substances thereupon produced, or the simple ideas introduced into any subject, effects. The efficacy whereby the new substance or idea is produced, is called, in the subject exerting that power, action; in the subject, wherein any simple idea is changed or produced, passion: which efficacy, in intellectual agents, we can conceive to be nothing else but modes of thinking and willing; in corporeal agents, nothing else but modifications of motion.

OF RELATION.

There is another set of ideas which the mind gets from the comparing of one thing with another. When the mind so considers one thing, that it does as it were bring it to and set it beside another, and carry its view from one to the other, this is relation or respect; and the denominations given to things intimating that respect, are what we call relatives, and the things so brought together related. Thus when I call James husband, or whiter, I intimate some other person, or thing, in both cases with which I compare him. Any of our ideas may be the foundation of relation. Where languages have failed to give correlative names, there the relation is not so easily taken notice of; as in concubine, which is a relative name as well as wife. The ideas of relation may be the same in those men who have far different ideas of the things that are related. Thus those who have different ideas of man, may agree in that of father. There is no idea of any kind which is not capable of an almost infinite number of considerations, in reference to other things; and therefore this makes no small part of men's words and thoughts. Thus one single man may at once sustain the relations of father, brother, son, husband, friend, subject, general, European, Englishman, islander, master, servant, bigger, less, &c. to an almost infinite number; he being capable of as many relations as there may be occasions of comparing him to other persons or things in any manner of agreement, disagreement, or respect whatsoever.

OF CAUSE AND EFFECT.

The ideas of cause and effect we get from our observation of the vicissitude of things, while we perceive some qualities or substances begin to exist, and that they receive their existence from the due application and operation of other things: that which produces is the cause; that which is produced the effect. Thus fluidity in wax is the effect of a certain degree of heat, which we observe to be constantly produced by the application of such heat.

OF REAL AND FANTASTICAL IDEAS.

Our ideas, in reference to things whence they are taken, or which they may be supposed to represent, come under a threefold distinction; and are, 1st, either real or fantastical; 2dly, adequate or inadequate; 3dly, true or false. Real ideas are such as have a foundation in nature, such as have a con-

formity with the real being and existence of things, or with their archetypes. Fantastical are such as have no foundation in nature, nor any conformity with that reality of being to which they are referred as to their archetypes. By examining the several sorts of ideas, we shall find, that, first, our simple ideas are all real; not that they are images or representations of what does exist, but as they are the certain effects of power in things without us, ordained by our Maker to produce in us such sensations: they are real ideas in us, whereby we distinguish the qualities that are really in things themselves. Their reality lies in the steady correspondence they have with the distinct constitutions of real beings. But whether they answer to those constitutions as to causes or patterns, it matters not; it suffices that they are constantly produced by them. Complex ideas being arbitrary combinations of simple ideas put together, and united under one general name, in forming of which the mind uses its liberty, we must inquire which of these are real, and which imaginary combinations.

1st, Mixed modes and relations having no other reality than what they have in the minds of men, nothing else is required to make them real, but a possibility of existing conformable to them. These ideas being themselves archetypes, cannot differ from their archetypes, and so cannot be chimerical: unless any one will jumble together in them inconsistent ideas. Those indeed that have names assigned them in any language, must have a conformity to the ordinary signification of the name that is given them, that they may not be thought fantastical.

2dly, Our complex ideas of substances being made, in reference to things existing without us, whose representations they are thought, are no farther real than as they are such combinations of simple ideas as are really united, and co-exist in things without us: those are fantastical which are made up of several ideas, that never were found united, as Centaur, Harpy, &c.

OF ADEQUATE AND INADEQUATE IDEAS.

Real ideas are either adequate or inadequate. 1st, Adequate, which perfectly represent those archetypes which the mind supposes them taken from, and which it makes them to stand for. 2dly, Inadequate: which are such as do but partially or incompletely represent those archetypes to which they are referred.

OF TRUE AND FALSE IDEAS.

Truth and falsehood, in propriety of speech, belong only to propositions; and when ideas are termed true or false, there is some secret or tacit proposition which is the foundation of that denomination. Our ideas being nothing but appearances or perceptions in the mind, can, in strictness of speech, no more be said to be true or false than single names of things can be said to be true or false. The idea of a Centaur has no more falsehood in it when it appears in our minds, than the name Centaur when it is pronounced or written on paper. For truth or falsehood lying always in some affirmation or negation, none of our ideas are capable of being false, till the mind passes some judgement on them, that is, affirms or denies something of them. In a metaphysical sense, they may be said to be true, that is, to be really such as they exist; though in things called true, even in that sense, there is perhaps a secret reference to our ideas, looked upon as the standards of that truth; which amounts to a mental proposition. When the mind refers any of its ideas to any thing extraneous to it, they are then capable of being true or false; because in such a reference, the mind makes a tacit supposition of their conformity to that thing; which supposition as it is true or false, so the ideas themselves come to be denominated. This happens in these cases; 1st, When the mind supposes its idea conformable to that in other men's minds called by the same name, such as that of justice, virtue, &c. 2dly, When the mind supposes any idea conformable to some real existence. Thus, that of Man is true, that of Centaur false; the one having a conformity to what has really existed, the other not. 3dly, When the mind refers any of its ideas to that real constitution and essence of any thing whereon all its properties depend: and thus the greatest part, if not all our ideas of substances are false. As to the first, when we judge of our ideas by their conformity to those of other men, any of them may be false: but simple ideas are least liable to be so mistaken. We seldom mistake green for blue, or bitter for sweet; much less do we con-

found the names belonging to different senses, and call a colour by the name of a taste. Complex ideas are much more liable to falsehood in this particular; and those of mixed modes more than substances: because in substances, their sensible qualities serve, for the most part, to distinguish them clearly; but in mixed modes we are more uncertain, and we may call that justice which ought to be called oppression. The reason of this is, that the abstract ideas of mixed modes being men's voluntary combination of such a precise collection of simple ideas, we have nothing else to refer our ideas of mixed modes or standards to, but the ideas of those who are thought to use names in their proper significations; and so far as our ideas conform or differ from them, they pass for true or false. As to the second, when we refer our ideas to the real existence of things, none can be termed false but our complex ideas of substances: for our simple ideas being nothing but perceptions in us, answerable to certain powers in external objects, their truth consists in nothing but such appearances as are produced in us, suitable to those powers: neither do they become liable to the imputation of falsehood, whether we judge these ideas to be in the things themselves, or not; for God having set them as marks of distinguishing things, that we may be able to discern one thing from another, and thereby choose them as we have occasion, it alters not the nature of our simple ideas, whether we think the idea of blue (for instance) to be in the violet itself, or in the mind only: and it is equally from that appearance to be denominated blue, whether it be that real colour, or only a peculiar texture in it, that causes in us that idea; since the name blue notes properly nothing but that mark of distinction that is in a violet, discernible only by our eyes, whatever it consists in. Neither would our simple ideas be false, if by the different structure of our organs it were so ordered that the same object should produce in several men's minds different ideas: for this could never be known, since objects would operate constantly after the same manner. It is most probable, nevertheless, that the ideas produced by the same objects in different men's minds are very near and undiscernibly like. Names of simple ideas may be misapplied; as a man, ignorant in the English tongue, may call purple, scarlet: but this makes no falsehood in the idea. Complex ideas of modes cannot be false, in reference to the essence of any thing really existing; because they have no reference to any pattern existing, or made by nature. Our complex ideas of substances, being all referred to patterns in things themselves, may be false. They are so, 1st, When looked upon as representations of the unknown essences of things: 2dly, When they put together simple ideas which in the real existence of things have no union; as in Centaur. 3dly, When from any collection of simple ideas, that do not always exist together, there is separated, by direct negation, any one simple idea which is constantly joined with them. Thus, if from extension, solidity, fixedness, malleableness, fusibility, &c. we remove the colour observed in gold: if this idea be only left out of the complex one of gold, it is to be looked on as an inadequate and imperfect, rather than a false one; since though it contains not all the simple ideas that are united in nature, yet it puts none together but what do really exist together. Upon the whole, our ideas, as they are considered by the mind, either in reference to the proper signification of their names, or in reference to the reality of things, may more properly be called right or wrong ideas, according as they agree or disagree to those patterns to which they are referred. The ideas that are in men's minds, simply considered, cannot be wrong, unless complex ideas, wherein inconsistent parts are jumbled together. All other ideas are in themselves right, and the knowledge about them right and true knowledge. But when we come to refer them to any patterns, or archetypes, then they are capable of being wrong, as far as they disagree with such archetypes.

OF THE ASSOCIATION OF IDEAS.

Some of our ideas have a natural correspondence and connection one with another. It is the office and excellency of our reason to trace these, and hold them together in that union and correspondence which is founded in their peculiar beings. Besides this, there is another connection of ideas wholly owing to chance or custom: ideas that in themselves are not at all a-kin, come to be sounded in some men's minds, that it is very hard to separate them: they always keep company, and the one no sooner comes

into the understanding, but its associate appears with it; and if they are more than two, the whole gang always inseparably shew themselves together. This strong combination of ideas, not allied by nature, the mind makes in itself either voluntarily or by chance: and hence it comes in different men to be very different, according to their different inclinations, educations, interests, &c. Custom settles habits of thinking in the understanding, as well as of determining in the will, and of motions in the body; all which seem to be but trains of motion in the animal spirits, which, once set a-going, continue on in the same steps they have been used to; which by often treading are worn into a smooth path, and the motion in it becomes easy, and, as it were, natural. As far as we can comprehend thinking, ideas seem to be thus produced in our minds; or if they are not, this may serve to explain their following one another in habitual train, when once they are put into that tract, as well as it does to explain such motions of the body. This connection in our minds of ideas, in themselves loose and independent one of another, is of so great force to set us awry in our actions, moral as well as natural, passions, reasonings, and notions themselves, that perhaps there is not any one thing that deserves more to be looked after.

OF KNOWLEDGE IN GENERAL.

Since the mind, in all its thoughts and reasonings, has no other immediate object but its own ideas, which alone it does or can contemplate, it is evident that our knowledge is only conversant about them. Knowledge then seems to be nothing but the perception of the connection and agreement, or disagreement and repugnancy of any of our ideas: where this perception is, there is knowledge; and where it is not, there, though we fancy, guess or believe, yet we always come short of knowledge. When we know that white is not black, what do we but perceive that these two ideas do not agree? Or that the three angles of a triangle are equal to two right ones; what do we more but perceive that equality to two right ones does necessarily agree to, and is inseparable from, the three angles of a triangle? But to understand a little more distinctly wherein this agreement or disagreement consists, we may reduce it all to these four sorts: 1st, Identity or diversity; 2dly, Relation; 3dly, Coexistence; 4thly, Real Existence.

I. **IDENTITY OR DIVERSITY.** It is the first act of the mind to perceive its ideas; and, so far as it perceives them, to know each what it is, and thereby to perceive their difference, that is, the one not to be the other: by this the mind clearly perceives each idea to agree with itself, and to be what it is; and all distinct ideas to disagree. This it does without any pains or deduction, by its natural power of perception and distinction. This is what men of art have reduced to those general rules, viz. What is, is; and, It is impossible for the same thing at the same time to be and not to be. But no maxim can make a man know it clearer, that round is not square, than the bare perception of those two ideas, which the mind at first sight perceives to disagree.

II. The next sort of agreement or disagreement the mind perceives in any of its ideas may be called Relative, and is nothing but the perception of the relation between any two ideas of what kind soever; that is, their agreement or disagreement one with another in several ways the mind takes of comparing them.

III. The third sort of agreement or disagreement to be found in our ideas is Co-existence or Non-existence in the same subject; and this belongs particularly to substances. Thus, when we pronounce concerning gold, that it is fixed; it amounts to no more but this, that fixedness, or a power to remain in the fire unconsumed, is an idea that always accompanies that particular sort of yellowness, weight, fusibility, &c. which make our complex idea signified by the word gold.

IV. The fourth sort is that of Actual and Real Existence agreeing to any idea. Within these four sorts of agreement or disagreement is contained all the knowledge we have, or are capable of. For all that we know or can affirm concerning any idea, is, That it is, or is not, the same with some other; as, that blue is not yellow: That it does, or does not, co-exist with another in the same subject; as, that iron is susceptible of magnetical impressions: That it has that or this relation to some other ideas; as, that two triangles upon equal bases upon two parallels are equal: That it has a real existence without the mind; as, that God is. There are several

several ways wherein the mind is possessed of truth, each of which is called Knowledge. 1st, There is actual knowledge, when the mind has a present view of the agreement or disagreement of any of its ideas, or of the relation they have one with another. 2dly, A man is said to know any proposition, when having once evidently perceived the agreement or disagreement of the ideas whereof it consists, and so lodged it in his memory, that, whenever it comes to be reflected on again, the mind assents to it without doubt or hesitation, and is certain of the truth of it. And this may be called habitual knowledge. And thus a man may be said to know all those truths which are lodged in his memory by a foregoing, clear, and full perception.

Of habitual knowledge there are two sorts: the one is of such truths laid up in the memory, as whenever they occur to the mind, it actually perceives the relation that is between those ideas. And this is in all those truths, where the ideas themselves, by an immediate view, discover their agreement or disagreement one with another. The other is of such truths, whereof the mind having been convinced, it retains the memory of the conviction, without the proofs. Thus a man that remembers certainly, that he once perceived the demonstration, that the three angles of a triangle are equal to two right ones, knows it to be true, when that demonstration is gone out of his mind, and possibly cannot be recollected: but he knows it in a different way from what he did before, namely, not by the intervention of those intermediate ideas, whereby the agreement or disagreement of those in the proposition was at first perceived, but by remembering, *i. e.* knowing that he was once certain of the truth of this proposition, that the three angles of a triangle are equal to two right ones. The immutability of the same relations between the same immutable things, is now the idea that shews him, that if the three angles of a triangle were once equal to two right ones, they will always be so. And hence he comes to be certain, that what was once true, is always true; what ideas once agreed will always agree; and consequently, what he once knew to be true, he will always know to be true, as long as he can remember, that he once knew it.

OF THE DEGREES OF HUMAN KNOWLEDGE.

All our knowledge consisting in the view the mind has of its own ideas, which is the utmost light and greatest certainty we are capable of, the different clearness of our knowledge seems to lie in the different way of perception the mind has of the agreement or disagreement of any of its ideas. When the mind perceives this agreement or disagreement of two ideas immediately by themselves, without the intervention of any other, we may call it intuitive knowledge; in which cases the mind perceives truth as the eye does light, only by being directed towards it. Thus the mind perceives, that white is not black; that three are more than two, and equal to one and two. This part of knowledge is irresistible, and, like the bright sunshine, forces itself immediately to be perceived as soon as ever the mind turns its view that way. It is on this intuition that depends all the certainty and evidence of our other knowledge; which certainty every one finds to be so great, that he cannot imagine, and therefore cannot require, a greater. The next degree of knowledge is, where the mind perceives not this agreement or disagreement immediately, or by the juxta-position, as it were, of the ideas, because those ideas concerning whose agreement or disagreement the inquiry is made, cannot by the mind be so put together as to shew it. In this case the mind is found to discover the agreement or disagreement which it searches, by the intervention of other ideas: and this is what we call reasoning. Thus, if we would know the agreement or disagreement in bigness between the three angles of a triangle and two right angles, we cannot by an immediate view and comparing them do it; because the three angles of a triangle cannot be brought at once, and be compared with any other one or two angles. And so of this the mind has no immediate or intuitive knowledge. But we must find out some other angles to which the three angles of a triangle have equality; and finding those equal to two right ones, we come to know the equality of these three angles to two right ones. These intervening ideas which serve to shew the agreement of any two others, are called proofs: and where the agreement or disagreement is by this means plainly and clearly perceived, it is called demonstration. A quickness in the mind to find those proofs, and to apply them right, is called sagacity.

This knowledge, though it be certain, is not so clear and evident as intuitive knowledge. It requires pains and attention, and steady application of mind, to discover the agreement or disagreement of the ideas it considers; and there must be a progression by steps and degrees before the mind can in this way arrive at certainty. Before demonstration there was a doubt, which, in intuitive knowledge, cannot happen to the mind that has its faculty of perception left to a degree capable of distinct ideas, no more than it can be a doubt to the eye, that can distinctly see white and black, whether this ink and paper be all of a colour. Now, in every step that reason makes in demonstrative knowledge, there is an intuitive knowledge of that agreement or disagreement it seeks with the next immediate idea, which it uses as a proof: for if it were not so, that would still require a proof: since without the perception of such agreement or disagreement, there is no knowledge produced. By which it is evident, that every step in reasoning that produces knowledge has intuitive certainty; but when the mind perceives, there is no more required but to remember it, to make the agreement or disagreement of the ideas, concerning which we inquire, visible and certain. This intuitive perception of the agreement or disagreement of the intermediate ideas, in each step and progression of the demonstration, must also be exactly carried in the mind: and a man must be sure that no part is left out; which because in long deductions the memory cannot easily retain, this knowledge becomes more imperfect than intuitive, and men often embrace falsehoods for demonstrations. It has been generally taken for granted, that mathematics alone are capable of demonstrative certainty. But to have such an agreement or disagreement as may be intuitively perceived, being not the privilege of the ideas of number, extension, and figure alone, it may possibly be the want of due method and application in us, and not of sufficient evidence in things, that demonstration has been thought to have so little to do in other parts of knowledge: for, in whatever ideas the mind can perceive the agreement or disagreement immediately, there it is capable of intuitive knowledge: and where it can perceive the agreement or disagreement of any two ideas, by an intuitive perception of the agreement or disagreement they have with any intermediate ideas, there the mind is capable of demonstration, which is not limited to the ideas of figure, number, extension, or their modes. The reason, why it has been generally supposed to belong to them only, is because in comparing their equality or excess the modes of numbers have every the least difference very clear and perceivable. And in extension, though every the least excess is not so perceptible, yet the mind has found out ways to discover the just equality of two angles, extensions, or figures; and both, that is, numbers and figures, can be set down by visible and lasting marks. But in other simple ideas, whose modes and differences are made and counted by degrees, and not quantity, we have not so nice and accurate a distinction of their differences, as to perceive or find ways to measure their just equality or least differences: for those other simple ideas being appearances or sensations produced in us by the size, figure, motion, &c. of minute corpuscles singly insensible, their different degrees also depend on the variation of some or all of those causes; which, since it cannot be observed by us in particles of matter, whereof each is too subtle to be perceived, it is impossible for us to have any exact measures of the different degrees of these simple ideas. Thus, for instance, not knowing what number of particles, nor what motion of them, is fit to produce any precise degree of whiteness, we cannot demonstrate the certain equality of any two degrees of whiteness, because we have no certain standard to measure them by, nor means to distinguish every the least difference; the only help we have being from our senses, which in this point fail us. But where the difference is so great as to produce in the mind ideas clearly distinct, there ideas of colours, as we see in different kinds (blue and red, for instance,) are as capable of demonstration as ideas of number and extension. What is here said of colours holds true in all secondary qualities. These two then, intuition and demonstration, are the degrees of our knowledge; whatever comes short of one of these is but faith or opinion, not knowledge, at least in all general truths. There is, indeed, another perception of the mind employed about the particular existence of finite beings without us; which going beyond probability, but not reaching to either of the foregoing degrees of certainty, passes under the name of knowledge.

ledge. Nothing can be more certain than that the idea we receive from an external object is in our minds: this is intuitive knowledge; but whether we can thence certainly infer the existence of any thing without us corresponding to that idea, is that whereof some men think there may be a question made, because men have such an idea in their minds when no such things exist, no such object affects their senses. But it is evident, that we are invincibly conscious to ourselves of a different perception, when we look upon the sun in the day, and think on it by night; when we actually taste wormwood or smell a rose, or only think of that savour or odour. So that we may add to the two former sorts of knowledge this also of the existence of particular external objects, by that perception and consciousness we have of the actual entrance of ideas from them, and allow these three degrees of knowledge, viz. intuitive, demonstrative, and sensitive. But since our knowledge is founded on and employed about our ideas only, will it follow thence, that it must be conformable to our ideas; and that where our ideas are clear and distinct, obscure and confused, there our knowledge will be so too? No: for our knowledge consisting in the perception of the agreement or disagreement of any two ideas, its clearness or obscurity consists in the clearness or obscurity of that perception, and not in the clearness or obscurity of the ideas themselves. A man (for instance) who has a clear idea of the angles of a triangle, and of equality to two right ones, may yet have but an obscure knowledge of it. But obscure and confused ideas can never produce any clear or distinct knowledge; because, as far as any ideas are obscure or confused; so far the mind can never perceive clearly whether they agree or disagree.

OF THE EXTENT OF HUMAN KNOWLEDGE.

From what has been said concerning knowledge, it follows, 1st, That we can have no knowledge farther than we have ideas. 2dly, That we have no knowledge farther than we can have perception of that agreement or disagreement of our ideas, either by intuition, demonstration, or sensation. 3dly, We cannot have an intuitive knowledge that shall extend itself to all our ideas, and all that we would know about them, because we cannot examine and perceive all the relations they have one to another by juxtaposition, or an immediate comparison one with another. Thus we cannot intuitively perceive the equality of two extensions, the difference of whose figures makes their parts incapable of an exact immediate application. 4thly, Our rational knowledge cannot reach to the whole extent of our ideas; because between two different ideas we would examine, we cannot always find such proofs as we can connect one to another, with an intuitive knowledge in all the parts of the deduction. 5thly, Sensitive knowledge reaching no farther than the existence of things actually present to our senses, is yet much narrower than either of the former. 6thly, From all this it is evident that the extent of our knowledge comes not only short of the reality of things, but even of the extent of our own ideas. We have the ideas of a square, a circle, and equality; and yet perhaps shall never be able to find a circle equal to a square. The affirmations or negations we make concerning the ideas we have, being reduced to the four sorts above-mentioned, viz. Identity, co-existence, relation, and real existence, we shall examine how far our knowledge extends in each of these. First, As to identity and diversity, our intuitive knowledge is as far extended as our ideas themselves; and there can be no idea in the mind which it does not presently, by an intuitive knowledge, perceive to be what it is, and to be different from any other. Secondly, As to the agreement or disagreement of our ideas in co-existence: in this our knowledge is very short; though in this consists the greatest and most material part of our knowledge concerning substances. For our ideas of substances being nothing but certain collections of simple ideas co-existing in one subject, (our idea of flame, for instance, is a body hot, luminous, and moving upward;) when we would know any thing farther concerning this, or any other sort of substance, what do we do, but inquire what other qualities or powers these substances have, or have not? which is nothing else but to know, what other simple ideas do or do not co-exist with those that make up that complex idea? The reason of this is, because the simple ideas, which make up our complex ideas of substances, have no visible necessary connection or inconsistency with other simple ideas, whose co-existence with

them we would inform ourselves about. These ideas being likewise, for the most part, secondary qualities, which depend upon the primary qualities of their minute or insensible parts, or on something yet more remote from our comprehension, it is impossible we should know which have a necessary union or inconsistency one with another, since we know not the root whence they spring, or the size, figure, and texture of parts on which they depend, and from which they result. Besides this, there is no discoverable connection between any secondary quality, and those primary qualities which it depends on. We are too far from knowing what figure, size, or motion produces, (for instance, a yellow colour, a sweet taste, or a sharp sound,) that we can by no means conceive how any size, figure, or motion, can possibly produce in us the idea of any colour, taste, or sound, whatsoever; and there is no conceivable connection between the one and the other. Our knowledge therefore of co-existence reaches little farther than experience. Some few, indeed, of the primary qualities have a necessary dependence and visible connection one with another; as figure necessarily supposes extension; receiving or communicating motion by impulse supposes solidity. But qualities co-existent in any subject, without this dependence and connection, cannot certainly be known to co-exist, any farther than experience by our senses informs us. Thus, though upon trial we find gold yellow, weighty, malleable, fusible, and fixed, yet because none of these have any evident dependence or necessary connection with the other, we cannot certainly know that where any four of these are, the fifth will be there also, how highly probable soever it may be: but the highest degree of probability amounts not to certainty; without which there can be no true knowledge: for this co-existence can be no further known than it is perceived; and it cannot be perceived, but either, in particular subjects, by the observation of our senses, or, in general, by the necessary connection of the ideas themselves. As to the third sort, the agreement or disagreement of our ideas in any other relation, this is the largest field of knowledge, and it is hard to determine how far it may extend. This part depending on our sagacity in finding intermediate ideas that may shew the habitudes and relations of ideas, it is difficult to tell when we are at the end of such discoveries. They, that are ignorant of Algebra, cannot imagine the wonders in this kind that are to be done by it; and what further improvements and helps advantageous to other parts of knowledge the sagacious mind of man may yet find out, it is not easy to determine. The ideas of quantity are not those alone that are capable of demonstration and knowledge; other and perhaps more useful parts of contemplation would undoubtedly afford us certainty, if vices, passions, and domineering interest, did not oppose or menace endeavours of this kind. The idea of a Supreme Being, infinite in power, goodness, and wisdom, whose workmanship we are, and on whom we depend; and ideas of ourselves, as understanding rational creatures; would, if duly considered, afford such foundation of our duty, and rules of action, as might place Morality among the sciences capable of demonstration. The relations of other modes may certainly be perceived, as well as those of number and extension. Where there is no property, there is no injustice, is a proposition as certain as any demonstration in Euclid: for the idea of property being a right to any thing, and the idea of injustice being the invasion or violation of that right, it is evident that these ideas being thus established, and these names annexed to them, we can as certainly know this proposition to be true, as that a triangle has three angles equal to two right ones. As to the fourth sort of knowledge, viz. of the real actual existence of things, we have an intuitive knowledge of our own existence; a demonstrative knowledge of the existence of God; and a sensitive knowledge of the objects that present themselves to our senses. From what has been said, we may discover the causes of our ignorance, which are chiefly these three: 1st, Want of ideas: 2dly, Want of a discoverable connection between the ideas we have: 3dly, Want of tracing and examining our ideas.

OF THE REALITY OF OUR KNOWLEDGE.

The reader by this time may be ready to object, If it be true that all knowledge lies only in the perception of the agreement or disagreement of our own ideas, the visions of an enthusiast, and the reasonings of a sober man, will be equally certain: It is no

matter how things are, so a man observe but the agreement of his own imaginations, and talk conformably; it is all truth, all certainty. To this it is answered, That if our knowledge of our ideas should terminate in them, and reach no farther, when there is something farther intended, our most serious thoughts would be of little more use than the reveries of a crazy brain. But it is evident that this way of certainty, by the knowledge of our own ideas, goes a little farther than bare imagination; and that all the certainty of general truths a man has, lies in nothing else but this knowledge of our ideas. It is evident, that the mind knows not things immediately, but by the intervention of the ideas it has of them. Our knowledge therefore is real, only so far as there is a conformity between our ideas and the reality of things. But how shall we know when our ideas agree with things themselves? there are two sorts of ideas, that we may be assured agree with things: these are,

1st, **SIMPLE IDEAS**; which, since the mind can by no means make to itself, must be the effect of things operating upon the mind in a natural way, and producing therein those perceptions, which, by the will of our Maker, they are ordained and adapted to. Hence it follows, that simple ideas are not fictions of our fancies, but the natural and regular productions of things without us, really operating upon us; which carry with them all the conformity our state requires, which is to represent things under those appearances they are fitted to produce in us. Thus the idea of whiteness, as it is in the mind, exactly answers that power which is in any body to produce it there. And this conformity between our simple ideas, and the existence of things, is sufficient for real knowledge.

2dly, All our **COMPLEX IDEAS**, except those of substances, being archetypes of the mind's own making, and not referred to the existence of things as to their originals, cannot want any conformity necessary to real knowledge: for that which is not designed to represent any thing but itself, can never be capable of a wrong representation. Here the ideas themselves are considered as archetypes, and things no otherwise regarded than as they are conformable to them. Thus the mathematician considers the truth and properties belonging to a rectangle or circle only as they are ideas in his own mind, which possibly he never found existing mathematically, that is, precisely true: yet his knowledge is not only certain, but real; because real things are no farther concerned, nor intended to be meant by any such propositions, than as things really agree to those archetypes in his mind. It is true of the idea of a triangle, that its three angles are equal to two right ones: it is true also of a triangle, wherever it exists: what is true of those figures, that have barely an ideal existence in his mind, will hold true of them also when they come to have a real existence in matter. Hence it follows, that moral knowledge is as capable of real certainty as mathematics: for certainty being nothing but the perception of the agreement or disagreement of our ideas, and demonstration nothing but the perception of such agreement by the intervention of other ideas; our moral ideas, as well as mathematical, being archetypes themselves, and so adequate or complete ideas, all the agreement or disagreement we shall find in them will produce real knowledge, as well as in mathematical figures. That which is requisite to make our knowledge certain, is the clearness of our ideas; and that which is required to make it real, is, that they answer their archetypes.

3dly, But the complex ideas, which we refer to archetypes without us, may differ from them, and so our knowledge about them may come short of being real; and such are our ideas of substances. These must be taken from something that does or has existed, and not be made up of ideas arbitrarily put together without any real pattern. Herein, therefore, is founded the reality of our knowledge concerning substances, that all our complex ideas of them must be such, and such only, as are made up of such simple ones as have been discovered to co-exist in nature. And our ideas being thus true, though not perhaps very exact copies, are the subjects of the real knowledge of them. Whatever ideas we have, the agreement we find they have with others will be knowledge. If those ideas be abstract, it will be general knowledge. But to make it real concerning substances, the ideas must be taken from the real existence of things. Wherever, therefore, we perceive the agreement or disagreement of our ideas, there is certain knowledge; and wherever we are sure

those ideas agree with the reality of things, there is certain real knowledge.

OF TRUTH IN GENERAL.

Truth, in the proper import of the word, signifies the joining or separating of signs, as the things signified by them do agree or disagree with one another. The joining or separating of signs, is what we call Propositions; so that truth properly belongs only to propositions: whereof there are two sorts, mental and verbal; as there are two sorts of signs commonly made use of, ideas and words. It is difficult to treat of mental propositions without verbal; because, in speaking of mental, we must make use of words, and then they become verbal. Again, men commonly in their thoughts and reasonings use words instead of ideas; especially if the subject of their meditation contains in it complex ideas. If we have occasion to form mental propositions about white, black, circle, &c. we can, and often do, frame in our minds the ideas themselves, without reflecting on the names: but when we would consider, or make propositions about the more complex ideas, as of a man, vitriol, fortitude, glory, &c. we usually put the name for the idea; because the idea these names stand for being for the most part confused, imperfect, and undetermined, we reflect on the names themselves, as being more clear, certain, and distinct, and ready to occur to our thoughts, than the pure ideas; and so we make use of these words instead of the ideas themselves, even when we would meditate and reason within ourselves, and make tacit mental propositions. We must then observe two sorts of propositions that we are capable of making: 1st, Mental propositions, wherein the ideas in our understandings are put together or separated, by the mind perceiving or judging of their agreement or disagreement. 2d, Verbal propositions, which are words put together or separated in affirmative or negative sentences: so that proposition consists in joining or separating signs; and truth consists in putting together or separating these signs, according as the things they stand for agree or disagree. Truth, as well as knowledge, may well come under the distinction of verbal and real; that being verbal truth, wherein terms are joined according to the agreement or disagreement of the ideas they stand for, without regarding whether our ideas are such as really have or are capable of having an existence in nature. But they contain real truth, when these signs are joined as our ideas agree; and when our ideas are such as, we know, are capable of having an existence in nature; which in substances we cannot know, but by knowing that such have existed. Truth is the marking down in words the agreement or disagreement of ideas as it is; falsehood is the marking down in words the agreement or disagreement of ideas otherwise than it is: and so far as these ideas, thus marked by sounds, agree to their archetypes, so far only is the truth real. The knowledge of this truth consists in knowing what ideas the words stand for, and the perception of the agreement or disagreement of those ideas, according as it is marked by those words. Besides truth taken in the strict sense above mentioned, there are other sorts of truths: As 1st, Moral truth; which consists in speaking of things according to the persuasion of our own minds. 2dly, Metaphysical truth; which is nothing but the real existence of things conformable to the ideas to which we have annexed their names. These considerations of truth either having been before taken notice of, or not being much to our present purpose, it may suffice here only to have mentioned them.

OF OUR KNOWLEDGE OF EXISTENCE.

Hitherto we have only considered the essences of things; which being only abstract ideas, and thereby removed in our thoughts from particular existence, give us no knowledge of existence at all. We proceed now to inquire concerning our knowledge of the existence of things, and how we come by it. We have the knowledge of our own existence by intuition; of the existence of God, by revelation and demonstration; and of other things, by sensation.

OF JUDGEMENT.

The understanding faculties being given to man, not barely for speculation, but also for the conduct of his life, a man would be at a great loss if he had nothing to direct him but what has the certainty of true knowledge. He that will not eat till he has dem-
monstration

monstration that it will nourish him, nor stir till he is infallibly assured of success in his business, will have little else to do but to sit still and perish. Therefore, as God hath set some things in broad day-light; as he has given us some certain knowledge, though limited to a few things in comparison, probably as a taste of what intellectual creatures are capable of, to excite in us a desire and endeavour after a better state; so, in the greatest part of our concerns he has afforded us only the twilight of probability, suitable to that state of mediocrity and probation he has been pleased to place us in here. The faculty which God has given man to enlighten him, next to certain knowledge, is judgement; whereby the mind, takes its ideas to agree or disagree, without perceiving a demonstrative evidence in the proofs. The mind exercises this judgement sometimes out of necessity, where demonstrative proofs and certain knowledge are not to be had; and sometimes out of laziness, unskilfulness, or haste, even where they are to be had. This faculty of the mind, when it is exercised immediately about things, is called judgement: when about truths delivered in words, is most commonly called assent or dissent. Thus the mind has two faculties conversant about truth and falsehood: 1st, Knowledge; whereby it certainly perceives, and is undoubtedly satisfied of, the agreement or disagreement of any ideas. 2dly, Judgement; which is the putting ideas together, or separating them from one another in the mind, when their certain agreement or disagreement is not perceived, but presumed to be so. And if it so unites or separates them as in reality things are, it is right judgement.

OF PROBABILITY.

Probability is nothing but the appearance of the agreement or disagreement of two ideas, by the intervention of proofs, whose connection is not constant and immutable, or is not perceived to be so; but is or appears for the most part to be so; and is enough to induce the mind to judge the proposition to be true or false, rather than the contrary. Of probability there are degrees, from the neighbourhood of certainty and demonstration, quite down to improbability and unlikeliness, even to the confines of impossibility: and also degrees of assent, from certain knowledge, and what is next to it, full assurance and confidence, quite down to conjecture, doubt, distrust, and disbelief. That proposition then is probable, for which there are arguments or proofs to make it pass or be received for true: the entertainment the mind gives to this sort of propositions, is called belief, assent, or opinion. Probability then being to supply the defect of our knowledge, is always conversant about propositions whereof we have no certainty, but only some inducements to receive them for true. The grounds of it are, in short, these two: 1st, The conformity of any thing with our own knowledge, experience, or observation. 2dly, The testimony of others, vouching their observation and experience. In the testimony of others is to be considered, 1. The number; 2. The integrity; 3. The skill of the witnesses; 4. The design of the author, if it be a testimony cited out of a book; 5. The consistency of the parts and circumstances of the relation; 6. Contrary testimonies. The mind, before it rationally assents to or dissents from any probable proposition, ought to examine all the grounds of probability, and see how they make, more or less, for or against it; and upon a due balancing of the whole, reject or receive it, with a more or less firm assent, according to the preponderancy of the greater grounds of probability on the one side or the other. But there are propositions that challenge the highest degree of our assent upon bare testimony, whether the thing proposed agree or disagree with common experience and the ordinary course of things or no: the reason whereof is, because the testimony is of such an one as cannot deceive or be deceived; and that is God himself. This carries with it certainly beyond doubt, evidence beyond exception. This is called by a peculiar name, revelation: and our assent to it, faith, which has as much

certainly in it as our knowledge itself; and we may as well doubt of our own being, as we can whether any revelation from God be true. So that faith is a settled and sure principle of assent and assurance, and leaves no manner of room for doubt or hesitation: only we must be sure that it be a divine revelation, and that we understand it right, else we shall expose ourselves to all the extravagancy of enthusiasm, and all the error of wrong principles, if we have faith and assurance in what is not divine revelation.

OF REASON.

The word reason, in English, has different significations. Sometimes it is taken for true and clear principles; sometimes for clear and fair deductions from those principles; sometimes for the cause, and particularly for the final cause: but the sense in which we shall use it here is, as a faculty whereby man is supposed to be distinguished from beasts, and wherein it is evident he much surpasses them. Reason is necessary, both for the enlargement of our knowledge, and regulating our assent; for it hath to do both in knowledge and opinion, and is necessary and assisting to all our other intellectual faculties; and indeed contains two of them, viz. 1st, Sagacity, whereby it finds intermediate ideas; 2dly, Illation, whereby it so orders and disposes of them as to discover what connection there is in each link of the chain whereby the extremes are held together, and thereby, as it were, to draw into view the truth sought for; which is that we call illation, or inference, and consists in nothing but the perception of the connection there is between the ideas in each step of the deduction; whereby the mind comes to see either the certain agreement or disagreement of any two ideas, as in demonstration, in which it arrives at knowledge; or their probable connection, on which it gives or withholds its assent, as in opinion. Sense and intuition reach but a little way; the greatest part of our knowledge depends upon deductions and intermediate ideas. In those cases where we must take propositions for true, without being certain of their being so, we have need to find out, examine, and compare, the grounds of their probability: in both cases, the faculty which finds out the means, and rightly applies them to discover certainty in the one, and probability in the other, is that which we call reason. So that in reason we may consider these four degrees: 1. The discovering and finding out of proofs. 2. The regular and methodical disposition of them, and laying them in such order as their connection may be plainly perceived. 3. The perceiving their connection. 4. The making a right conclusion. See LOGIC. Reason, though of a very large extent, fails us in several instances; as, 1st, Where our ideas fail: 2dly, It is often at a loss, because of the obscurity, confusion, or imperfection, of the ideas it is employed about. Thus having no perfect idea of the least extension of matter, or of infinity, we are at a loss about the divisibility of matter. 3dly, Our reason is often at a stand, because it perceives not those ideas, which would serve to shew the certain or probable agreement or disagreement of any two other ideas. 4thly, Our reason is often engaged in absurdities and difficulties, by proceeding upon false principles, which being followed lead men into contradictions, and inconsistency in their own thoughts. 5thly, Dubious words, and uncertain signs, often puzzle men's reason, and bring them to a nonplus. Though the deducing one proposition from another be a greater part of reason, and that which it is usually employed about; yet the principal act of ratiocination is the finding the agreement or disagreement of two ideas one with another, by the intervention of a third; as a man, by a yard, finds two houses to be of the same length, which could not be brought together to measure their equality by juxta-position: words have their consequences as the signs of such ideas: and things agree or disagree, as really they are; but we observe it only by our ideas. In reasoning, men ordinarily use four sorts of arguments. See ARGUMENTUM.

METAPLASM, [*μεταπλασμός*], in grammar, is a change made in a word, by adding, retrenching, or altering, a syllable, or letter thereof.

METAPTOSIS, [from *μετα*, against, and *πτωσις*, a fall,] the lapse of one disease into another.

METASTASIS, [*μεταστάσις*], in medicine, is a transposition or settlement of some humour or disease in some other part; and sometimes it signifies such an alteration of a disease as is succeeded by a solution.

METASYNCHRISIS, [from *μετα*, against, and *συνχρσις*, a concretion,] a restoration; the removal of a morbid concretion.

METATARSUS, [*μετα* and *ταρσος*], the middle of the foot, which is composed of five small bones connected to those of the first part of the foot. See **ANATOMY**.

METATHESIS, [*μετάθεσις*], in grammar, a species of the metaplasin; being a figure whereby the letters or syllables of a word are transposed or shifted out of their usual situations, as *pistris* for *pristis*, *Lybia* for *Libya*, &c.

METATHESIS, in medicine, is used with respect to morbid causes, which, when they cannot be evacuated, are removed to places where they are less injurious.

METAURO, a river of Italy, in the marquisate of Ancona, which runs into the Adriatic, near Ancona.

METAURO, a river of Naples, in Calabria Ultra, which runs into the Adriatic, 6 miles S. of Nicotera.

METAURUS, in ancient geography, a town of Italy, in the country of the Brutii, now called Metro.

METAURUS, a river of Italy, now called Metauro.

METELIN, the modern name of the island of Lesbos. See **LESBOS**, and **MITYLENE**.

METEMPSYCHOSIS, [*μετα*, beyond, and *εμψυχή*, animated,] Pythagoras and his followers held, that after death men's souls passed into other bodies, of this or that kind, according to the manner of life they had led. If they had been vicious, they were imprisoned in the bodies of miserable beasts, there to do penance for several ages; at the expiration whereof, they returned afresh to animate men. But if they lived virtuously, some happier brute, or a human creature, was to be their lot. Some authors, however, maintain that the metempsychosis of Pythagoras implied nothing more than a similitude of manners, desires, and studies, formerly existing in some person deceased, and now revived in another alive. Pythagoras is said to have borrowed the notion of a metempsychosis from the Egyptians; others say, from the ancient Brachmans. It is still retained among the Banians and other idolaters of India and China; and makes the principal foundation of their religion. So extremely are they bigoted to it, that

they not only forbear eating any thing that has life, but many of them even refuse to defend themselves from wild beasts. They burn no wood, lest some little animalcule should be in it; and are so very charitable, that they will redeem from the hands of strangers any animals that they find ready to be killed.

METEMPTOSIS, [from *μετα*, after, and *πτίπω*, I fall,] a term in chronology, expressing the solar equation, necessary to prevent the new moon from happening a day too late; by which it stands contradistinguished from Proemiptosis, which signifies the lunar equation, necessary to prevent the new moon from happening a day too soon. The new moons running a little backwards, that is, coming a day too soon at the end of 312 years and a half; by the proemiptosis, a day is added every 300 years, and another every 2400 years: on the other hand, by the metemiptosis, a bissextile is suppressed each 134 years: that is, three times in 400 years. These alterations are never made but at the end of each century; that period rendering the practice of the calendar easy. There are three rules for making this addition or suppression of the bissextile day, and for changing the index of the epacts. 1. When there is a metemiptosis, the next following, or lower index, must be taken. 2. When there is a proemiptosis without a metemiptosis, the next preceding or superior index is to be taken. 3. When there are both a metemiptosis and a proemiptosis, or when there is neither the one nor the other, the same index is preserved. Thus, in 1600, we had D: in 1700, by reason of the metemiptosis, C was taken: in 1800, there was both a proemiptosis and metemiptosis; so the same index was retained. In 1900, there will be a metemiptosis again, when B will be taken; which will be preserved in 2000, because there will then be neither the one nor the other. This is as far as we need to compute for it: but Clavius has calculated a cycle of 301,800 years; at the end of which period, the same indices return in the same order.

METEOR, [by the Greeks called *μετεωρα*, *q. d.* high raised; and by the Latins, *impressio*, as making signs or impressions in the air,] is extended to the phenomena of hail, rain, snow, thunder, &c. but is most commonly confined to those unusual and fiery appearances named falling stars, *ignes fatui*, *auroræ boreales*, &c. whether they appear at a great distance from the earth or not. See these articles, and **METEOROLOGY**.

METEOROLOGICAL JOURNAL, a table recording the daily state of the air, exhibited by the barometer, thermometer, hygrometer, anemometer, and other meteorological instruments. We have many journals of this kind, kept at the house of the Royal Society, and by different observers in other places, in the Philosophical Transactions, the Memoirs of the Academy of Sciences, and similar publications. See the next article.

METEOROLOGY.

METEOROLOGY, [*μετεωρα* and *λογία*], a science which investigates those phenomena of the atmosphere, commonly called meteors, giving an account of the circumstances attending each, and explaining the causes whence they arise.

OF THE OBJECTS OF METEOROLOGY.

The objects of this science are naturally divided into three classes: viz. 1. Luminous and Fiery Meteors, including the Halo, the Parhelion or mock-sun, the Rainbow, the Fata Morgana, the Ignis Fatuus, the Stella Cadens or falling star, the Draco Volans or flying dragon, the Aurora Borealis or northern morn, Thunder, and Lightning. 2. Airy Meteors, including Hurricanes, Tornadoes, the Harmattan, the Siroc, Whirlwinds, Trade-winds, &c. 3. Aqueous Meteors, including Evaporation, Water-Spouts, Clouds, Mists, Rain, Dew, Snow, and Hail. See these articles in their order. To treat of all these in a satisfactory manner, it is plain that we ought to have an intimate acquaintance with the constitution of the atmosphere; with the nature of those powerful agents by which it appears to be principally influenced, viz. fire, light, and electric fluid; and with their peculiar modes of operation and action upon one another and upon the atmosphere, and this in every possible variety of circumstances. Nor is even all

this sufficient: the various phenomena of rain, wind, snow, heat, cold, &c. are known to depend very much upon the situation of different places on the surface of the earth; and their occasional variations are with great reason supposed to proceed, partly at least, from changes which take place in the bowels of the earth: whence a meteorologist ought not only to be perfectly well acquainted with geology, but with mineralogy also; and that to an extent at which human knowledge will probably never arrive. In a science so very difficult, it is not to be supposed that any thing like a certain and established theory can be laid down: our utmost knowledge in this respect goes no farther yet, than to the establishment of a few facts; and in reasoning even from these, we are involved every moment in questions which seem scarcely within the compass of human wisdom to resolve. Most of the atmospherical phenomena are so various and uncertain, that it seems impossible to reduce them to any kind of rule. Every year, for instance, differs in a vast number of particulars from that which preceded it, even in such as are the most similar to one another. Sometimes we find a number of years successively similar to one another, and another set quite different taking place immediately after them. Some have supposed that this succession took place every nineteen years, nearly the time of the revolution of the

the moon's nodes; but the observations on which this opinion is built are by no means sufficient to establish it, and the dissimilarity between the phenomena of different years sufficiently warrants us to conclude, that other causes, besides the regular action of the sun and revolution of the earth, are concerned. Some of these causes have been supposed to be fermentations and other commotions within the bowels of the earth itself, but the immense variety which occurs in meteorological appearances can by no means be accounted for by the interference of such causes. But a little attention to the subject will lead us to conclude that these phenomena are the consequences of chemical action by which there is a continual and rapid succession of new combinations and decompositions. "Though the phenomena of the weather, says Dr. Thomson, must have at all times attracted much of the attention of mankind, because their subsistence and their comfort in a great measure depended upon them, it was not till the 17th century, that any considerable progress was made in investigating the laws of meteorology. How desirous soever the ancients might have been to acquire an accurate knowledge of this science, their want of proper instruments entirely precluded them from cultivating it. By the discovery of the barometer and thermometer, in the 17th century, and the invention of accurate electrometers and hygrometers in the 18th, this defect is now pretty well supplied; and philosophers are enabled to make meteorological observations with ease and accuracy. Accordingly a very great number of such observations have been collected, which have been arranged and examined from time to time by ingenious men, and consequences deduced from them, on which several different theories of the weather have been built. But meteorology is a science so exceedingly difficult, that notwithstanding the united exertions of some of the first philosophers of the age, the phenomena of the weather are still very far from being completely understood; nor can we expect to see the veil removed, till accurate tables of observations have been obtained from every part of the world, till the atmosphere has been more completely explored, and the chemical changes which take place in it ascertained. The changes, which take place in the atmosphere demonstrate, in the clearest manner, that new combinations and decompositions are continually going on in it. On these chemical alterations, the greater number of meteorological phenomena depend: they may be considered as the result of the mutual action of the different component parts of the atmosphere; and would admit of an easy explanation, if we were thoroughly acquainted with all these substances, and with the chemical laws which govern their action. The most important meteorological phenomena are, 1. The changes which take place in the weight of the atmosphere. 2. The changes which take place in its temperature. 3. The fogs, clouds, and rain, which so often precipitate from it. 4. The violent agitation into which it is often thrown: and, 5. The electric phenomena which sometimes accompany or occasion these precipitations and agitations. The considerations of these phenomena shall occupy the five following sections."

1. OF THE CHANGES IN THE WEIGHT OF THE ATMOSPHERE.

"The barometer indicates to us the weight of a column of air, extending to the top of the atmosphere, and whose base is equal to that of the mercury. At the level of the sea, where the column of air is longest, the mean height of the barometer is thirty inches. This Sir George Shuckburgh found to be the case in the Mediterranean and the Channel, in the temperature of 55° and 60°; M. Bouguer, on the coast of Peru, in that of 84°; and Lord Mulgrave in lat. 80°. The mean height of the barometer is less, the higher any place is situated above the level of the sea, because the column of air which supports the mercury is the shorter. The barometer has accordingly been used for measuring heights. See BAROMETER. But if a barometer be allowed to remain in one place, the mercury does not remain stationary; sometimes it rises, and at other times falls, varying to the extent of several inches; of course the weight of the air, which balances the mercury must be subject to the same changes. Hence we learn, that the air in the same place is sometimes light, and at other times heavy; differences which must be owing to changes in its quantity. The barometer then informs us, that the quantity of air above any spot is liable to continual alterations. Consequently either the air accu-

mulates in particular spots, while it partially abandons others; or part of the atmosphere must be alternately abstracted altogether, and restored again by some constant, though apparently irregular, process. Between the tropics the variations of the barometer are exceedingly small; and it is remarkable, that, in that part of the world, it does not descend above half as much for every 200 feet of elevation as it does beyond the tropics. In the torrid zone, too, the barometer is elevated about two-thirds of a line twice every day; and this elevation happens at the same time with the tides of the sea. As the latitude advances towards the poles the range of the barometer gradually increases, till at last it amounts to two or three inches. This gradual increase will appear from the following table:

TABLE OF THE RANGE OF THE BAROMETER.

Lat.	Places.	Greatest R.	Annual R.
0°	Peru	0.20	—
22 23	Calcutta	0.77	—
40 55	Naples	1.00	—
51 8	Dover	2.47	1.80
53 13	Middlewick	3.00	1.94
53 23	Liverpool	2.89	1.96
59 56	Petersburgh	3.45	2.77

"In North America, however, the range of the barometer is a great deal less than in the corresponding European latitudes. In Virginia, for instance, it never exceeds 1.1. It is greater at the level of the sea than on the mountains, and in the same degree of latitude the extent of the range is in the inverse ratio of the height of the place above the level of the sea. From a table published by M. Cotte in the *Journal de Physique*, (for Aug. 1790, p. 110,) it seems exceedingly probable that the barometer has always a tendency to rise from the morning to the evening; and that this tendency is greatest between two o'clock P. M. and nine at night, at which hour the greatest elevation takes place; that the elevation of nine o'clock differs from that of two by four-twelfths, while that at two differs from the morning-elevation only by one-twelfth; and that in certain climates the greatest elevation takes place at two o'clock."

The following is a part of the Table on which these observations are founded, reduced to the English standard.

PLACES.	Years of observation.	Mean Height of the Barometer.			
		Morn.	Noon.	Even.	Year.
Arles	6	29.9347	29.9347	29.9413	29.9347
Arras	6	29.6083	29.6083	29.6832	29.6758
Bordeaux	11	29.7212	29.8385	29.8385	29.8385
Cambray	13	29.8756	29.8682	29.8756	29.8756
Chinon	12	29.7719	29.7795	29.8001	29.7869
Dunkirk	8	29.9199	29.9347	29.9347	29.9273
Hagenau	10	29.5648	29.5648	29.5741	29.5648
Laon	7	29.3354	29.3206	29.3429	29.3354
Lisle	6	29.9165	29.9274	29.9347	29.9077
Mayenne	7	29.7172	29.7056	29.7127	29.7127
Manheim	5	29.6167	29.6018	29.6167	29.6093
Montmorenci	22	29.6536	29.6536	29.6610	29.6536
Mulhausen	7	29.1873	29.1800	29.1873	29.1873
Obernheim	12	29.4834	29.4665	29.4764	29.4764
Paris	67	29.8902	29.8607	29.8756	29.8756
Poitiers	12	29.7276	29.7276	29.7276	29.7276
Rouen	11	29.8697	29.8535	29.8535	29.8535
Rome	3	29.8607	29.8460	29.8756	29.8607
St. Maurice le Gerard	10	29.8016	29.8016	29.8090	29.8016
Troyes	10	29.6885	29.6979	29.6885	29.6885

"The range of the barometer (continues Dr. Thomson,) is greater in winter than in summer. Thus at York, the mean range of the barometer, during October, November, December, January, February, and March, 1774, was 1.42; and for the six summer-months 1.016. In serene and settled weather it is generally

tally high; and low in calm weather, when the air is inclined to rain; it sinks on high winds, rises highest on easterly and northerly winds, and sinks when the wind blows from the S. At Calcutta, it is always highest when the wind blows from the N. W. and N. and lowest when it blows from the S. E. The barometer falls suddenly before tempests, and undergoes great oscillations during their continuance. Mr. Copland of Dumfries has remarked, (in the Manchester Trans. vol. iv.) that a high barometer is attended with a temperature above, and a low barometer with one below the monthly mean." See BAROMETER. "Such are the phenomena respecting the barometer, as far as they can be reduced under general heads. Various attempts have been made to explain them, but hitherto without any great success. See ATMOSPHERE, and BAROMETER. The theory of Mr. Kirwan appears to me by far the most plausible, though it is not sufficient to explain all the facts." Here Dr. Thomson gives "a kind of abstract of Mr. Kirwan's theory," of which we shall give an abridged view. "The density of the atmosphere is least at the equator, and greatest at the poles; for the centrifugal force, the distance from the earth's centre, and the heat, are there at their maximum, while at the pole they are at their minimum. The mean height of the barometer at the level of the sea, all over the globe, is thirty inches; the weight of the atmosphere, therefore, is the same all over the globe. The weight of the atmosphere depends on its density and height; where its density is greatest, the height must be least; and where its density is least, its height must be greatest. See ATMOSPHERE. The height of the atmosphere must therefore be greatest at the equator and least at the poles; and it must decrease gradually between these, so that its upper surface will resemble two inclined planes meeting above the equator. During summer, when the sun is in our hemisphere, the mean heat between the equator and the poles does not differ so much as in winter. Indeed the heat of the northern countries at that time equals the heat of the torrid zone: thus in Russia, during July and August, the thermometer rises to 85°. Hence the rarity of the atmosphere at the pole, and its height, will be increased. Its upper surface, therefore, in the N. hemisphere will be less inclined, while that of the S. hemisphere will be more inclined. The reverse will take place during winter. The density of the atmosphere depends greatly on the pressure of the superincumbent column; and, therefore, in the torrid zone, will not decrease so fast as in the temperate and frigid zones, because its column is longer, and there is a greater proportion of air in the higher part of it. This accounts for Mr. Cassan's observation, that the barometer sinks only half as much for every 200 feet of elevation, in the torrid as in the temperate zones. The density of the atmosphere at the equator, therefore, though at the surface of the earth it is less, must at a certain height equal, and at a still greater surpass its density in the temperate zones, and at the poles. A current of air is constantly ascending at the equator, and part of it reaches and continues in the higher parts of the atmosphere. From its fluidity it cannot accumulate above the equator, but must roll down the inclined plane, which the upper surface of the atmosphere assumes towards the poles. As the surface of the atmosphere of the N. hemisphere is more inclined during our winter than that of the S. a greater quantity of the equatorial current of air must flow upon the N. than upon the S. atmosphere; so that the quantity of our atmosphere will be greater during winter, than that of the S. hemisphere; but during summer the reverse will take place. Hence the greatest mercurial heights take place during winter, and the range of the barometer is less in summer than in winter. The density of the atmosphere is in a great measure regulated by the heat of the place: wherever the cold is greatest, the density will be greatest, and its column shortest. High countries and lofty mountains must be colder, and the column of air over them much shorter. The current of air will linger and accumulate over these places in its passage to the poles, and thus occasion an irregularity in its motion, producing a similar irregularity in the barometer. Such accumulations will be formed over the N. W. parts of Asia and North America: hence the barometer stands higher and varies less than in Europe. Accumulations are also formed upon the Pyrenees, the Alps, the mountains of Africa, Turkey, Tartary, and Thibet. When these have gone on for some time, the density of the air becomes too great; it rushes down on the neighbouring countries, and produces cold winds,

which raise the barometer. Hence the rise of it which attenes N. E. winds in Europe, from accumulations in the N. W. of Asia, or about the pole; hence too the N. W. wind from the mountains of Thibet raises the barometer at Calcutta. It is probable that considerable quantities of air are destroyed in the polar regions. When this happens the atmosphere to the S. rushes in to fill up the void. Hence the S. W. winds take place, and the barometer falls. As the mean heat of our atmosphere differs in different years, its density, and the quantity of equatorial air, which flows towards the poles, must also be variable. Hence the range of the barometer differs in different years. In some years greater accumulations than usual take place in the mountainous parts in the S. of Europe and Asia; owing perhaps to earlier snow or long continued fogs. When this takes place, the atmosphere in the polar regions will be proportionally lighter. Hence the prevalence of S. winds in some winters more than others. As the heat in the torrid zone never differs much, the density and height of the atmosphere will not vary much. Hence the range of the barometer within the tropics is small; and increases gradually towards the poles, because the difference of the temperature, and consequently of the density, of the atmosphere increases with the latitude. The diurnal elevation of the barometer in the torrid zone corresponding to the tides, observed by Cassan, &c. must be owing to the influence of the moon on our atmosphere. This influence, notwithstanding the attempts of D'Alembert, seems altogether inadequate to account for the various phenomena of the winds. It is not so easy to account for the tendency of the barometer to rise as the day advances. Perhaps the additional quantity of vapour added to the atmosphere, by increasing its quantity, may produce the effect. The falls of the barometer which precede, and the oscillations which accompany, violent storms and hurricanes, shew us, that these phenomena are produced by very great rarefactions, or perhaps destruction, of air, in particular parts of the atmosphere. The falls of the barometer, too, that accompany winds, proceed from the same cause. The falling of the barometer which generally precedes rain, remains still to be accounted for: but we know too little about the causes by which rain is produced to be able to account for it in a satisfactory manner." See RAIN.

II. OF THE TEMPERATURE OF THE AIR.

"Though there is a considerable difference in every part of the world between the temperature of the atmosphere in summer and in winter; though in the same sea-on the temperature of almost every day, and even every hour, differs from that which precedes and follows it; though the heat varies continually in the most irregular and seemingly capricious manner—still there is a certain mean temperature in every climate, which the atmosphere has always a tendency to observe, and which it neither exceeds nor comes short of, beyond a certain number of degrees. What this temperature is, may be known by taking the mean of tables of observations kept for a number of years; and our knowledge of it must be the more accurate, the greater the number of observations is. The mean annual temperature is greatest at the equator, (or a degree or two on the N. side of it,) and it diminishes gradually towards the poles, where it is least. This diminution takes place in arithmetical progression; or the annual temperature of all the latitudes are arithmetical means between the mean annual temperature of the equator and the pole. This was first discovered by Mr. Mayer; and, by an equation which he founded on it, but rendered considerably plainer and simpler, Mr. Kirwan has calculated the mean annual temperature of every degree of latitude between the equator and the pole. He proceeded on the following principle: Let the mean annual heat at the equator be m , and at the pole $m - n$; put ϕ for any other latitude; the mean annual temperature of that latitude will be $m - n \times \sin. \phi$. If therefore the temperature of any two latitudes be known, the value of m and n may be found. Now the temperature of N. Lat. 40° has been found by the best observations to be 62.1°, and that of Lat. 50°, 52.9°. The square of the sine of 40° is nearly 0.419, and the square of the sine of 50° is nearly 0.586.

Therefore $m - 0.41 n = 62.1$, and
 $m - 0.58 n = 52.9$; therefore
 $62.1 + 0.41 n = 52.9 + 0.58 n$, as each of them
 from the two first equations, is equal to m . From this last equation

tion the value of n is found to be 53 nearly; and m is nearly equal to 84. The mean temperature of the equator, therefore, is 84° , and that of the pole 31° . To find the mean temperature for every other latitude, we have only to find 88 arithmetical means between 84 and 31 . In this manner Mr. Kirwan calculated the following

TABLE

Of the Mean Annual Temperature of the Standard Situation in every Latitude.

Lat.	Temper.	Lat.	Temper.	Lat.	Temper.
90	31.	61	43.5	32	69.1
89	31.04	60	44.3	31	69.9
88	31.10	59	45.09	30	70.7
87	31.14	58	45.8	29	71.5
86	31.2	57	46.7	28	72.3
85	31.4	56	47.5	27	72.8
84	31.5	55	48.4	26	73.8
83	31.7	54	49.2	25	74.5
82	32.	53	50.2	24	75.4
81	32.2	52	51.1	23	75.9
80	32.5	51	52.4	22	76.5
79	32.9	50	52.9	21	77.2
78	33.2	49	53.8	20	77.8
77	33.7	48	54.7	19	78.3
76	34.1	47	55.6	18	78.9
75	34.5	46	56.4	17	79.4
74	35.	45	57.5	16	79.9
73	35.5	44	58.4	15	80.4
72	36.	43	59.4	14	80.8
71	36.6	42	60.3	13	81.3
70	37.2	41	61.2	12	81.7
69	37.8	40	62.	11	82.
68	38.4	39	63.	10	82.3
67	39.1	38	63.9	9	82.7
66	39.7	37	64.8	8	82.9
65	40.4	36	65.7	7	83.2
64	41.2	35	66.6	6	83.4
63	41.9	34	67.4	5	83.6
62	42.7	33	68.3	0	84.

This table, however, only answers for the temperature of the atmosphere of the ocean. It was calculated for that part of the Atlantic Ocean which lies between the 80th degree of northern and the 45th of southern latitude, and extends westward as far as the Gulf-stream, and to within a few leagues of the coast of America; and for all that part of the Pacific Ocean reaching from latitude 45° north to latitude 40° south, from the 20th to the 275th degree of longitude east of London. This part of the ocean Mr.

Kirwan calls the standard; the rest of the ocean is subject to anomalies which will be afterwards mentioned. Mr. Kirwan has also calculated the mean monthly temperature of the standard ocean, on the following principles, viz. The mean temperature of April seems to approach very nearly to the mean annual temperature; and as far as heat depends on the action of the solar rays, the mean heat of every month is as the mean altitude of the sun, or rather as the sine of the sun's altitude. The mean heat of April, therefore, and the sine of the sun's altitude, being given, the mean heat of May is found in this manner: As the sine of the sun's mean altitude in April, is to the mean heat of April, so is the sine of the sun's mean altitude in May, to the mean heat of May. In the same manner the mean heats of June, July, and August, are found; but the rule would give the temperature of the succeeding months too low, because it does not take in the heat derived from the earth, which possesses a degree of heat nearly equal to the mean annual temperature. The real temperature of these months, therefore, must be looked upon as an arithmetical mean between the astronomical and terrestrial heats. Thus, in latitude 51° , the astronomical heat of the month of September is 44.6° , and the mean annual heat is 52.4° ; therefore the real heat of this

month should be $\frac{44.6 + 52.4}{2} = 48.5$. But however accurate

the principles, on which these calculations are made, may appear, and how well soever they may answer the expectations of the philosopher in particular cases, or at particular seasons and certain latitudes; yet when the calculations are made and submitted to the test of general and continual observations, a wide difference will be manifest in the results; and it is not to be expected that any theory will ever be framed which will afford principles sufficiently fixed and certain, to determine the mean temperature of the atmosphere, in every case to answer to observations and actual experiment. The least attention to the subject will shew at once, that, since the temperature of the atmosphere depends on so many circumstances, a great number of which are merely casual, not being directed by any known laws whatever, the calculations founded on a regular procedure cannot in any measure be adequate to the purposes intended. For not only the various kinds of surface and soil as being wet or dry, as consisting of clay or gravel, as being an open champagne country or containing extensive forests, as having many elevations or depressions, &c. which may be considered in some measure as constant; but also the various directions of the wind, and the effects of electricity from exhalation, evaporation, formation of mists and clouds with the descent of rain, &c. greatly affect the temperature. From these and similar considerations it is evident, that the most we can expect from any settled principles or determinate rules is a slight approximation to the truth; and therefore as any one might have with certainty predicted, it happened that Mr. Kirwan, after going through a tedious calculation, found the results by no means to agree with observations; hence he drew up the following table, partly from these principles, and partly from a variety of sea-journals in his possession:

TABLE of the Monthly Mean Temperature of the Standard from Lat. 80° to Lat. 9° .

Lat.	80°	79°	78°	77°	76°	75°	74°	73°	72°	71°	70°	69°	68°	67°	66°	65°	64°	63°
January.....	22.	22.5	23.	23.5	24.	24.5	25.	25.5	26.	26.5	27.	27.5	27.5	28.	28.	28.	29.	30.
February.....	23.	23.	23.5	24.	24.5	25.	25.5	26.	26.5	27.	27.5	28.	28.	28.5	29.	30.	31.	32.
March.....	27.	27.5	28.	28.5	29.	29.5	30.	30.5	31.	31.5	32.	32.5	33.	33.5	34.	35.	36.	37.
April.....	32.6	32.9	33.2	33.7	34.1	34.5	35.	35.5	36.	36.6	37.2	37.8	38.4	39.1	39.7	40.4	41.2	41.9
May.....	36.5	36.5	37.	37.5	38.	38.5	39.	39.5	40.	40.5	41.	41.5	42.	42.5	43.	44.	45.	46.
June.....	51.	51.	51.5	52.	52.	52.	52.5	53.	53.5	54.	54.	54.5	54.5	54.5	55.	55.	55.5	55.5
July.....	50.	50.	50.5	51.	51.	51.	51.5	52.	52.5	53.	53.5	53.5	53.5	54.	54.5	54.5	55.	55.
August.....	39.5	40.	41.	41.5	42.	42.5	43.	43.5	44.	44.5	45.	45.5	46.	47.	48.	48.5	49.	50.
September.....	33.5	34.	34.5	35.	35.5	36.	36.5	37.	38.	38.5	39.	39.5	40.	41.	42.	43.	44.	45.
October.....	28.5	29.	29.5	30.	30.5	31.	31.5	32.	32.5	33.	33.5	34.	34.	35.	36.	37.	37.5	38.
November.....	23.	23.5	24.	24.5	25.	25.5	26.	26.5	27.	27.5	28.	28.5	29.	30.	31.	32.	32.5	33.
December.....	22.5	23.	23.5	24.	24.5	25.	25.5	26.	26.5	27.	27.5	28.	28.	29.	30.	30.5	31.	31.

Sequel of the TABLE of the Monthly Mean Temperature of the Standard from Lat. 80° to Lat. 9°.

Lat.	62°	61°	60°	59°	58°	57°	56°	55°	54°	53°	52°	51°	50°	49°	48°	47°	46°	45°
January.....	31.	32.	33.	34.	35.	36.	37.	38.	39.	40.	41.	42.	42.5	43.5	43.	42.5	44.	44.5
February.....	33.	34.	35.	36.	37.	38.	39.	40.	41.	42.	43.	44.	44.5	44.5	45.	45.5	46.	46.5
March.....	38.	39.	40.	41.	42.	43.	44.6	45.	46.	48.	49.	50.	50.5	51.	52.5	53.	53.5	54.5
April.....	42.7	43.5	44.3	45.09	45.8	46.7	47.5	48.4	49.2	50.2	51.1	52.4	52.9	53.8	54.7	55.6	56.4	57.5
May.....	47.	48.	49.	50.	51.	52.	53.	54.	55.	56.	57.	58.	58.5	59.	60.	61.	62.	63.
June.....	56.	56.	56.	56.5	57.	57.	57.5	58.	58.5	59.	59.	60.	61.	62.	63.	64.	65.	66.
July.....	55.5	55.5	56.	56.5	57.	57.5	58.	59.	60.	61.	62.	63.	63.5	64.	65.	66.	67.	68.
August.....	51.	52.	53.	54.	55.	56.	57.	58.	59.	60.	61.	62.	63.5	64.	65.	66.	67.	68.
September.....	46.	47.	48.	49.	50.	51.	52.	53.	54.	55.	56.	57.	58.5	59.	60.	61.	62.	63.
October.....	39.	40.	41.	42.	43.	44.	45.	46.	47.	48.	49.	50.	50.5	51.	52.	53.	54.	55.
November.....	34.	35.	36.	37.	38.	39.	40.	41.	42.	43.	44.5	46.	46.5	47.	48.	49.	50.	51.
December.....	32.	33.	34.	35.	36.	37.	38.	39.	40.	41.	42.	44.	44.5	45.	46.	47.	48.	49.

Lat.	44°	43°	42°	41°	40°	39°	38°	37°	36°	35°	34°	33°	32°	31°	30°	29°	28°	27°
January.....	45.	45.5	46.	46.5	49.5	51.	52.	53.5	55.	56.5	59.5	63.	63.	63.	63.5	63.5	63.5	64.
February.....	47.	48.	49.	50.	53.	56.5	58.	60.	61.	62.	63.	64.5	66.	67.	68.5	68.5	69.5	69.5
March.....	53.5	56.5	58.5	59.5	60.	60.5	61.	62.	63.	64.	65.	66.5	67.5	68.5	69.5	71.	72.	72.5
April.....	58.4	59.4	60.3	61.2	62.1	63.	63.9	64.8	65.7	66.6	67.4	68.3	69.1	69.9	70.7	71.5	72.3	72.8
May.....	64.	65.	66.	67.	68.	69.	70.	70.5	71.	71.5	72.	72.5	73.	73.	73.5	74.5	75.5	76.
June.....	67.	68.	69.	70.	70.5	71.	71.	71.	71.5	71.5	72.	72.5	73.	73.	73.5	74.5	75.5	76.
July.....	69.	69.5	70.	70.	71.	71.	72.	72.	72.5	72.5	72.5	72.5	73.	73.	73.5	74.5	75.5	76.
August.....	69.	69.5	70.	70.	71.	71.	72.	72.	72.5	72.5	72.5	72.5	73.	73.	73.5	74.5	75.5	76.
September.....	64.	66.	68.	69.5	70.5	71.	71.5	72.	72.5	72.5	72.5	72.5	73.	73.	73.5	74.	75.5	76.
October.....	56.	57.	58.	59.	60.	61.	62.	63.	64.	65.	66.	67.5	68.5	69.5	70.5	71.	72.5	72.5
November.....	52.	53.	54.	55.	56.	57.	58.	59.	60.	61.	62.	63.	64.5	65.5	66.5	68.	69.	69.5
December.....	50.	51.	52.	53.	54.	55.	56.	57.	58.	59.	60.	61.	62.5	63.5	64.5	66.	67.	67.5

Lat.	26°	25°	24°	23°	22°	21°	20°	19°	18°	17°	16°	15°	14°	13°	12°	11°	10°	9°
January.....	64.5	65.5	67.	68.	69.	71.	72.	72.5	73.	73.5	74.	74.5	75.	76.	76.5	77.	77.5	77.7
February.....	70.5	71.	72.	72.	72.5	74.	75.	76.	76.5	77.	77.5	78.	78.5	79.	79.5	79.8	80.	80.2
March.....	73.	73.5	74.5	75.	75.5	76.	77.	77.5	78.	78.5	79.	79.5	80.	80.8	81.	81.5	81.3	81.5
April.....	73.8	74.5	75.4	75.9	76.5	77.2	77.8	78.3	78.9	79.4	79.9	80.4	80.8	81.3	81.7	82.	82.3	82.5
May.....	76.5	77.5	78.	78.5	79.5	80.	80.5	81.	81.5	82.	82.5	83.	83.	83.5	84.	84.	84.3	84.5
June.....	76.5	78.	78.5	79.	79.5	80.	80.5	81.5	82.	82.5	83.	83.5	83.8	84.	84.3	84.6	84.8	85.
July.....	76.5	78.	78.5	79.	79.5	80.	80.5	81.5	82.	82.5	83.	83.5	83.8	84.	84.3	84.6	84.8	85.
August.....	76.5	78.	78.5	79.	79.5	80.	80.5	81.5	82.	82.5	83.	83.5	83.8	84.	84.3	84.6	84.8	85.
September.....	76.5	77.5	78.	78.5	79.	79.5	80.	81.	81.5	82.	82.5	83.	83.	83.5	84.	84.3	84.6	84.8
October.....	73.	73.5	74.5	75.	75.5	77.	78.	79.	80.	81.	81.5	82.	82.5	83.	83.5	83.8	84.	84.2
November.....	71.5	72.	73.5	74.	74.5	75.	75.5	76.	77.	78.	78.5	79.	79.5	80.	80.5	80.8	81.	81.2
December.....	68.5	69.5	70.	71.	71.5	72.	72.5	73.	74.	75.	75.5	76.	76.5	77.	77.5	78.	78.5	78.8

"From this table," continues the Dr. "it appears that January is the coldest month in every latitude, and that July is the warmest in all latitudes above 48°. In lower latitudes August is generally warmest. The difference between the hottest and coldest months increases in proportion to the distance from the equator. Every habitable latitude enjoys a mean heat of 60° for at least two months. Within 10° of the poles the temperature differs very little; neither do they differ much within 10° of the equator; but they differ more as the latitudes approach the poles. The temperature of the earth at the level of the sea is the same with that of the Standard Ocean; but this temperature gradually diminishes as we ascend above that level, till at a certain height we arrive at the region of perpetual congelation. This region varies in height according to the latitude of the place: it is highest at the equator, and descends gradually nearer the earth as we approach the poles. It varies also according to the season, being highest in summer and lowest in winter. Mr. Bouguer found the cold on the top of Pinchinca, one of the Andes, to extend from 7° to 9° below the freezing-point every morning before sun-rise. He concluded, therefore, that the mean height of the term of congelation (the place where it first freezes during some part of the day all the year round), between the

tropics, was 15,577 feet above the level of the sea; but in latitude 28° he placed it in summer at the height of 13,440 feet. Now, if we take the difference between the temperature of the equator and the freezing point, it will bear the same proportion to the term of congelation at the equator, that the difference between the mean temperature of any degree of latitude and the freezing point bears to the term of congelation in that latitude. Thus the mean heat of the equator being 84°, the difference between it and 32° is 52; the mean heat of lat. 28° is 72.3°, the difference between which and 32° is 40.3: then 52 : 15577 :: 40.3 : 12072. In this manner Mr. Kirwan calculated the following

TABLE OF THE MEAN HEIGHT OF THE TERM OF CONGELATION.

Lat.	Feet.	Lat.	Feet.	Lat.	Feet.
0	15577	30	11592	60	3684
5	13437	35	10664	65	2510
10	15067	40	9011	70	1557
15	14498	45	7658	75	748
20	13719	50	6200	80	120
25	13030	55	4912		

"If the elevation of a country above the level of the sea proceeds at a greater rate than six feet per mile, we must, according to Mr. Kirwan, for every 200 feet of elevation diminish the annual temperature of the standard in that latitude as follows: if the elevation be at the rate of 6 feet per mile, $\frac{1}{4}$ of a degree; 7 feet $\frac{1}{2}$; 13 feet, $\frac{3}{8}$; 15 or upwards, $\frac{1}{2}$. For every 50 miles distance from the standard ocean, the mean annual temperature in different latitudes is to be depressed or raised nearly at the following rate:

From Lat. 70° to 35° depressed $\frac{1}{4}$ of a degree.

35	$\frac{1}{4}$
30	0
25 raised	$\frac{1}{4}$
20	$\frac{1}{2}$
15	$\frac{3}{4}$
10	1

"The cause of the heat of the atmosphere is evidently the sun's rays. The heat which they produce is less according as they fall obliquely; hence the temperature constantly diminishes during the equator to the pole, because their obliquity constantly increases with the latitude. But if the heat depended on the solar rays alone, it would disappear in the polar regions during winter, when the sun ceases to rise. This, however, is by no means the case; the mean temperature even at the pole is 31°; and we find within the arctic circle as hot weather as under the equator. The reason of this is that the sun's rays heat the earth considerably during summer: this heat it retains and gives out slowly during winter, and thus moderates the violence of the cold; and summer returns before the earth has time to be cooled beyond a certain degree. This is the reason, that the coldest weather does not take place at the winter-solstice, but some time after, when the temperature of the earth is lowest; and that the greatest heat takes place also some considerable time after the summer-solstice, because then the temperature of the earth is highest. For pure air is not heated by the solar rays which pass through it; but acquires slowly the temperature of the earth with which it is in contact. This is the reason why the temperature decreases according to the elevation above the level of the sea. Since the atmosphere is heated by contact with the superficies of the earth, its temperature must depend upon the capacity of the superficies for receiving and transmitting heat. Now this capacity differs very much in land and water. Land, especially when dry, receives heat with great readiness, but transmits it through its own substance very slowly. Dr. Hales found, that, in 1724, when the air and surface of the earth were both at 88°, a thermometer placed only two inches below the surface stood at 85°; another 16 inches below at 70°; and another 24 inches deep at 68°.—The earth, at about 80 or 90 feet below its surface, constantly retains the same temperature; and this is nearly equal to the mean annual heat of the country. Hence the mean annual temperature of any country, may be found pretty accurately by examining the heat of deep wells or springs. Water receives heat slowly on account of its transparency; but what it does receive is very quickly carried through the whole mass. Land is often heated and cooled to a much greater degree than sea is. Dr. Raymond often found the earth near Marseilles heated to 170°, but never found the sea above 77°: in winter the earth was often cooled down to 14°, but the sea never lower than 45°. The sea-atmosphere, therefore, ought to preserve a much more uniform temperature, than the land-atmosphere; and we find this to be the case. The cause of the greater equability of water than land is evident. In summer the surface of the sea is constantly cooled down by evaporation; and in winter, whenever the surface is cooled, it descends to the bottom from its increased gravity while its place is supplied by warmer water. This process goes on continually, and in winter is over before the atmosphere has been able to cool down the water beyond a certain degree. "These observations enable us to explain the difference which takes place between the annual temperature of the atmosphere above the ocean, and that of places at some considerable distance from it. As the sea is never heated so highly as the land, the mean summer-temperature at sea may be considered all over the world as lower than on land. During winter, when the power of the sun's rays in a great measure ceases, the sea gives out heat to the air much more readily than the earth: the mean winter-temperature, therefore, at sea, is higher than on land; and in cold countries the difference is so great, that it more than counterbalances the difference which takes place in summer; so that in high

latitudes the mean annual temperature ought to be greater than on land. Accordingly from lat. 70° to 35°, to find the temperature of a place, the standard-temperature for the same latitude ought to be depressed one-eighth of a degree for every fifty miles distance; for the cold which takes place in winter always increases in proportion to the distance from the standard. At a less distance than fifty miles, the temperatures of land and sea are so blended by sea and land-winds, that there is little difference in the annual mean. In lower latitudes than 30°, the rays of the sun, even in winter, retain considerable power; the surface of the earth is never cooled very low; consequently the difference between the annual temperatures of the sea and land become less. As we approach nearer to the equator, the power of the solar rays during winter increases so that the mean winter-temperature of the land-atmosphere approaches nearer and nearer to that of the sea, till at last at the equator it equals it. After we pass lat. 30°, therefore, the mean annual land-temperature gradually exceeds that of the sea more and more, till at the equator it exceeds it a degree for every fifty miles distance. Such then, in general, is the method of finding the mean annual temperature over the globe. There are, however, several exceptions to these general rules," enumerated by Dr. Thomson, of which we shall only quote one or two of the principal. "Small seas surrounded with land, at least in temperate and cold climates, are generally warmer in summer and colder in winter, than the standard ocean, because they are a good deal influenced by the temperature of the land. The Gulph of Bothnia, for instance, is for the most part frozen in winter; but in summer it is sometimes heated to 70°; a degree of heat never to be found in the opposite part of the Atlantic. The German sea is above three degrees colder in winter, and five degrees warmer in summer, than the Atlantic. The Mediterranean sea is, for the greater part of its extent, warmer both in summer and winter than the Atlantic, which therefore flows into it. The eastern parts of North America are much colder than the opposite coast of Europe, and fall short of the standard by about 10° or 12°, as appears from American Meteorological Tables. The causes of this remarkable difference are many. The highest part of North America lies between 40° and 50° of N. lat. and 100° and 110° of W. lon. of London; for there the greatest rivers originate. The very height, therefore, makes this spot colder, than it otherwise would be. It is covered with immense forests, and abounds with large swamps, which render it incapable of receiving any great degree of heat; so that the rigour of winter is much less tempered by the heat of the earth than in the old continent. Islands are warmer than continents in the same degree of latitude, and countries lying to the windward of extensive mountains or forests are warmer than those lying to the leeward. Stones or sand have a less capacity for heat than earth has, which is always somewhat moist; they heat or cool, therefore, to a greater degree. Hence the violent heat of Arabia and Africa, and the intense cold of Terra del Fuego. It is probable that the variations of the barometer, as well as those of the thermometer, are susceptible of what we may term a local character for each tract or country differing in climate. This will be most readily discovered by the following mode of investigation: prepare a sheet of paper ruled in squares with pale ink; the horizontal lines agreeing with the inches and decimal divisions of the scale of the barometer, the perpendicular, which may be about twice as distant, representing divisions of time. It will be convenient to consider each line as denoting midnight, and to mark the days of the month at the top of the columns thus defined. On this scale let the several notations of any register of the barometer be set down by means of a dot for each, placed in the part of the scale where it may point out the time and the elevation. The desired number of notations thus made, a curve may be drawn through the series of dots, which will represent at one view the course of the barometer for the time. It will be found, on comparing a number of these curves, that they characterise, in a certain degree, not only the latitude and season, but the locality of the observations. So that although the most obvious resemblances may be traced in different years of the same register, yet the general appearance of registers from different climates, will be found to differ in all respects. In this way may be seen at one view both the correspondence between the latitude or elevation above the sea of any place, and the range at that place; and the coincidence between the movements of the barometer, and the other phenomena

of the weather. It is obvious that the same mode, and even the same scale, may be made to serve for temperature also, by marking degrees upon the horizontal lines, and changing the appearance of the line representing temperature, so as to make it readily distinguishable from the other curve. There is a correspondence in this climate between the two instruments, which will thus often become conspicuous. It consists in an elevation of temperature after a rise of the barometer, and vice versa: the exceptions to this occur chiefly at the setting in of frost, and when it rains with the wind from the eastward. But the most remarkable circumstance which has thus been brought to light is, an influence which the sun and moon exercise over the atmosphere in respect to its pressure; and which is detailed in a series of observations, accompanied with a chart of this kind, for the year 1798, in the *Philosophical Magazine*, vol. vii. p. 355. The effect of this is, a tendency in the atmosphere to gain weight while the moon is passing to either quarter, and vice versa to lose it during the approach of full or new moon. The actual change which on a mean of ten years is found always to take place at London, amounts only to two-tenths of an inch in the barometer, which thus occurs twice in each moon. The apparent influence is often much greater for a considerable time together. There is something in these movements of the atmosphere very much resembling the waves producible in dense fluids. Thus a sudden and great depression in the barometer is followed by an equally sudden rise, which is often carried beyond the point from which the original movement commenced, and vice versa. In Plate CXIX is given the specimen of the register above noticed.

III. OF EVAPORATION AND RAIN.

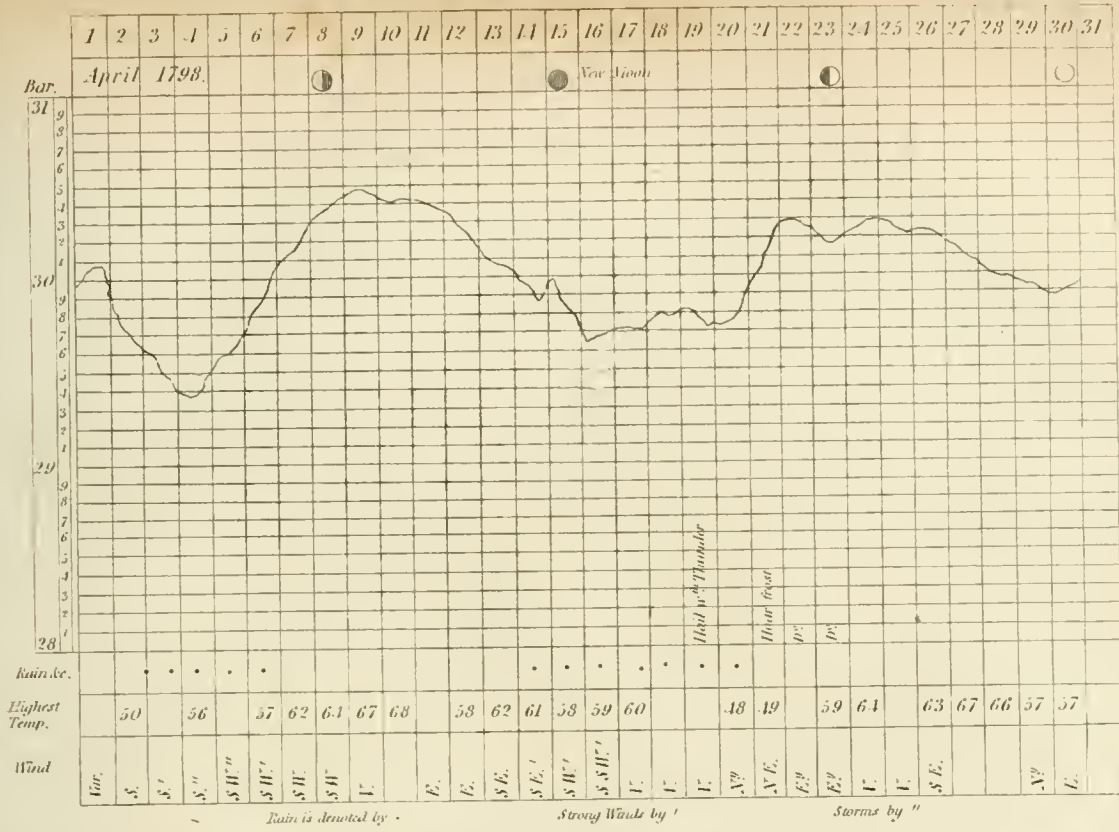
Evaporation is the principal cause of almost all the meteors of our atmosphere, and may be reckoned in a more particular manner the effect of heat. Evaporation is a natural process which is continually going on, and by means of which the atmosphere supplied with aqueous vapours is what furnishes mists, dew, rain, hail, snow, &c. See EVAPORATION, and RAIN. We found reason to conclude, says Dr. Thomson, that the water of the atmosphere exists in the state of vapour. We are indebted to the experiments of Saussure and De Luc, for much of our knowledge, of the qualities of vapour. It is an elastic invisible fluid like common air, but lighter; being to common air, according to Saussure, as ten to fourteen, or according to Kirwan as ten to twelve: it cannot pass beyond a certain maximum of density, otherwise the particles of water, which compose it, unite together and form small, hollow, visible vesicles, called vesicular vapour; which is of the same specific gravity with atmospherical air. It is of this vapour that clouds and fogs are composed. This maximum increases with the temperature, and at the heat of boiling water is so great, that steam can resist the whole pressure of the air, and exist in the atmosphere in any quantity. Evaporation, at least in our climate, is about four times greater during the summer than the winter half-year: other things being equal, it is so much more abundant, the greater the difference is between the temperature of the air and of the evaporating surface; so much the less, the nearer they approach to the same temperature, and least of all, when they actually arrive at it. Whenever the atmosphere is more than fifteen degrees colder than the evaporating surface, little evaporation takes place at all. Evaporation is powerfully promoted by winds, especially cold winds blowing into warm countries, or warm winds blowing into cold countries. Tracts of land covered with trees or vegetables emit more vapour, than the same space covered with water." Dr. Thomson, after quoting the experiments of Dr. Hales, Dr. Watson, and others, upon this subject, for which we refer the reader to the article EVAPORATION, has this general remark, that, "the formation of clouds and rain cannot be accounted for by a single principle with which we are acquainted. It is neither owing to the saturation of the atmosphere, nor the diminution of heat, nor the mixture of airs of different temperatures, as Dr. Hutton supposes; for clouds are often formed without any wind at all either above or below them; and even if this mixture constantly took place, the precipitation, instead of accounting for rain, would be almost imperceptible." *Elem. Chem.* Vol. III. p. 321. We must, therefore, in accounting for the phenomena of evaporation and rain, admit the joint agency of different principles. The water being raised into the atmosphere, by means of evaporation, is

there suspended, and by its condensation or precipitation produce the phenomena of clouds. The clouds or forms assumed by the suspended water in the interval between the first precipitation and the descent of rain, afford a copious field of observation. These are not, as might be hastily supposed, the sport of winds, changing with every movement of the containing medium. Indeed the atmosphere, at the height where clouds usually appear, is undisturbed by the various obstacles which throw it into contending streams and eddies near the surface of the earth, and flows in more direct and even current. Accordingly, the particles of water which it contains are allowed to assume a certain arrangement and constitute a form, which is often equally well defined at a distance with that of solids. From observations relative to this subject, Mr. Howard was led to conclude that the forms or modifications of the clouds are subject to certain fixed laws, in their production, their action on each other, and their resolution into rain. And the better to describe these modifications he formed a nomenclature, which we shall here quote, and refer the reader to for a further account of this subject to the *Philosophical Magazine*, Vol. 16, and 17. There are three simple and distinct modifications, in any one of which the aggregate of minute drops, called a cloud may be formed, increase to its greatest extent, and finally decrease and disappear. By modification is to be understood simply the structure or manner of aggregation, not the precise form or magnitude, which indeed varies every moment in most clouds. The principal modifications are commonly as distinguishable from each other as a tree from a hill, or the latter from a lake; although clouds in the same modification, considered with respect to each other, have often only the common resemblances which exist among trees, hills, or lakes, taken generally. The same aggregate, which has been formed in one modification, upon a change in the attendant circumstances may pass into another. Or it may continue a considerable time in an intermediate state, partaking of the characters of two modifications; and it may also disappear in this stage, or return to the first modification. Lastly, aggregates separately formed in different modifications, may unite and pass into one, exhibiting different characters in different parts; or portion of a simple aggregate may pass into another modification without separating from the remainder of the mass. Hence, together with the simple, it becomes necessary to admit intermediate and compound modifications, and to impose names on such of them as are worthy of notice. The simple modifications are thus named and defined: See Plate CXIX. 1. *Cirrus*. Def. Nubes cirrata, tenuissima, quæ undique crescat. Parallel, flexuous, and diverging fibres, extensible in any or in all directions. 2. *Cumulus*. Def. Nubes cumulata, densa, sursum crescens. Convex or conical heaps, increasing upward from a horizontal base. 3. *Stratus*. Def. Nubes strata, aquæ modo expansa, deorsum crescens. widely extended, continuous, horizontal, sheet, increasing from below. The intermediate modifications which require to be noticed are: 4. *Cirro-cumulus*. Def. Nubeculae densiores, subrotundæ, et quasi in agmine appositæ. Small, well defined, roundish masses, in close horizontal arrangement. 5. *Cirro-stratus*. Def. Nubes extenuata, subconcava vel undulata. Nubeculae hujusmodi appositæ. Horizontal or slightly inclined masses, attenuated towards a part or the whole of their circumference, concave downward; or undulated, separate, or in groups, consisting of small clouds, having these characters. The compound modifications are: 6. *Cumulo-stratus*. Def. Nubes densa, basin cum cum structura patente exhibens. A dense cloud with the base of the cumulus, but in its upper part extended into a broad sheet structure. 7. *Cumulo-cirro-stratus, vel nimbus*. Def. Nubes vel nubium congeries pluviâ effundens. The rain-cloud. A cloud, or system of clouds, from which rain is falling. It is a horizontal sheet, above which the cirrus spreads, while the cumulus enters it laterally, and from beneath.

IV. OF THE ELECTRICITY OF THE ATMOSPHERE.

"The electrical state of the atmosphere, (says Dr. Thomson) is a point of considerable importance, and has, with great propriety, occupied the attention of philosophers ever since Dr. Franklin demonstrated that thunder is occasioned by the agency of electricity." "There are four sources of atmospheric electricity known: 1. FRICTION: 2. EVAPORATION: 3. HEAT and COLD: 4. EXPANSION and CONTRACTION: see these articles

Specimen of a Register for exhibiting periodical Variations.



The modifications of clouds according to Mr. Howard.



a. Cirrus. b. Cirro cumulus. c. Cirro stratus. d. Cumulo stratus. e. Cumulus. f. Stratus. g. Nimbus.



not to mention the electricity evolved by the melting, freezing, solution, &c. of various bodies in contact of air. During every discharge of electricity, whether natural or artificial, through air, some change similar to combustion undoubtedly takes place. The light and the peculiar smell, with which all electrical discharges are accompanied, demonstrate this; for no light is perceptible, when electricity is discharged in a vacuum. What the change is, which electricity produces in air, or how it produces it, are questions which, in the present state of our knowledge, are altogether insoluble. However, from this and other phenomena of electricity, we are warranted to conclude that, in many cases, it exerts a powerful agency in the production of meteors." See ELECTRICITY, and the several articles above referred to.

V. OF THE PRINCIPAL AGENTS IN PRODUCING METEOROLOGICAL PHENOMENA.

Heat and cold are very powerful agents in producing various meteors: but these are only relatives, and different modifications of the same fluid. Though we do not know what connection there is between heat, cold, and electricity, yet we know that this last is very much affected by them; for heat makes bodies more pervious to electricity than otherwise they would be, and cold makes them less so. Hence the most violent electrical phenomena are observed in hot countries; while in the colder regions those which depend on a more moderate electrification, as aurora boreales, are more frequent. From what has been already said, however, about the nature of the different agents concerned in meteorology, both in this article and in other parts of the work, we may take the following view of the causes of meteors in general. 1. Evaporation, combined with electricity, produces all the phenomena of vapour, fog, clouds, rain, &c.; and according as these two are joined to certain degrees of heat or cold, they produce dew, hoar-frost, rain, hail, or snow. The phenomena of dew and hoar-frost seem to proceed from a quantity of aqueous and undecomposed vapour which always exists in the atmosphere; and which, being raised by mere heat, is condensed by mere cold, without undergoing that process by which water is changed into air. Hence it both ascends and descends; for if we cover a small space of ground with plates of glass, they will be wetted both above and below. The reason is, that the evaporation from the ground does not stop immediately after the air begins to cool, especially if it be covered with any thing which prevents the access of the cold air, as the glass-plates do in this case. The cold air, therefore, acting upon the glass, condenses the vapour below it, in the same manner that the head of a still or the receiver of a retort condenses the vapours which rise from the matter to be distilled. If the cold be very intense, hoar-frost appears instead of dew; which is nothing more than the dew frozen after it falls upon the ground, in the same manner that the vapour in a warm room congeals on the inside of the windows in a frosty night. As this seems to be the whole process, it has not been observed that any electricity is concerned in the production of dew. When the vapour has been thoroughly decomposed, and become invisible, it very frequently returns back to its pristine state, so far as to assume the appearance of mist or fog. In this case, electricity is evidently concerned; for

Mr. Cavallo has observed that all fogs are electrified. When the process has advanced farther, and the water begins to collect into drops, the electricity is still more remarkable; and it is with great reason supposed, that it is by means of electrical repulsion that the drops of rain keep at a regular distance from one another. When the cold is intense, and the electricity strong, the drops of water are frozen, and hail is produced: but snow indicates a more moderate degree of electricity; and a very violent cold, accompanied with a strongly electrical atmosphere, produces that excessively disagreeable vapour in the polar regions called frost-smoke, which is a general congelation of all the aqueous moisture contained in the atmosphere. By violent electricity alone are produced the phenomena of thunder, lightning, fire-balls, ignes fatui, and the aurora borealis. In the phenomena of thunder, evaporation, and the other agents by which rain and hail are produced, are also concerned; though electricity is most remarkably so, and thunder and lightning of the most violent kind frequently occur without any rain. The ignis fatuus, aurora borealis, large fire-balls, and the smaller ones called falling stars, seem to depend upon electricity alone, without any aid from evaporation, heat, or cold. Aurora borealis, indeed, is most common in the northern and southern parts of the world, where the cold is intense; though this seems to be owing, not to the cold, but to the natural emission of the electrical fluid, from the polar regions in much greater quantities than from others. The fire-balls commonly appear collected on the very extreme boundaries of the atmosphere, where, from the violent resistance already mentioned, the fluid is confined as it were in a concave shell, which it cannot by any means penetrate in great quantities in any particular place. Dr. Blagden has clearly proved, that fire-balls are "great bodies of electric matter, moving from one part of the heavens, where to our conception it is superabundant, to another where it is deficient." But though these fire-balls contain an immense quantity of this fluid, they can only proceed in an horizontal direction, and never fly perpendicularly up from the earth, as those sometimes do which are formed near the ground. By the action of heat and electricity combined, are produced the phenomena of hurricanes, whirlwinds, and water-spouts. It is not, indeed, known in what manner those agents combine themselves to produce such tremendous effects; but it seems evident that electricity is a principal agent in them, as the sea-water becomes unusually clear before a hurricane, and many signs of electricity are likewise observed in the heavens. The winds are supposed to proceed mostly from the heat of the sun rarifying the atmosphere, and occasioning a continual influx of fresh air to fill up the vacuum; but very violent winds are frequently observed where no such cause can be supposed to exist. Thus, on the tops of high mountains the winds are commonly very violent; and mountainous countries, especially when cold, are for the most part also subject to high winds. As the tops of mountains, however, are known to be strongly electrified by their attracting and repelling the clouds, we must suppose that electricity has a considerable share in producing the winds which are generally so violent on their tops. This will appear the more probable, when we consider that frequently storms of wind, and those of the most violent kind, seem to be brought along with clouds.

METEORIC STONES, substances which have been found to fall to the ground on the explosion of fire-balls. See AEROLITHS, and BALLS OF FIRE.

METEOROMANCY, a species of divination by meteors, principally by lightning and thunder.

METESSIB, an officer of the eastern nations, who has the care and oversight of all the public weights and measures, and sees that things are made justly according to them.

METHEGLIN, a species of mead; one of the most pleasant and general drinks the northern parts of Europe afford, and much used among the ancient inhabitants. See MEAD.

METHOD, in logic. See LOGIC.

METHODISTS, **METHODICI**, in the history of medicine,

a sect of ancient physicians, who reduced the whole art of healing to a few common principles or appearances. The Methodists were the followers of Thessalus; whence they were also called Thessalici. They were strenuously opposed by Galen in several of his writings.

METHODISTS, a denomination given to the followers of the late Rev. John Wesley, and by some also applied to the followers of the Rev. George Whitefield. In Nov. 1729, Mr. John Wesley, being then a fellow of Lincoln College, Oxford, Mr. Morgan commoner of Christ's Church, Mr. Charles Wesley student, and Mr. Kirkman of Merton College, set apart some evenings for reading the original scriptures, and prayer. Some time after they were joined by Mr. Ingham of Queen's College, Mr. Broughton

of Exeter, and Mr. James Hervey, and in 1735 by the celebrated Mr. George Whitefield. They began now to move in a more public sphere, appropriating a part of their time for instructing the prisoners, and visiting the sick. They also instituted a fund for the relief of the poor; and in order to accomplish their benevolent design, Mr. John Wesley not only abridged himself of all the superfluities, but even of many of the necessities of life. Their holy department soon attracted the attention of the college censors and students, who discountenanced their proceedings, branded them with many opprobrious epithets, denominated them Sacramentarians, the Godly Club, and afterwards Methodists; which name was first given them by a fellow of Merton College, in allusion to a certain college of physicians who flourished at Rome about the reign of Nero, and were remarkable for putting their patients under regimen. In 1735, Mr. John Wesley sailed along with his brother Charles, Mr. Ingham, and Mr. Delamotte, for Georgia, in order to preach the gospel to the Indians. The piety and devotion, which they manifested during the voyage, was highly commendable, and such as bespoke their minds impressed with a due sense of their important undertaking; but failing in their grand design, and some other disagreeable circumstances arising, Mr. John Wesley returned to England, after having been absent near two years, and was succeeded by his valuable friend, the Rev. George Whitefield, a man every way qualified to please and profit his hearers. Upon Mr. Wesley's return to England he was invited to preach in several churches, but the concourse of people who followed him was so great, that the churches in general were soon shut against him. However his labours were not in vain; the minds of many were religiously impressed; and about fifty persons agreed to meet together for free conversation, to begin and end with singing and prayer. These he left upon the 13th June, 1738, on a visit to the Moravian Brethren in Germany, from whence he returned upon the 16th Sept. It was yet his desire and design to preach in the established church, as he ever entertained a sincere regard for it; but for the cause above assigned he was not permitted. He therefore preached in Newgate, in some dissenting chapels in London, and in different places in the country where he could obtain admission. He also visited Oxford and Bristol, and had the happiness to see his labours blessed. It was at this early period of Methodism, when most of his valuable friends forsook him, among whom was that justly celebrated character before mentioned, the late Rev. George Whitefield, who, during this time, had been chiefly employed in America, where he inhibited certain doctrines contrary to those taught by Mr. Wesley. Upon his return to England, in 1741, a temporary separation took place betwixt them, although Mr. Wesley used every possible means to prevent it. Not long after this William Cudworth and James Rely separated from Mr. Whitefield. These two gentlemen were Antinomians, avowed enemies to the Law of God, and termed all who preached it Legalists. With them preaching the Law was an abomination. They would preach Christ, as they termed it, though they neither enforced holiness nor good works. These were still denominated Methodists, though differing so widely from them both in the principle and practice. But though Mr. Whitefield and Mr. Wesley differed in sentiment, they lived and died united in heart; for Mr. Whitefield, in his will, written by his own hands, inserts as follows: "I leave a mourning ring to my honoured and dear friends, and disinterested fellow-labourers, the Rev. Messrs. John and Charles Wesley, in token of my indissoluble union with them in heart and Christian affection, and notwithstanding our difference in judgement about some particular points of doctrine. The doctrines taught by Mr. Wesley and his followers are these: 1st, They teach that man is fallen; asserting, that when he came forth out of the hands of his Maker, he was pure, and that through his disobedience to the divine command he lost his original rectitude, and subjected his body to pain and death: Sin

"Brought death into the world, and all our woe:" deprived all the faculties of the mind, and subjected the soul to endless misery. 2d, Restoration by Jesus Christ; maintaining that his obedience, sufferings, and death, were efficacious to atone for the great offence, for "as by the offence of one," &c. Rom. v. 18. They also strongly assert, that the merits of Christ are not confined to any particular elect number, but general, he being the propitiation for the sins of the whole world. 3dly, The nature

and necessity of repentance. Or a cordial renunciation of sin arising from a deep sense of its evil nature, and destructive effects; and a sincere seeking for deliverance from it through the Redeemer Jesus Christ, from a conviction that there is salvation in no other. 4thly, Justification by faith; they renounce all works from having any part in a sinner's justification, asserting that a man is justified by faith without the deeds of the law, but maintain that good works will necessarily follow. Their zeal for good works, as the fruits of faith, has led many to denominate them Legalists. 5thly, Sanctification, or Christian perfection; proving that upon the exercise of justifying faith the work of sanctification is begun, and that if the believer faithfully use the grace received, he will make sensible advances towards holiness, even till he arrive at a state of purity in this life, or meetness for the heavenly inheritance. Some mistaken persons charge the Methodists with holding absolute perfection attainable, whereas they neither believe absolute, angelical, nor even paradisaical, perfection, attainable in this life; only such a perfection as our state admits of; viz. that grace infused into the soul at justification being brought unto maturity, or loving God with the whole heart, which is in Scripture often called being perfect. 6thly, The salvation of all infants dying in nonage. 7thly, The Trinity of the Godhead with the equality of the Persons. Having thus stated their doctrine, we shall notice their rules. It would exceed our limits to transcribe every rule or law which exists for the government of so large a body; we shall, therefore, only mention a few of the most general: 1. Every society is divided into classes consisting of about twelve or fourteen persons, one of whom (who is judged the best qualified) is appointed the leader. It is his business, 1st, To see each person in his class once a-week; to inquire how their souls prosper; to advise, reprove, comfort, or exhort, as occasion may require; and to receive what they are willing to give towards the relief of the poor. 2d, To meet the ministers and stewards of the society; to inform them of any who are sick, or walk disorderly; and to pay to the stewards what he has received from his class the week preceding. 3. It is required that all who are received or continue members of the society should evidence their desire of salvation, 1st, By refraining from open sin, public amusements, &c. 2d, By doing all the good in their power by acts of mercy and benevolence to others; and, 3. By attending diligently to the ordinances of God. 3. Every approved member receives a ticket, having a portion of Scripture and a large letter printed upon it, which will procure his admission to any society, either at home or abroad. Its chief use is to procure admission to the love-feast, a meeting held once every quarter, at which most of the members from the different societies in the circuit attend, and to which none but members are admitted. This meeting is opened by the superintendant of the circuit with singing and prayer, after which a small quantity of bread and water is distributed among them; which after they have taken as a token of affection to each other, they are at liberty to speak if they find themselves disposed, respecting the providences of God towards them, or the operations of his grace upon their minds, observing due order and regularity; but to prevent imposition, these tickets are renewed every three months, when each member contributes according to the freedom of his own mind, for the support of the cause in general. The whole body of members is divided into different circuits, and two, three, four, or more ministers are appointed to each, proportioned to its extent; one of whom has the superintendency. As no minister is bound to stay more than one year in a circuit, or allowed to continue longer than three, a change takes place every year which is almost general; and a conference of the ministers is held once a-year. Mr. Wesley, being excluded the churches, and having no places for the accommodation of his numerous audiences, was at last moved to imitate the example which his Lord had set before him, by preaching in the streets, lanes, and fields:

"They stood, and under open air ador'd

"The God who made both air, earth, heaven, and sky."

The societies being much increased in London, Bristol, and other places, and having in vain solicited assistance from the established clergy, he was induced to choose out among themselves those whom he judged the best qualified to instruct the rest. Thus were lay-preachers introduced. Having now teachers after his own heart, they enlarged the sphere of action, and soon formed societies in the counties of York, Wilts, Gloucester, Leicester, Warwick,

Warwick, Lincoln, Nottingham, &c. But as it was in the beginning of Christianity, so it was now, they were every where spoken against, and in many places persecuted without any mixture of mercy, or distinction of sex or circumstances; many of the members having their houses beset, their bodies maimed, and their property destroyed; some of their ministers impressed and sent off for soldiers, to the disgrace of magistracy, and of many of the clergy of the established church, who were often the chief instigators of the mob. Some irregularities have arisen in different parts of the connection, but these have been discountenanced, and opposed to the utmost bounds of prudence. Perhaps in nothing is this body so deficient, as in some parts of its government; but this is not of choice, but necessity, its extent being so great, and the genius and education of the different countries so contrary to each other, that no regular rules can be established to govern the whole body, the want of which occasions different modes of regulations among them, as that which is approved by one circuit or county is exploded by another: for instance, in some places the people wish to have the holy sacrament administered by their own ministers in their own chapels; for which purpose a number of the preachers have been ordained by the imposition of hands, both in Britain and America: but in many places both in England and Ireland the people incline to receive the sacraments in the established church. Both parties are indulged, as the body wishes to become all things to all men, so far as is consistent with a good conscience. Their ministers, in general, do not put much stress on literary knowledge, believing that only a divine call and qualification are sufficient; but they do not despise human learning: on the contrary they esteem it as serviceable to the congregations of the Lord; and several individuals among them have made very great proficiency therein. Their ministers are, in general, men of deep piety, and exemplary conduct. Their labours are unequalled by those of any other sect; many of them travelling a number of miles every day, besides preaching ten or twelve times every week. They love the Calvinists as members of Christ, though they do not love their doctrine of absolute unconditional reprobation. Their charity embraces the whole human race; but especially those whom they believe of the household of faith of every denomination. The members, in general, are very temperate, both in food and clothing; in their dress they imitate the Quakers in form, though not in quality. They also avoid all places of public amusement, such as theatres, race-courses, ball-rooms, &c. Their deportment to each other is very affectionate, being ready to sympathise over the distressed, and administer to their wants. This has subjected them to the imposition of designing persons, as it is only needful to adopt the name of a Methodist to insure relief from that generous body. In the large societies, in London, Bristol, Leeds, Manchester, &c. they have certain persons appointed, whom they judge the best qualified, to visit and instruct the sick and pray with them; not only of their own but of other societies, where they can obtain admission; and have different funds instituted for supplying their wants. Their unwearied exertions for the public good have a just claim upon our commendation, while their number and deportment entitles them to respect. The members are very numerous, and the greater part of them have been reclaimed from the most vicious course of life, but now, in general, adorn the gospel of Christ. Those who wish to be more fully informed of their history and customs, may consult Mr. Wesley's Journals and other writings; or his Life by Dr. Coke and H. More. Their doctrines will be found impartially handled in the works of the late Rev. John Fletcher, vicar of Madeley.

METHUSELAH, [מֶתוּשֶׁלַח, Heb. *i. e.* the weapons of death,] or **MATHUSALA**, or **MATHUSHELAH**, the son of Enoch, was born A.M. 687, begat Lamech in 874, and died in 1656, being the very year of the deluge, at the age of 969, which is the greatest age upon record that has been attained to by any man (Gen. v. 21, 22, &c.).

METHWOLD, a town of Norfolk, 15 miles N. W. of Thetford.

METIUS, JAMES, the inventor of telescopes with glasses, one of which he presented to the States General in 1609, was born in Alenmaer. Tubes, extended by uniting them, to a great length, were known to the ancients; but Metius was the first who added glasses.

METLING, a town of Austria, in Carniola, 40 miles S. E. of Laubach.

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METO, a famous mathematician of Athens, who, B. C. 432, published his *Enneadeicatoride*, or *Cycle of Nineteen Years*, by which he endeavoured to adjust the course of the sun to that of the moon, and to make the solar and lunar years begin at the same point of time.

METOECI, a name given by the Athenians to such as had their fixed habitations in Attica, though foreigners by birth.

METONIC CYCLE, in chronology, the same with the cycle of the moon. See **CHRONOLOGY**.

METONYMY, [μετωνυμία,] a rhetorical figure, by which one word is put for another, as the matter for the material; as, *e. g.* he died by steel, that is, by a sword. See **ORATORY**.

METOPE, in architecture, the interval or square space between the triglyphs of the Doric frieze, which among the ancients used to be painted, or adorned with carved work, representing the heads of oxen or utensils used in sacrifices.

METOPOSCOPY, [μετωποσκοπία,] the pretended art of knowing a person's dispositions and manners by the traces and lines in the face. *Ci-ro Spontoni*, who has written on metoposcopy, says, that seven lines are examined in the forehead, and that each line is considered as having its particular planet; the first is the line of Saturn, the second of Jupiter, the third of Mars, &c.

METRE, [μετρον,] in poetry, a system of feet of a just length. The different metres in poetry, are the different manners of ordering and combining the quantities, or the long and short syllables: thus hexameter, pentameter, iambic, sapphic, verses, &c. consist of different metres or measures. See **HEXAMETER**, &c. In the English verses, the metres are extremely various and arbitrary, every poet being at liberty to introduce any new form that he pleases. The most usual are the heroic, generally consisting of five long and five short syllables, and verses of four feet, and of three feet, and a caesura or single syllable. The ancients, by variously combining and transposing their quantities, made a vast variety of different measures. See **POETRY**.

METRE, in the new French measures. See **MEASURE**.

METRETES, a Grecian measure, containing something more than nine English gallons. See **MEASURE**.

METRICAL VERSES consist of a determinate number of long and short syllables; as those of the Greek and Latin poets.

METROCOMIA, [from *μητηρ*, mother, and *κομμη*, town or village,] a term in ancient church-history, signifying a borough or village that had other villages under its jurisdiction.

METRONOMII, the name given by the Athenians to five officers in the city and ten in the *piræus*, whose duty it was to inspect all sorts of measures, except those of corn.

METROPOLIS, [*metropolis*, Lat. *μητηρ* and *πολις*,] the mother-city; the chief city of any country or district.

METROPOLIS is also applied to archiepiscopal churches, and sometimes to the principal or mother-church of a city. The Roman empire having been divided into 13 dioceses and 120 provinces, each diocese and each province had its metropolis, where the praeconsul resided. To this civil division the ecclesiastical was afterwards adapted, and the bishop of the capital city had the direction of affairs, and the pre-eminence over all the bishops of the province. His residence in the metropolis gave him the title of Metropolitan. This erection of metropolitans is referred to the end of the third century, and was confirmed by the council of Nice.

METROPOLITAN, a bishop of the mother-church; an archbishop. A metropolitan has the privilege of ordaining his suffragans; and appeals from sentences passed by the suffragans are preferred to the metropolitan.

METROSIDEROS, in botany, a genus of the *icosandria monogynia* class and order; natural order, *Myrti*. Calyx five-cleft, half superior; petals five; stamina very long, standing out; stigma simple; capsule three-celled. There are thirteen species.

METZ, a city of France, capital of the department of the Moselle. Lon. 6. 16. E. Lat. 49. 7. N.

MEULAN, a town of France, in the department of the Seine and Oise, and late province of the Isle of France; 20 miles N. W. of Paris. Lon. 1. 57. E. Lat. 49. 1. N.

MEURS, **MEURS**, or **MORS**, a late principality of Germany, about eight miles square, surrounded by those of Juliers, Cleves, Berg, Cologne, and Gueldres, now included in the department of the Roer.

6 U

MEURS.

MEURS, or MËURS, capital of the above district, seated on the Rhine, 16 miles N. W. of Dusseldorp. Lon. 6. 41. E. Lat. 51. 29. N.

MEURSIUS, JOHN, a learned and laborious writer, born at Lo-dun, near the Hague, in 1579. He early discovered a fondness for the sciences. At 13 he wrote Greek verses, and at 16 a commentary on Lycophron. He went to study the law at Orleans with the son of Barneveldt, whom he accompanied in his travels. In 1610 he was made professor of history at Leyden; and afterwards Greek professor. In 1611 the magistrates of the United Provinces appointed him to write the history of his country. He married in 1612, Anna Catherina Bilberbeccia, descended from a very ancient family in Pomerania, who possessed many amiable qualities. During 14 years residence at Leyden, he published more works than the whole body of professors had done from the foundation of the university in 1575. His writings have now spread his reputation in every part of Europe. Christian IV. king of Denmark, in 1625, conferred on him the places of historiographer royal, and professor of history and politics in the academy of Sora, where he resided 12 years. In 1638 he had a violent attack of the stone, from which he recovered, but died of a consumption induced by it, 20th Sept 1639. He left behind him a son and a daughter. He was the author of many excellent historical, critical, and miscellaneous works; but had no hand in a scandalous indecent piece, published in his name, intitled *Meursii Elegantiæ Latinæ Sermonis*: which was the production of one Westrenius, an advocate of Copenhagen. Meursius's works may be divided into four classes: 1. Those relative to Athens; 2. Historical pieces; 3. Miscellaneous dissertations; and 4. Various authors, with his notes and corrections.

MEURTE, or MEURTHE, a department of France, containing part of the late province of Lorraine; bounded on the E. by the department of the Lower Rhine; S. by that of the Vosges; W. by that of Meuse; and N. by that of Moselle; about 65 miles long from E. to W. and 35 broad. Nancy is the capital.

MEURTHE, or MEURTE, a river of France, which rises in the department of Vosges, and joins the Moselle, five miles below Nancy.

MEUSE, or MAESE, a department of France, containing the late duchy of Bar. Bar-le-Duc is the capital.

MEUSE, or MAESE, a river of France and Holland, which rises in Mount Vauge, and joins the Wahal below Grave.

MEUSE, or MAESE, a department of Holland, comprehending the late province of Zealand. Middleburg is the capital.

MEUSE, INTERIEURE, and MEUSE, LOWER, a department of France, formed out of the late Austrian Netherlands; comprehending part of the bishopric of Liege. Maestricht is the capital.

MEW, or SEA-MALL. See LARUS.

MEWAT, a hilly country of Hindostan, lying W. of the Jumnah, S. W. of Delhi, and N. W. of Agra; 130 miles long from E. to W. and about 90 broad. It abounds with woods.

MEWING, the falling off or change of hair, feathers, skin, horns, or other parts of animals, which happens in some annually, in others only at certain stages of their lives; but the generality of beasts mew in the spring.

MEXAT OCEM, a town of Persia, on the Euphrates. Lon. 42. 57. E. Lat. 33. 0. N.

MEXICANO, a river of N. America, in Louisiana, which runs into the Gulf of Mexico.

MEXICO, or NEW SPAIN, an extensive country in N. America, bounded on the N. by New Mexico, and on the S. E. by the isthmus of Darien, where its breadth is not more than 60 miles; its western coast being washed by the Pacific Ocean, and the gulf of California; and its eastern by the gulf of Mexico, and the Caribbean sea. It lies between 83 and 110 W. long, and extends from 7° 30' to 30° 40' N. lat. being 2000 miles long, and its widest part to the N. above 600 broad. In general it is a mountainous country intermixed with many rich valleys; but the highest mountains are near the coast of the Pacific Ocean, many of which are volcanoes. The eastern shore is a flat country, full of bogs and morasses, overflowed in the rainy season, which is at the same time as our summer; although Mexico is chiefly within the torrid zone, the climate is temperate and healthy. No country abounds

more with grain, fruits, roots, and vegetables; many of them peculiar to the country, or at least to America. It is celebrated for its mines of gold and silver, and has quarries of jasper, porphyry, and exquisite marble. Cochineal is almost peculiar to this country; its indigo and cocoa are superior to any in America; and its logwood has been long an important article of commerce. Among the quadrupeds are the puma and jaguar, bears, elks, wolves, deer, &c. The puma and jaguar have been inaccurately denominated by Europeans lions and tigers; for they possess neither the undaunted courage of the former, nor the ravenous cruelty of the latter. The domestic animals of Europe, particularly horned cattle, have multiplied there almost with incredible rapidity. Numbers of these having been suffered to run wild, now range over the vast plains in herds from 30, to 40,000; they are killed merely for the sake of their hides, which are annually exported, in vast quantities, to Europe. New Spain is divided into three audiences of Guadalajara, Mexico, and Guatemala; subdivided into provinces; the principal of which in each audience is, Guadalajara Proper, Mexico Proper, and Guatemala Proper. The whole country is governed by a viceroy.

MEXICO, GULF OF, an immense bay or gulf of the Atlantic, on the coast of N. America, extending 600 miles from N. to S. between the N. E. point of Yucatan and S. coast of E. Florida; and 700 from E. to W. between Cuba and the coast of Mexico.

MEXICO, NEW, so called because of its being discovered later than Old Mexico, a country of America, bounded on the N. by high mountains, beyond which is a country altogether unknown; by Louisiana on the E. by New Spain on the S. and on the W. by the gulf of California, and the Colorado, extending above 100 miles from E. to W. and about 900 from S. to N. but the 20th part of the country within these limits is neither cultivated nor inhabited by Spaniards nor Indians. As it lies in the midst of the temperate zone, the climate, in general, is very pleasant; the summers, though very warm, are neither sultry nor unwholesome; and the winters, though pretty sharp, are, for the most part, clear and healthy. The greatest encomiums are lavished on the fertility of the soil, the richness of the mines, and the variety of valuable commodities produced in this country. It is beautifully diversified with fields, meadows, rising grounds, and rivers; abounding with fruit and trees, turquoises, emeralds, and other precious stones, mines of gold and silver, a great variety of wild and tame cattle, fish and fowls. Upon the whole, it is one of the pleasantest, richest, and most plentiful countries in America, or any part of the world. It is divided into four districts; viz. New Mexico proper, New Leon, New Navarre, and California. The capital is Santa Fe.

MEXITLI, the god of war, among the ancient Mexicans. The worship of this idol was most horribly bloody.

MEZANDERAN, a province of Persia; bounded E. by Chorasán; S. by Chusistan and Irak; W. by Chilan, and N. by the Caspian sea. The S. part is mountainous, but very healthful; the N. is so extremely fertile, that it is styled the garden of Persia. Silk is the chief manufacture. Ferbad is the capital.

MEZANDERAN, a town in the above province, 80 miles W. S. W. of Ferabad.

MEZERAY, or MEZERAY, FRANCIS EUDES DE, an eminent French historian, the son of Isaac Eudes, a surgeon, was born at Rye, in Lower Normandy, in 1610; and took the surname of Mezeray, from a hamlet near Rye. Having studied at Caen, he discovered a strong inclination to poetry; but going to Paris, he applied himself to politics and history, and procured the place of commissary at war, which he held for two campaigns. He then shut himself up in the college of St. Barbe, in the midst of books and MSS. and, in 1643, published the first volume of the History of France, in folio; and some years after the second and third. He surpassed all who had written the history of France before him, and was rewarded by the king with a pension of 4000 livres. In 1668, he published an Abridgement of his History of France, in three vols. 4to, which was well received by the public: but as he inserted in that work the origin of most of the taxes with very free reflections, Mr. Colbert complained of it, when Mezeray promised to correct what he had done in a second edition; but those corrections being only palliations, the minister caused half of his pension to be suppressed. Mezeray complained of this in very severe terms; when he obtained no other answer than the suppressica

press: at of the other pain. Vexed at this treatment, he resolved to write on subjects that could not expose him to such disappointments; and composed his treatise on the Origin of the French, which did him much honour. He was elected perpetual secretary to the French academy; and died in 1683. He is said to have been so careless in his dress, that he might have passed for a beggar rather than for what he was. He was actually seized one morning by the parish-officers; which was so far from provoking him, that he was highly diverted with it, and told them, that "he was not able to walk on foot, but that as soon as a new wheel was put to his chariot, he would attend them wherever they thought proper." With regard to religion, he affected Pyrrhonism; which however was not so much in his heart as in his mouth. This appeared from his last sickness; for having sent for those friends who had been the most usual witnesses of his licentious talk about religion, he made a recantation, and desired them "to forget what he might formerly have said upon the subject of religion, and to remember that Mezeray dying was a better believer than Mezeray in health." He also wrote, 1. A Continuation of the History of the Turks. 2. A French translation of John de Sarisbury's Latin treatise on the vanities of the court. 3. Several satires against the government, under the name of Sandricourt.

MEZIERES, or MEZIERS, a town of France in the department of Ardennes, and late province of Champagne. Lon. 4. 48. E. Lat. 49. 46. N.

MEZIN, a town of France, in the department of Lot and Garonne, and late province of Guienne; and 8 miles N. W. of Condon.

MEZUZOTH, in the Jewish customs, pieces of parchment which the Jews fix to the door-posts of their houses, taking literally that precept of Moses, "Thou shalt never forget the laws of thy God, but thou shalt write them upon the posts of thy house, and on thy gates:" which means only that thou shalt always remember them, whether thou comest into thy house or goest out. But the Hebrew doctors imagined, that the lawgiver meant something more than this. They pretended, that, to avoid profanation of the wicked, they ought to write them on a parchment, and to enclose it in something. Therefore they wrote these words upon a square piece of parchment prepared on purpose, with a particular ink, and a square kind of character: Deut. vi. 4, 5, 6, 7, 8, 9. "Hear, O Israel, the Lord our God is one Lord, &c.—Then they left a little space, and afterwards went on, Deut. xi. 13. "And it shall come to pass, if thou shalt hearken diligently to my commandments, &c." as far as, "Thou shalt write them upon the doorposts of thy house, &c." After this they rolled up the parchment, and put it into a case; on the end of which the word Shaddai, one of the names of God, was written; and they put it at the doors of their houses, chambers, &c. and fixed it to the knockers of the door on the right side; and as often as they entered in or went out they touched it in this place, with the end of their finger, which they afterwards kissed out of devotion. The Hebrew word mezzaza properly signifies the door-posts of a house; but it is also given to this roll of parchment now mentioned.

MEZZOTINTO, a particular manner of representing figures on copper, so as to form prints in imitation of painting in Indian ink. See ENGRAVING. This invention has been attributed to prince Rupert. But Baron Heinikin, a very judicious writer upon engraving, asserts, with great appearance of truth, that it was a lieutenant colonel de Siegan, in the service of the landgrave of Hesse, who first engraved in this manner; and that the print which he produced was a portrait of the princess Amelia Elizabeth of Hesse, engraved in 1643. Prince Rupert learned the secret from this gentleman, and brought it into England, when he came over the second time with Charles II. Prince Rupert's print of An Executioner holding a Sword in one Hand and a Head in the other, a half length, from Spagnoletto, is dated 1658. This art has never been cultivated with success in any country but England. The prince laid his grounds on the plate with a channelled roller; but one Sherwin, about the same time, laid his grounds with a half-round file, which was pressed down with a heavy piece of lead. Both these grounding tools have been laid aside for many years; and a hand-tool, resembling a shoemaker's cutting-board knife, with a fine crenelling on the edge, was introduced by one Edial, a smith by trade, who afterwards became a mezzotinto-painter. It is very different from the common way of engraving. To per-

form it, they rake, hatch, or punch, the surface of the plate all over with a knife, or instrument made for the purpose, first one way, then the other, across, &c. till the surface of the plate be thus entirely furrowed with lines or furrows, close, and as it were contiguous to each other; so that, if an impression was then taken from it, it would be one uniform blot or smut. This done, the design is drawn or marked on the same face; after which, they proceed with burnishers, scrapers, &c. to expunge and take out the dents or furrows, in all the parts where the lights of the piece are to be; and that more or less as the lights are to be stronger or fainter; leaving those parts black which are to represent the shadows or deepenings of the draught. As it is much easier to scrape or burnish away parts of a dark ground corresponding with the outline of any design sketched upon it, than to form shades upon a light ground by an infinite number of hatches, strokes, or points, which must all terminate with exactness on the outline, as well as differ in their force and manner; the method of scraping, as it is called, in mezzotinto, consequently becomes much more easy and expeditious than any other method of engraving. The instruments used in this kind of engraving are cradles, scrapers, and burnishers. In this engraving, the plate must be prepared and polished in the same manner as for other engraving; and afterwards divided equally by lines parallel to each other, and traced out with very soft chalk. The distance of these lines should be about one-third of the length of the face of the cradle which is to be used, and these lines should be marked with capital letters, or strokes of the chalk. The cradle is then to be placed exactly between the two first lines, and passed forwards in the same direction; being kept as steady as possible, and pressed upon with a moderate force. The same operation must be repeated with respect to all the other lines; till the instrument has thus passed over the whole surface of the plate. Other lines must be then drawn from the extremities of the other two sides, in the same manner; which, intersecting the first at right angles, will with them form squares; and the same operation must be repeated with the cradle as in the case of the first. New lines must then be drawn diagonally, and the cradle passed betwixt them as before; and when the first diagonal-operation is performed, the lines must be crossed at right angles as the former, and the cradles passed betwixt them in the same manner. The plate having undergone the action of the cradle, according to the disposition of the first order of lines, a second set must be formed having the same distances from each other as the first. But they must be so placed as to divide those already made into spaces one-third less than their whole extent; i. e. every one after the first on each side will take in one-third of that before it, e. g. beginning at A, of which the first third must be left out; a third of B will consequently be taken in, and so of the rest. These lines of the second order must be marked with small letters, or less strokes to distinguish them from the first; and the same treatment of the plate must be pursued with respect to them as was practised for the others. When this second operation is finished, a third order of lines must be made; the first of which, e. g. in A, must omit two-thirds of it, and consequently take in two-thirds of B, &c. By these means, the original space will be exactly divided into equal thirds; and the cradle must be again employed betwixt these lines as before. When the whole of this operation is finished, it is called one turn; but in order to produce a very dark and uniform ground, the plate must undergo the repetition of all these several operations for above twenty times; beginning to pass the cradle again betwixt the first lines, and proceeding in the same manner through all the rest. When the plate is prepared with a proper ground, the sketch must be chalked on it, by rubbing the paper on the black side with chalk. It is also proper to overtrace it afterwards with black-lead or Indian ink. The scraping is then performed, by paring or cutting away the grain of the ground in various degrees: so that none of it is left in the original state except in the touches of the strongest shade. The general manner of proceeding is the same as drawing with white upon black paper. The masses of light are first begun with; and those parts which go off into light in their upper part, but are brown below: the reflections are then entered upon; after which the plate is blackened with a printer's blacking-ball made of felt, to discover the effect; and then the work is proceeded with; observing always to begin every part in the places where the strongest lights are to be. The art of scraping mezzotintoes has been applied to the printing with

a variety of colours, in order to produce the resemblance of paintings. The inventor of this method was J. C. Le Blon, a native of Frankfort, and pupil of Charles Marata, between 1720 and 1730. It was established by the inventor on this principle, that there are primitive colours, of which all the rest may be composed by mixing them in various proportions; that any two of these colours being mixed together preserve their original power, and only produce a third colour such as their compound must necessarily give; but if transparent colours be mixed, and three primitive kinds compounded together, they destroy each other, and produce black or a tendency to it, in proportion to the equality or inequality of the mixture; and that if, therefore, these three colours be laid, either separately or upon each other, by three plates, engraved correspondently on these principles to the colouring of the design, the whole variety of tints necessary may be produced.

MIA, or **MIJAH**, a town of Japan, in the province of Owry, and isle of Nippon. Lon. 135. 40. E. Lat. 35. 50. N.

MIASM, [from *μαῖωμι*, inquinare, to infect,] a particular kind of effluvia, by which certain fevers, particularly intermittents, are produced.

MICA, in mineralogy, a species of the clay-genus, generally of a grey colour, passing into brown and black. It occurs disseminated in thin tables and layers in other stones, also crystallized; it feels smooth, but not greasy; may be converted by the blow-pipe into a white enamel; specific gravity about 2.85; according to Vauquelin, it contains

Silica.....	50
Alumina.....	35
Oxide of iron.....	7
Magnesia.....	1.35
Lime.....	1.33

94.68

Loss..... 5.32

100

Mica is one of the constituent parts of granite, gneiss, and mica-slate; it is also found in syenite, porphyry, and wace, in almost every part of the world. It was formerly used for windows and lanterns, instead of glass, and in the Russian navy it is still used for the same purpose, being, on account of its elasticity, less liable to break than glass, on the discharge of cannon. Mica, used by the Russians, is dug up in Siberia. Cronstedt thinks that it might be advantageously used for covering houses. The twisted or crumpled mica, found in some places of Sweden, is manufactured into kettles and other vessels; likewise into hearths for chimneys.

MICHAEL, or **MICHEL**, [*i. e.* who is like to God?] The scripture-account of Michael is, that he is the archangel, or, in other words, ὁ ἀρχὴν πᾶν ἀγγελῶν, the prince of the angels, who presides over the Jewish nation, as other angels did over the Gentile world, (Dan. x. 13,) that he had an army of angels under his command (Rev. xii. 7.); that he fought with the Dragon, or Satan and his angels; and that, contending with the devil, he disputed about the body of Moses. (Jude 9.) As to the combat between Michael and the Dragon, some authors understand it literally. Others take it in a figurative sense; and refer it, either to the contest that happened at Rome between St. Peter and Simon Magus, in which the apostle prevailed over the magician, or to those violent persecutions under which the church laboured for 300 years. The Romish church celebrates three appearances of Michael, which happened, they say, long after the age of the apostles, viz. 1. at Colossæ in Phrygia, but when is uncertain: 2. at Mount Garganus, in Naples, about the end of the fifth century: 3. His appearances to Aubert bishop of Avranches, A. D. 706, upon a rock called the Tomb, where the abbey of St. Michael stands. The first of these festivals is observed on the 6th Sept. the second on the eighth May, and the last on the 16th October.

MICHAEL ANGLO. See **ANGELO**.

MICHAEL MOUNT, one of the most celebrated state-prisons of France, lies about twenty miles from Granville. It is a rock situated in the middle of the bay of Avranches; and is only accessible at low water. One side is naturally completely fortified, by its

craggy and almost perpendicular descent, which renders it impracticable to climb it by any address or courage, however consummate. The other parts are surrounded by walls fenced with semilunar towers after the Gothic manner; but sufficiently strong, together with the advantage of its situation, to render it impregnable to any attack. At the foot of the mountain begins a street or town, which winds round its base to a considerable height. Above are chambers where state-prisoners are kept, and where there are other buildings intended for residence.

MICHAEL ST. or **ST. MICHAEL'S**, a borough of Cornwall, between St. Columb and Truro, 249 miles W. by S. from London.

MICHAEL ST. an island in the British Channel lying off East Looe. Lon. 4. 32. W. Lat. 50. 18. N.

MICHAEL ST. the largest of the Azores. See **MIGUEL**.

MICHAEL ST. a town of France in the department of the Meuse, 20 miles N. E. of Bar-le-Duc. Lon. 5. 38. E. Lat. 48. 51. N.

MICHAEL ST. a town of Italy, on the Tartaro, in the department of Mincio, and district and late duchy of Mantua.

MICHAEL'S MOUNT, St. a very high rock, or cape, in the county of Cornwall, in the corner of Mount's Bay, only divided by the tide from the main land, so that it is land and island twice a day.

MICHAELIS, **JOHN DAVID**, a celebrated biblical critic, and author of many esteemed works, was the eldest son of Dr. Christian Benedict Michaelis, professor in the university of Halle in Lower Saxony, and was born there, Feb. 27, 1717. He received the first part of his education in a celebrated Prussian seminary, called the Orphan-house, at Glanche, near Halle. He commenced his academical career at Halle, in 1733, and took his degrees of A. M. and of philosophy, in 1739. In 1741 he came to England, where his knowledge of the oriental languages, which was increased by his indefatigable researches in the Bodleian library at Oxford, introduced him to the acquaintance and esteem of our first literary characters; with several of whom, particularly bishop Lowth, he corresponded for many years. He returned to Halle in fifteen months, and began to read lectures on the historical books of the Old Testament, which he continued after his removal to Gottingen in 1754. In 1746 he was appointed professor extraordinary, and soon after of philosophy. In 1747, he was appointed secretary to the Royal Society there, of which he was director in 1761, and was soon after made Aulic counsellor by the court of Hanover. In 1764, a publication relative to a journey to Arabia, which was undertaken by several literary men, at the expence of the king of Denmark, procured him the honour of being chosen a member of the Academy of Inscriptions at Paris of whom the institution admitted only eight; and in the same year he became a member of the society at Haarlem. In 1775, Count Hopkin, who 18 years before had prohibited the use of his writings at Upsal, when chancellor of that university, prevailed upon the king of Sweden to confer on him the order of the polar star, as a national compensation. In 1768 he was appointed a privy counsellor of justice by the court of Hanover; and in 1788 received his last literary honour, by being unanimously elected F. R. S. of London. His great critical knowledge of the Hebrew, which he displayed in a new translation of the Bible, and in other works, raised him to a degree of eminence almost unknown before in Germany; and his labours were indefatigable in instructing the numerous students of all countries who attended his admirable lectures, which he continued to deliver on the sacred writings in half-yearly courses, and on the Hebrew, Arabic, and Syriac languages, to the last year of his life. He was professor in the university of Gottingen 45 years, and died October 22, 1791, aged 74. He left behind him several valuable MSS. Of his numerous works, published during his life-time, a catalogue is given in the Gentleman's Magazine for March 1792.

MICHAELMAS, the feast of the archangel Michael, celebrated on the 29th September. See **MICHAEL**.

MICHAUXIA, in botany, a genus of the octandria monogynia class and order; natural order, Campanaceæ. Calyx sixteen-parted; corolla wheel-shaped, eight-parted; nectary eight-valved, stamiferous; capsule eight-celled, many-seeded. It has but one species, viz. *M. campanuloides*, rough-leaved michauxia: this is a handsome biennial plant, native of Aleppo.

MICHELIA, in botany, a genus of the polygynia order, and polyandria, or thirteenth, class of plants. Calyx three-leaved; petals

petals fifteen; berries many, four-seeded. There are two species, natives of the East Indies.

MICHIGAN, a large lake of the United States, in the North Western Territory; 280 miles long from N. to S. and from 60 to 70 broad, and covering 10,368,000 acres. It is navigable for ships of any burden, and communicates with Lake Huron, by the Strait of Michillimackinac. It abounds with various kinds of fish, particularly enormous trouts, from 20 to 60 and even 90 lb. weight. Lon. from 84. 30. to 87. 30. W. Lat. 42. 10. to 45. 50. N.

MICHILLIMACKINAK, a strait or river of the North Western Territory, which runs from Lake Michigan into lake Huron. It is six miles broad. Its waters have a gradual rise and fall of about three feet every seven years.

MICHILLIMACKINAK, an island of the United States, on the S. W. side of the above strait, with a fort and village in it.

MICHIPICOTON, a river, island, and village, of Upper Canada.

MICROGRAPHY, [$\mu\iota\kappa\rho\gamma\rho\alpha\phi\iota\alpha$ and $\gamma\rho\alpha\phi\iota\alpha$] the description of the parts of such very small objects as are discernible only with a microscope. See **MICROSCOPIC ANIMALS**, and **OBJECTS**.

MICROMETER, [$\mu\iota\kappa\rho\mu\epsilon\tau\rho\iota\kappa\omicron\nu$ and $\mu\epsilon\tau\rho\iota\kappa\omicron\nu$] an instrument, by which the apparent magnitudes of objects viewed through telescopes or microscopes are measured with great exactness. The first telescopic micrometers were only mechanical contrivances for measuring the image of an object in the focus of the object-glass. Before these contrivances were thought of, astronomers were accustomed to measure the field of view in each of their telescopes, by observing how much of the moon they could see through it, the semidiameter being reckoned at 15 or 16 minutes; and other distances were estimated by the eye, comparing them with the field of view. Mr. Gascoigne, an English gentleman, however, fell upon a much more exact method, and had a Treatise on Optics prepared for the press; but he was killed during the civil wars in the service of Charles I. and his MSS. was never found. His instrument, however, fell into the hands of Mr. R. Townly, who says, that by the help of it he could mark above 40,000 divisions in a foot. Mr. Gascoigne's instrument being shewn to Dr. Hooke, he gave a drawing and description of it, and proposed several improvements in it, which may be seen in Phil. Trans. abr. Vol. I. p. 217. Mr. Gascoigne divided the image of an object, in the focus of the object-glass, by the approach of two pieces of metal ground to a very fine edge, in the place of which Dr. Hooke would substitute two fine hairs stretched parallel to one another. Two other methods of Dr. Hooke's different from this, are described in his Posthumous Works, p. 497, 498. An account of several curious observations that Mr. Gascoigne made by the help of his micrometer, particularly in the mensuration of the diameters of the moon and other planets, may be seen in the Phil. Trans. Vol. xlviii. p. 190. Mr. Huygens, used to measure the apparent diameters of the planets, or any small angles, by first measuring the quantity of the field of view in the telescope; which, he says, is best done by observing the time which a star takes up in passing over it, and then preparing two or three long and slender brass-plates, of various breadths, the sides of which were very straight, and converging to a small angle. In using these pieces of brass, he made them slide in two slits, made in the sides of the tube, opposite to the place of the image, and observed in what place it just covered the diameter of any planet, or any small distance that he wanted to measure. It was observed, however, by Sir Isaac Newton, that the diameters of planets, measured in this manner, will be larger than they should be, as all lucid objects appear to be when viewed upon dark ones. In the Ephemerides of the Marquis of Malvasia published in 1662, it appears that he had a method of measuring small distances between fixed stars and the diameters of the planets, and also of taking accurate draughts of the spots of the moon; and this was by a net of silver-wire, fixed in the common focus of the object and eye-glass. He also contrived to make one of two stars to pass along the threads of this net, by turning it, or the telescope, as much as was necessary for that purpose, and he counted by a pendulum-clock, beating seconds, the time that elapsed in its passage from one wire to another, which gave him the number of the minutes and seconds of a degree contained between the intervals of the wires of his net, with respect to the focal length of his telescope. In 1666, Messrs. Azout and Picard published a description of a micrometer, which was nearly the same with that of the Marquis of Malvasia, excepting the method of dividing it, which they

performed with more exactness by a screw. In some cases they used threads of silk, as being finer than silver-wires. Dechales also recommends a micrometer consisting of fine wires, or silken threads, the distances of which were exactly known, disposed in the form of a net, as peculiarly convenient for taking a map of the moon. M. de la Hire says, that there is no method more simple or commodious for observing the digits of an eclipse than a net in the focus of the telescope. These, he says, were generally made of silken threads; and that for this particular purpose six concentric circles had also been made use of, drawn upon oiled paper; but he advises to draw the circles on very thin pieces of glass with the point of a diamond. He also gives particular directions to assist persons in the use of them. In another memoir he shews a method of making use of the same net for all eclipses, by using a telescope with two object-glasses, and placing them at different distances. Mr. Servington Sivory of Exeter proposed a new kind of micrometer which consisted of two object-glasses instead of one, so as to form two images of the object. The divided object-glass-micrometer, as now made, was contrived by the late Mr. John Dollond, and by him adapted to the object-end of a reflecting telescope, and has been since by Mr. P. Dollond his son applied with equal advantage to the end of an achromatic telescope. The principle is this. The object-glass is divided into two segments in a line drawn through the centre; each segment is fixed in a separate frame of brass, which is moveable, so that the centres of the two segments may be brought together by a handle for that purpose, and thereby form one image of an object; but when separated they will form two images, lying in a line passing through the centre of each segment; and consequently the motion of each image will be parallel to that line, which can be thrown into any position by the contrivance of another handle to turn the glass about in its own plane. The brass-work carries a vernier to measure the distance of the centres of the two segments. Now let E and H, Plate CXI, fig. 1, be the centres of the two segments, F their principal focus, and PQ two distant objects in FE, FH, produced, or the opposite limbs of the same object PBQD; then the images of P and Q, formed by each segment, or the images of the opposite limbs of the object PBQD, coincide at F: hence two images mz F, nx F, of that object are formed, whose limbs are in contact; therefore the angular distance of the points P and Q is the same as the angle which the distance EH subtends at F, which, as the angles supposed to be measured are very small, will vary at EH extremely nearly; and consequently if the angle corresponding to one interval of the centres of the segments be known, the angle corresponding to any other will be found by proportion. Now to find the interval for some one angle, take the horizontal diameter of the sun on any day, by separating the images till the contrary limbs coincide, and read off by the vernier the interval of their centres, and look into the nautical almanac for the diameter of the sun on that day, and you have the corresponding angle. Or if greater exactness be required than from taking the angle in proportion to the distances of their centres, we may proceed thus:—Draw FG perpendicular to EH, which therefore bisects it; then one half EH, or EG, is the tangent of half the angle EFH; hence, half the distance of their centres: tangent of half the angle corresponding to that distance :: half any other distance of the centres: tangent of half the corresponding angle. Hence the method of measuring small angles is manifest: for we consider P, Q, either as two objects whose images are brought together by separating the two segments, or as the opposite limbs of one object PBQD, whose images formed by the two segments E, H, touch at F: in the former case, EH gives the angular distance of the two objects; and in the latter, it gives the angle under which the diameter of the object appears. Hence, to find the angular distance of two objects, separate the segments till the two images which approach each other coincide. Besides these two images, there will be two others receding from each other, for each segment gives an image of each object. To find the diameter of an object, separate the segments till the contrary limbs of the images touch each other, and read off the distance of the centres of the segment from the vernier, and find the angle as directed in the last article. From hence appears one great superiority in this above the wire-micrometer; as, with this, any diameter of an object may be measured with the same ease and accuracy; whereas with that we cannot with accuracy measure any diameter, except that which is at right angles to its apparent mo-

tion. But, besides these two uses to which the instrument seems well adapted, Dr. Maskelyne has shewn, in the *Philos. Trans.* for 1771, how it may be applied to find the difference of right ascensions and declinations. For this purpose, two wires at right angles to each other, bisecting the field of view, must be placed in the principal focus of the eye-glass, and moveable about in their own plane. Let HCRc, fig. 2, be the field of view, HR and Cc the two wires; turn the wires till the westernmost star (which is the best, having further to move) run along ROH; then separate the two segments, and turn about the micrometer till the two images of the same star lie in the wire Cc; and then, partly by separating the segments, and partly by raising or depressing the telescope, bring the two innermost images of the two stars to appear and run along ROH, as *a*, *b*, and the vernier will give the difference of their declinations; because, as the two images of one of the stars coincided with Cc, the image of each star was brought perpendicularly upon HR, or to HR, in their proper meridian. And, for the same reason, the difference of their times of passing the wire COc will give their difference of right ascensions. These operations will be facilitated, if the telescope be mounted on a polar axis. If two other wires KL, MN, parallel to Cc, be placed near H and R, the observation may be made on two stars whose difference of meridians is nearly equal to HR, the diameter of the field of view, by bringing the two images of one of the stars to coincide with one of these wires. If two stars be observed whose difference of declination is well settled, the scale of the micrometer will be known. It has hitherto been supposed, that the images of the two stars can be both brought into the field of view at once upon the wire HOR: but if they cannot, set the micrometer to the difference of their declinations as nearly as you can, and make the image which comes first run along the wire HOR, by elevating or depressing the telescope; and when the other star comes in, if it do not also run along HOR, alter the micrometer till it does, and half the sum of the numbers shewn by the micrometer, at the two separate observations of the two stars on the wire HOR, will be the difference of their declinations. That this should be true, it is manifestly necessary that the two segments should recede equally in opposite directions; and this is effected by Mr. Dollond in his new improvement of the object-glass-micrometer. The difference of right ascensions and declinations of Venus or Mercury in the sun's disk and the sun's limb may be thus found. Turn the wires so that the north limb *n* of the sun's image AB, fig. 3, or the north limb of the image V of the planet, may run along the wire RH, which therefore will then be parallel to the equator, and consequently Cc a secondary to it; then separate the segments, and turn about the micrometer till the two images Vv of the planet pass Cc at the same time, and then by separating the segments, bring the north limb of the northernmost image V of the planet to touch HR, at the time the northernmost limb *n* of the southernmost image AB of the sun touches it, and the micrometer shews the difference of declinations of the northernmost limbs of the planet and sun, for the reason formerly given, we having brought the northernmost limbs of the two innermost images V and AB to HR, these two being manifestly interior to *v* and the northernmost limb N of the image PQ. In the same manner we take the difference of declinations of their southernmost limbs; and half the difference of the two measures, (taking immediately one after another) is equal to the difference of the declinations of their centres, without any regard to the sun's or planet's diameters, or error of adjustment of the micrometer; for as far as it affects both equally, the difference is the same as if there were no error: and the difference of the times of the transits of the eastern or western limbs of the sun and planet over Cc gives the difference of their right ascensions. Instead of the difference of right ascensions, the distance of the planet from the sun's limb, in lines parallel to the equator, may be more accurately observed thus: Separate the segments, and turn about the wires and micrometer, so as to make both images V, *v*, fig. 4, run along HB, or so that the two intersections I, T, of the sun's image may pass Cc at the same time. Then bring the planet's and sun's limbs into contact, as at V, and do the same for the other limb of the sun, and half the difference gives the distance of the centre of the planet from the middle of the chord on the sun's disk parallel to the equator, or the difference of the right ascensions of their centres, allowing for the motion of the planet in the interval of the observations, without any regard to the error of adjustment, for the

same reason as before. For if you take any point in the chord of a circle, half the difference of the two segments is clearly the distance of the point from the middle of the chord; and as the planet runs along HB, the chord is parallel to the equator. In like manner, the distances of their limbs may be measured in lines perpendicular to the equator, by bringing the micrometer into the position already described, and instead of bringing V to HR, fig. 5, separate the segments till the northernmost limbs coincide as at V; and in the same manner make their southernmost images to coincide, and half the difference of the two measures, allowing for the planet's motion, gives the difference of the declinations of their centres. Hence the true place of a planet in the sun's disk may at any time of its transit be found; and consequently the nearest approach to the centre and the time of ecliptic conjunction may be deduced, although the middle should not be observed. But however valuable the object-glass-micrometer undoubtedly is, difficulties sometimes have been found in its use, owing to the alteration of the focus of the eye, which will cause it to give different measures of the same angle at different times. For instance, in measuring the sun's diameter, the axis of the pencil coming through the two segments from the contrary limbs of the sun, as PF, QF, fig. 1, crossing one another in the focus F under an angle equal to the sun's semidiameter, the union of the limbs cannot appear perfect, unless the eye be disposed to see objects distinctly at the place where the images are formed; for if the eye be disposed to see objects nearer to or further off than that place, in the latter case the limbs will appear separated, and in the former they will appear to lap over. This imperfection led Dr. Maskelyne to inquire whether some method might not be found of producing two distinct images of the sun, or any other object, by bringing the axis of each pencil to coincide, or very nearly so, before the formation of the images, by which means the limbs when brought together would not be able to appear separated from any alteration of the eye; and this he found would be effected by the refraction of two prisms, placed either without or within the telescope; and on this principle, placing the prisms within, he constructed a new micrometer, and had one executed by Mr. Dollond, which upon trial answered as he expected. The construction is as follows: let AB be the object-glass; see fig. 6, and 7; *ab* the image, suppose of the sun, which would have been formed in the principal focus Q; but let the prisms PR, SR, be placed to intercept the rays, and let EF, WG, be two rays proceeding from the eastern and western limbs of the sun, converging, after refraction at the lens, to *a* and *b*; and suppose the refraction of the prisms to be such, that in fig. 6, the ray EFR, after refraction at R by the prism PR, may proceed in the direction RQ; and as all the rays which were proceeding to *a* suffer the same refraction at the prism, they will all be refracted to Q; and therefore, instead of an image *ab*, which would have been formed by the lens alone, an image Qc is formed by those rays which fall on the prism PR; and for the same reason, the rays falling on the prism SR will form an image Qd: and in fig. 7, the image of the point *b* is brought to Q, by the prism PR, and consequently an image Qd is formed by those rays which fall on PR: and for the same reason, an image Qc is formed by the rays falling on SR. Now in both cases, as the rays EFR, WGR, coming from the two opposite limbs of the sun, and forming the point of contact of the two limbs, proceed in the same direction RQ, they must thus accompany each other through the eye-glass, and also through the eye, whatever refractive power it has, and therefore to every eye the images must appear to touch. Now the angle *aRb* is twice the refraction of the prism, and the angle *aCb* is the diameter of the sun; and as these angles are very small, and have the same subtense *ab*, we have the angle *aRb*: angle *aCb* :: CQ: RQ.—Now as CQ is constant, and also the angle *aRb*, being twice the refraction of the prism, the angle *aCb* varies as RQ. Hence the extent of the scale for measuring angles becomes the focal length of the object-glass, and the angle measured is in proportion to the distance of the prisms from the principal focus of the object-glass; and the micrometer can measure all angles (very small ones excepted, for the reason afterwards given,) which do not exceed the sum of the refractions of the prisms; for the angle *aCb*, the diameter of the object to be measured, is always less than the angle *aRb*, the sum of the refractions of the prisms, except when the prisms touch the object-glass, and then they become equal. The

scale can never be out of adjustment, as the point 0, where the measurement begins, answers to the focus of the object-glass, which is a fixed point for all distant objects, and we have only to find the value of the scale answering to some known angle: for instance, bring two limbs of the sun's images into contact, and measure the distance of the prisms from the focus, and look in the nautical almanac for the sun's diameter, and you get the value of the scale. In fig. 6, the limb Q, of the image Qc, is illuminated by the rays falling on the object-glass between A and F, and on the image Qd by those falling between B and G; but in fig. 7, the same limbs are illuminated by the rays falling between B and F, A and G respectively, and therefore will be more illuminated than in the other case; but the difference is not considerable in achromatic telescopes, on account of the great aperture of the object-glass compared with the distance FG. It might be convenient to have two sets of prisms, one for measuring angles not exceeding $36'$, and therefore fit for measuring the diameters of the sun and moon, and the lucid parts and distances of the cusps in their eclipses; and another for measuring angles not much greater than $1'$, for the convenience of measuring the diameters of the planets. For as $QC:QR::$ sum of the refractions of the prisms: angle aCb , the apparent diameter of the object, it is evident that if you diminish the third term, you must increase the second in the same ratio, in order to measure the same angle: and thus by diminishing the refractive angle of the prisms, you throw them further from Q, and consequently avoid the inconvenience of bringing them nearer to Q, for the reason afterwards given; and at the same time you will increase the illumination in a small degree. The prisms must be achromatic, each composed of two prisms of flint and crown glass, placed with their refracting angles contrariwise, otherwise the images will be coloured. In the construction here described, the angle measured becomes evanescent when the prisms come to the principal focus of the object-glass, and therefore 0 on the scale then begins; but if the prisms be placed in the principal focus they can have no effect, because the pencil of rays at the junction of the prisms would then vanish, and therefore it is not practicable to bring the two images together to get 0 on the scale. Dr. Maskelyne, therefore, thought of placing another pair of prisms within, to refract the rays before they came to the other prisms, by which means the two images would be formed into one before they came to the principal focus, and therefore 0 on the scale could be determined. But to avoid the error arising from the multiplication of mediums, he, instead of adding another pair of prisms, divided the object-glass through its centre, and sliding the segments a little it separated the images, and then by the prisms he could form one image very distinctly, and consequently could determine 0 on the scale; for by separating the two segments you form two images, and you will separate the two pencils so that you may move up the two prisms, and the two pencils will fall on each respectively, and the two images may be formed into one. In the instrument which Dr. Maskelyne had made, 0 on the scale was chosen to be about $\frac{2}{3}$ of the focal length of the object-glass, and each prism refracted $27'$. By these means all angles are measured down to 0. In the *Philos. Trans.* for 1779, Mr. Ramsden has described two new micrometers, which he contrived with a view of remedying the defects of the object-glass-micrometer. 1. One of these is a catoptric micrometer, which, beside the advantage it derives from the principle of reflection, of not being disturbed by the heterogeneity of light, avoids every defect of other micrometers, and can have no aberration, nor any defect arising from the imperfection of materials or of execution; as the extreme simplicity of its construction requires no additional mirrors or glasses to those required for the telescope; and the separation of the image being effected by the inclination of the two specula, and not depending on the focus of any lens or mirror, any alteration in the eye of an observer cannot affect the angle measured. It has peculiar to itself the advantages of an adjustment, to make the images coincide in a direction perpendicular to that of their motion; and also of measuring the diameter of a planet on both sides of the zero, which will appear no inconsiderable advantage to observers, who know how much easier it is to ascertain the contact of the external edges of two images than their perfect coincidence. A, fig. 8, represents the small speculum divided into two equal parts; one of which is fixed on the end of the arm B; the other end of the arm is fixed

on a steel axis Z, which crosses the end of the telescope C. The other half of the mirror A is fixed on the arm D, which arm at the other end terminates in a socket y, that turns on the axis Z; both arms are prevented from bending by the braces a a. G represents a double screw, having one part e cut into double the number of threads in an inch to that of the part g: the part e having 100 threads in one inch, and the part g 50 only. The screw e works in a nut F in the side of the telescope, while the part g turns in a nut H, which is attached to the arm B; the ends of the arms B and D, to which the mirrors are fixed, are separated from each other by the point of the double screw pressing against the stud h, fixed to the arm D, and turning in the nut H on the arm B. The two arms B and D are pressed against the direction of the double screw e g by a spiral spring within the part n, by which means all shake or play in the nut H, on which the measure depends, is entirely prevented. From the difference of the threads on the screw at e and g, it is evident, that the progressive motion of the screw through the nut will be half the distance of the separation of the two halves of the mirror; and consequently the half-mirrors will be moved equally in contrary directions from the axis of the telescope C. The wheel V fixed on the end of the double screw has its circumference divided into 100 equal parts, and numbered at every fifth division with 5, 10, &c. to 100, and the index I shews the motion of the screw with the wheel round its axis, while the number of revolutions of the screw is shewn by the divisions on the same index. The steel-screw at R may be turned by the key S, and serves to incline the small mirror at right angles to the direction of its motion. By turning the finger-head T, fig. 9, the eye-tube P is brought nearer or farther from the small mirror, to adjust the telescope to distinct vision; and the telescope itself has a motion round its axis for the convenience of measuring the diameter of a planet in any direction. The inclination of the diameter measured with the horizon is shewn in degrees and minutes by a level and vernier on a graduated circle, at the breech of the telescope. Besides the table for reducing the revolutions and parts of the screw to minutes, seconds, &c. it may require a table for correcting a very small error which arises from the eccentric motion of the half-mirrors. By this motion their centres of curvature will (when the angle to be measured is large) approach a little towards the large mirror: the equation for this purpose in small angles is insensible; but when angles to be measured exceed ten minutes, it should not be neglected. Or, the angle measured may be corrected by diminishing it in the proportion the versed sine of the angle measured, supposing the eccentricity radius, bears to the focal length of the small mirror. Mr. Ramsden preferred Cassegrain's construction of the reflecting telescope to either the Gregorian or Newtonian; because in the former, errors caused by one speculum are diminished by those in the other. From a property of the reflecting telescope (which, he observes, has not been attended to,) that the apertures, of the two specula are to each other very nearly in the proportion of their focal length, it follows, that their aberrations will be to each other in the same proportion; and these aberrations are in the same direction, if the two specula are both concave; or in contrary directions, if one speculum is concave and the other convex. In the Gregorian construction, both specula being concave, the aberration at the second image will be the sum of the aberrations of the two mirrors; but in the Cassegrain construction, one mirror being concave and the other convex, the aberration at the second image will be the difference between their aberrations. By assuming such proportions for the foci of the specula as are generally used in the reflecting telescope, which is about as 1 to 4, the aberration in the Cassegrain construction will be to that in Gregorian as 3 to 5. 2. The other is a dioptric micrometer, or one suited to the principle of refraction. This micrometer is applied to the erect eye-tube of a refracting telescope, and is placed in the conjugate focus of the first eye-glass: in which position, the image being considerably magnified before it comes to the micrometer, any imperfection in its glass will be magnified only by the remaining eye-glasses, which in any telescope seldom exceeds five or six times. By this position also the size of the micrometer-glass will not be the one 100th part of the area which would be required if it was placed in the object-glass; and notwithstanding this great disproportion of size, which is of great moment to the practical optician, the same extent of scale is preserved, and the images are uniformly bright

bright in every part of the field of the telescope. Fig. 10, represents the glasses of a refracting telescope; xy , the principal pencil of rays from the object-glass o ; t and u , the axis of the two oblique pencils; a , the first eye-glass; m , its conjugate focus or the place of the micrometer; b the second eye-glass; c the third; and d the fourth, or that which is nearest the eye. Let p be the diameter of the object-glass, e the diameter of a pencil at m , and f the diameter of the pencil at the eye; it is evident, that the axis of the pencils from every part of the image will cross each other at the point m ; and c , the width of the micrometer-glass, is to p the diameter of the object-glass as $m'a$ is to $g o$, which is the proportion of the magnifying power at the point m ; and the error caused by an imperfection in the micrometer-glass placed at m will be to the error, had the micrometer been at o , as m is to p . Fig. 11, represents the micrometer, formed by a convex or concave lens divided into two equal parts by a plane across its centre; one of these semi-lenses is fixed in a frame B, and the other in the frame E; which two frames slide on a plate H, and are pressed against it by thin plates $a a$; the frames B and E are moved in contrary directions by turning the button D; L is a scale of equal parts on the frame B; it is numbered from each end towards the middle with 10, 20, &c. There are two verniers on the frame E, one at M and the other at N, for the convenience of measuring the diameter of a planet, &c. on both sides the zero. The first division on both these verniers coincides at the same time with the two zeros on the scale L; and if the frame be removed towards the right, the relative motion of the two frames is shewn on the scale L by the vernier M; but if the frame B be moved towards the left, the relative motion is shewn by the vernier N. This micrometer has a motion round the axis of vision, for the convenience of measuring the diameter of a planet, &c. in any direction, by turning an endless screw F; and the inclination of the diameter measured with the horizon is shewn on the circle g by a vernier on the plate V. The telescope may be adjusted to distinct vision by means of an adjusting screw, which moves the whole eye-tube with the micrometer nearer or farther from the object-glass, as telescopes are generally made; or the same effect may be produced in a better manner, without moving the micrometer, by sliding the part of the eye-tube m on the part n , by help of a screw or pinion. The micrometer is made to take off occasionally from the eye-tube, that the telescope may be used without it. Mr. Herschel having long had much occasion for micrometers that would measure exceeding small distances exactly, was led to bend his attention to the improvement of these instruments; and the result of his endeavours has been a very ingenious instrument called a lamp-micrometer, which is not only free from most of the imperfections of other micrometers, but also possesses the advantages of a very large scale. This instrument is described in the Philos. Trans. for 1782. In the Philos. Trans. for 1791, a very simple micrometer for measuring small angles with the telescope is described by Mr. Cavallo; who introduces his description with the following observations upon the different sorts of telescopic micrometers in use: "These instruments may be divided into two classes; namely, those which have not, and those which have, some movement amongst their parts. The micrometers of the former sort consist mostly of fine wires or hairs, variously disposed, and situated within the telescope, just where the image of the object is formed. In order to determine an angle with those micrometers, a good deal of calculation is generally required. The micrometers of the other sort, of which there is a great variety, some being made with moveable parallel wires, others with prisms, others again with a combination of lenses, and so on, are more or less subject to several inconveniences, the principal of which are the following: 1. Their motions generally depend upon the action of a screw; and of course the imperfections of its threads, and the greater or less quantity of lost motion, which is observable in moving a screw, especially when small, occasion a considerable error in the mensuration of angles. 2. Their complication and bulk render them of difficult application to a variety of telescopes, especially to the pocket ones. 3. They do not measure the angle without some loss of time, which is necessary to turn the screw, or to move some other mechanism. 4. And lastly, they are considerably expensive, so that some of them cost even more than a tolerably good telescope." After having had long in view (our author informs us) the construction of a micrometer which might

be in part at least, if not entirely, free from all these objections; he, after various attempts, at last succeeded with a simple contrivance, which, after repeated trials, has been found to answer the desired end, not only from his own experience, but from that also of several friends, to whom it has been communicated. This micrometer, in short, consists of a thin and narrow slip of mother-of-pearl finely divided, and situated in the focus of the eye-glass of a telescope, just where the image of the object is formed. It is immaterial whether the telescope be a refractor or a reflector, provided the eye-glass be a convex lens, and not a concave one as in the Galilean construction. The simplest, and therefore the best, way of fixing it is to stick it upon the diaphragm which generally stands within the tube and in the focus of the eye-glass. When it is thus fixed properly in this situation, if you look through the eye-glass, the divisions of the micrometrical scale will appear very distinct, unless when the diaphragm is not exactly in the focus; in which case, the micrometrical scale must be placed exactly in the focus of the eye-glass, either by pushing the diaphragm backwards or forwards, when that is practicable; or else the scale may be easily removed from one or the other surface of the diaphragm by the interposition of a circular piece of paper or card, or by a bit of wax. This construction is fully sufficient, when the telescope is always to be used by the same person; but when different persons are to use it, then the diaphragm which supports the micrometer must be constructed so as to be easily moved backwards or forwards, though that motion needs not be greater than about a tenth or an eighth of an inch. This is necessary, because the distance of the focus of the same lens appears different to the eyes of different persons; and, therefore, whoever is going to use the telescope for the mensuration of any angle, must first of all unscrew the tube which contains the eye-glass of the micrometer from the rest of the telescope, and, looking through the eye-glass, must place the micrometer where the divisions of it may appear quite distinct to his eye. In case any person should not like to see always the micrometer in the field of the telescope, then the micrometrical scale, instead of being fixed to the diaphragm, may be fitted to a circular perforated plate of brass, wood, or even paper, which may be occasionally placed upon the said diaphragm. Mr. Cavallo has made several experiments to determine the most useful substance for this micrometer. Glass, which he had successfully applied for a similar purpose to the compound microscope, seemed at first to be the most promising; but it was at last rejected after several trials: for the divisions upon it generally are either too fine to be perceived, or too rough; and though with proper care and attention the divisions may be proportioned to the sight, yet the thickness of the glass itself obstructs in some measure the distinct view of the object. Ivory, horn, and wood, were found useless for the construction of this micrometer, on account of their bending, swelling, and contracting, very easily; whereas mother-of-pearl is a very steady substance, the divisions upon it may be marked very easily, and when it is made as thin as common writing paper it has a very useful degree of transparency. Fig. 12, exhibits this micrometer-scale, but shews it four times larger than the real size of one, which he has adapted to a three-feet-achromatic telescope that magnifies about 84 times. It is something less than the 24th part of an inch broad; its thickness is equal to that of common writing paper; and the length of it is determined by the aperture of the diaphragm, which limits the field of the telescope. The divisions upon it are the 200ths of an inch, which reach from one edge of the scale to about the middle of it, excepting every fifth and 10th division, which are longer. The divided edge of it passes through the centre of the field of view, though this is not a necessary precaution in the construction of this micrometer. Two divisions of the above described scale in my telescope are very nearly equal to one minute; and as a quarter of one of those divisions may be well distinguished by estimation, therefore an angle of one-8th part of a minute, or of $7\frac{1}{2}$, may be measured with it. When a telescope magnifies more, the divisions of the micrometer must be more minute; and Mr. Cavallo finds, that when the focus of the eye-glass of the telescope is shorter than half an inch, the micrometer may be divided with the five hundredth of an inch; by means of which, and the telescope magnifying about 200 times, one may easily and accurately measure an angle smaller than half a second. On the other hand; when the telescope does not magnify above 30 times, the divisions

divisions need not be so minute : for instance, in one of Dollond's pocket-telescopes, which when drawn out for use is about 14 inches long, a micrometer with the hundredths of an inch is quite sufficient, and one of its divisions is equal to little less than three minutes, so that an angle of a minute may be measured by it. "In looking through a telescope furnished with such a micrometer (says our author), the field of view appears to be divided by the micrometer-scale, the breadth of which occupies about one-seventh part of the aperture ; and as the scale is semitransparent, that part of the object which happens to be behind it may be discerned sufficiently well to ascertain the division, and even the quarter of a division, with which its borders coincide. Fig. 13, shews the appearance of the field of my telescope with the micrometer, when directed to the title-page of the Philosophical Transactions, wherein one may observe that the thickness of the letter C is equal to 3-4ths of a division, the diameter of the O is equal to three divisions, and so on. At first view, one is apt to imagine, that it is difficult to count the divisions which may happen to cover or to measure an object ; but upon trial it will be found, that this is readily performed ; and even people who have never been used to observe with the telescope, soon learn to measure very quickly and accurately with this micrometer ; for since every fifth and tenth division is longer than the rest, one soon acquires the habit of saying five, ten, fifteen ; and then, by adding the other divisions less than five, completes the reckoning. Even with a telescope which has no stand, if the object-end of it be rested against a steady place, and the other end be held by the hand near the eye of the observer, an object may be measured with accuracy sufficient for several purposes, as for the estimation of small distances, for determining the height of a house, &c. After having constructed and adapted this micrometer to the telescope, it is necessary to ascertain the value of the divisions. It is hardly necessary to mention in this place, that though those divisions measure the chords of the angles, and not the angles or arches themselves, and the chords are not as the arches, yet it has been shewn by all the trigonometrical writers, that in small angles the chords, arches, sines, and tangents, follow the same proportion so very nearly, that the very minute difference may be safely neglected : so that if one division of this micrometer is equal to one minute, we may safely conclude, that two divisions are equal to two minutes, three divisions to three minutes, and so on. There are various methods of ascertaining the value of the divisions of such a micrometer, they being the very same that are used for ascertaining the value of the divisions in other micrometers. Such are, the passage of an equatorial star over a certain number of divisions in a certain time ; or for the measuring the diameter of the sun, by computation from the focal distance of the object and other lenses of the telescope ; the last of which, however, is subject to several inaccuracies ; but as they are well known to astronomical persons, and have been described in many books, they need not be farther noticed here. However, for the sake of workmen, and other persons not conversant in astronomy, I shall describe an easy and accurate method of ascertaining the value of the divisions of the micrometer. Mark upon a wall or other place the length of six inches, which may be done by making two dots or lines six inches asunder, or by fixing a six-inch ruler upon a stand ; then place the telescope before it, so that the ruler or six-inch length may be at right angles with the direction of the telescope, and just 57 feet $3\frac{1}{2}$ inches distant from the object-glass of the telescope : this done, look through the telescope at the ruler or other extension of six inches, and observe how many divisions of the micrometer are equal to it, and that same number of divisions is equal to half a degree, or $30'$; and this is all that needs be done for the required determination ; the reason of which is, because an extension of six inches subtends an angle of $30'$ at the distance of 57 feet $3\frac{1}{2}$ inches, as may be easily calculated by the rules of plane trigonometry. In one of Dollond's fourteen-inch pocket-telescopes, if the divisions of the micrometer be the hundredths of an inch, $11\frac{1}{2}$ of those divisions will be found equal to $30'$, or 23 to a degree. When this value has been once ascertained, any other angle measured by any other number of divisions is determined by the rule of three. Thus suppose that the diameter of the sun seen through the same telescope, be found equal to 12 divisions, say as $11\frac{1}{2}$ divisions are to 30 minutes, so are 12 divisions to $\left(\frac{12' \times 30'}{11.5}\right) 31'.3$, which is the re-

quired diameter of the sun. Notwithstanding the facility of this calculation, a scale may be made answering to the divisions of a micrometer, which will shew the angle corresponding to any number of divisions to mere inspection. Thus, for the above mentioned small telescope, the scale is represented in fig. 14. AB is a line drawn at pleasure ; it is then divided into 23 equal parts, and those divisions which represent the divisions of the micrometer that are equal to one degree, are marked on one side of it. The line then is divided again into 60 equal parts, which are marked on the other side of it ; and these divisions represent the minutes which correspond to the divisions of the micrometer : thus the figure shews, that six divisions of the micrometer are equal to $15\frac{1}{2}$ minutes, $11\frac{1}{2}$ divisions are nearly equal to 29 minutes, &c. What has been said of minutes may be said of seconds also, when the scale is to be applied to a large telescope. Thus far this micrometer and its general use have been sufficiently described ; and mathematicians may easily apply it to the various purposes to which micrometers have been found subservient. But as the simplicity, cheapness, and accuracy, of this contrivance, may render the use of it much more general than that of any other micrometer ; and I may venture to say, that it will be found very useful in the army, and amongst sea-faring people, for the determination of distances, heights, &c. ; I shall therefore join some practical rules to render this micrometer useful to persons unacquainted with trigonometry and the use of logarithms.

Problem I. The angle, not exceeding one degree, which is subtended by an extension of one foot, being given, to find its distance from the place of observation. **N. B.** This extension of one foot, or any other which may be mentioned hereafter, must be perpendicular to the direction of the telescope through which it is observed. The distances are reckoned from the object-glass of the telescope ; and the answers obtained by the rules of this problem, though not exactly true, are however so little different from the truth, that the difference seldom amounts to more than two or three inches, which may be safely neglected.

Rule 1. If the angle be expressed in minutes, say, as the given angle is to 60, so is 687.55 to a fourth proportional, which gives the answer in inches. 2. If the angle be expressed in seconds, say, as the given angle is to 3600, so is 687.55 to a fourth proportional, which expresses the answer in inches. 3. If the angle be expressed in minutes and seconds, turn it all into seconds, and proceed as above.

Example. At what distance is a globe of one foot in diameter when it subtends an angle of two seconds?

$$2 : 3600 :: 687.55 : \frac{3600 \times 687.55}{2} = 1237390$$

inches, or 103132 $\frac{1}{2}$ feet, which is the answer required. This calculation may be shortened ; for since two of the three proportionals are fixed, their product in the first case is 41253, and in the other two cases is 2475180 ; so that in the first case, viz. when the angle is expressed in minutes, you need only divide 41253 by the given angle ; and in the other two cases, &c. when the angle is expressed in seconds, divide 2475180 by the given angle, and the quotient in either case is the answer in inches.

Prob. II. The angle, not exceeding one degree, which is subtended by any known extension, being given, to find its distance from the place of observation.

Rule. Proceed as if the extension were of one foot by Problem I, and call the answer B ; then, if the extension in question be expressed in inches, say, as 12 inches are to that extension, so is B to a fourth proportional, which is the answer in inches ; but if the extension in question be expressed in feet, then you need only multiply it by B, and the product is the answer in inches.

Example. At what distance is a man six feet high, when he appears to subtend an angle of $30'$. By problem I. if the man were one foot high, the distance would be 82506 inches ; but as he is six feet high, therefore multiply 82506 by 6, and the product gives the required distance, which is 495036 inches. For greater convenience, especially in travelling, or in such circumstances in which one has not the opportunity of making even the easy calculations required in those problems, I have calculated the following two tables ; the first of which shews the distance answering to any angle from one minute to one degree, which is subtended by an extension of one foot ; and the second table shews the distance answering to any angle from one minute to one degree, which is subtended

subtended by a man, the height of which has been called an extension of six feet; because, at a mean, such is the height of a man when dressed with hat and shoes on. These tables may be transcribed on a card, and may be had always ready with a pocket-telescope furnished with a micrometer. Their use is evidently to ascertain distances without any calculation; and they are calculated only to minutes, because with a pocket-telescope and mi-

crorometer it is not possible to measure an angle more accurately than to a minute. Thus, if one wants to measure the extension of a street, let a foot-ruler be placed at the end of the street; measure the angular appearance of it, which suppose to be $36'$, and in the table you will have the required distance against $36'$, which is $95\frac{1}{2}$ feet. Thus also a man who appears to be $49'$ high, is at the distance of 421 feet."

MR. CAVALLO'S TABLES FOR MEASURING DISTANCES BY MICROMETERS.

TABLE I.—Angles subtended by an Extension of One Foot at different Distances.

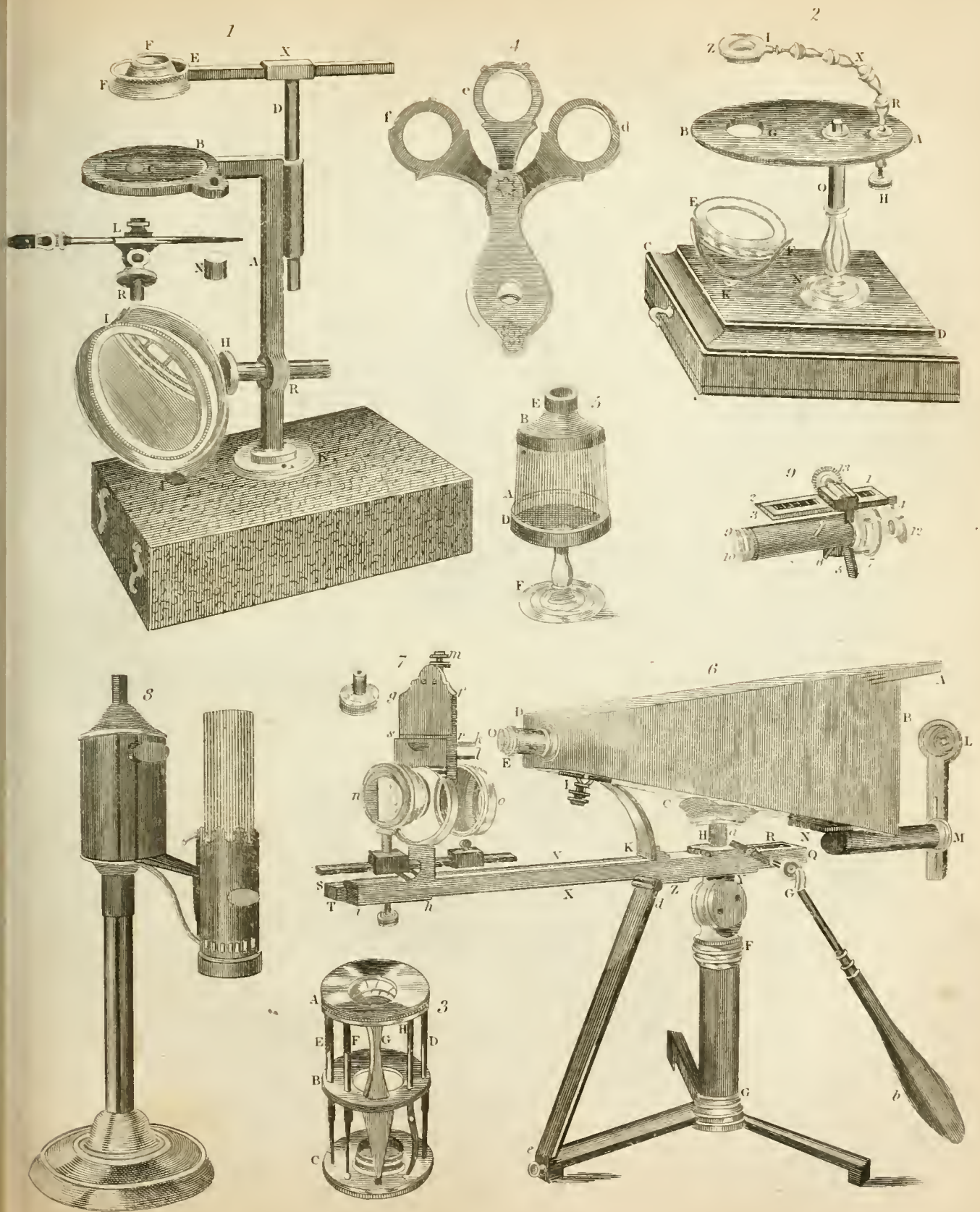
Angles.	Distances in feet.	Angles.	Distances in feet.
Min. 1	3437,7	Min. 31	110,9
2	1718,9	32	107,4
3	1145,9	33	104,2
4	859,4	34	101,1
5	687,5	35	98,2
6	572,9	36	95,5
7	491,1	37	92,9
8	429,7	38	90,4
9	382,0	39	88,1
10	343,7	40	85,9
11	312,5	41	83,8
12	286,5	42	81,8
13	264,4	43	79,9
14	245,5	44	78,1
15	229,2	45	76,4
16	214,8	46	74,7
17	202,2	47	73,1
18	191,0	48	71,6
19	180,9	49	70,1
20	171,8	50	68,7
21	162,7	51	67,4
22	156,2	52	66,1
23	149,4	53	64,8
24	143,2	54	63,6
25	137,4	55	62,5
26	132,2	56	61,4
27	127,3	57	60,3
28	122,7	58	59,2
29	118,5	59	58,2
30	114,6	60	57,3

TABLE II.—Angles subtended by an Extension of Six Feet at different Distances.

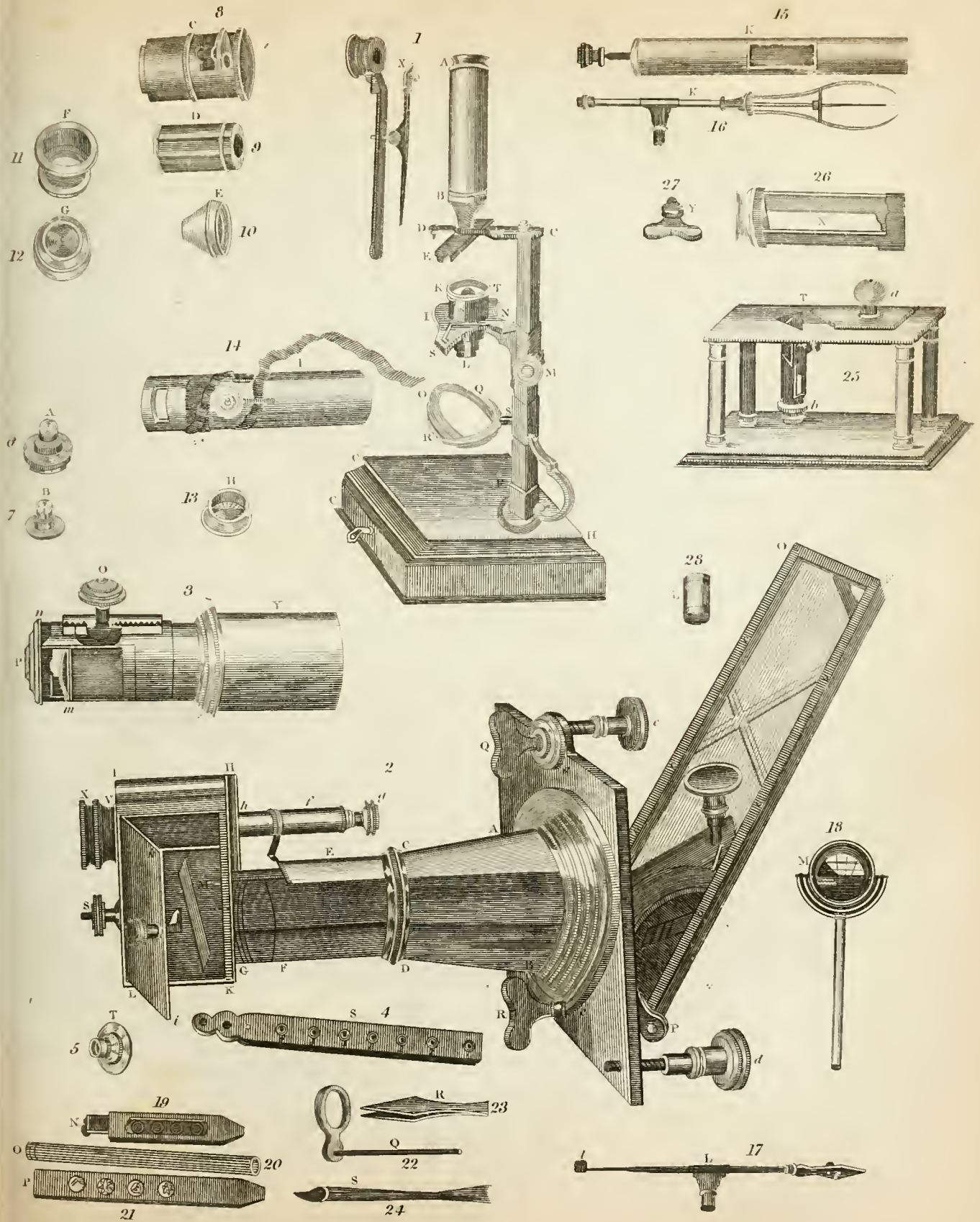
Angles.	Distances in feet.	Angles.	Distances in feet.
Min. 1	20626,8	Min. 31	665,4
2	10313.	32	644,5
3	6875,4	33	625.
4	5156,5	34	606,6
5	4125,2	35	589,3
6	3437,7	36	572,9
7	2946,6	37	557,5
8	2578,2	38	542,8
9	2291,8	39	528,9
10	2062,6	40	515,6
11	1875,2	41	503,1
12	1718,8	42	491,1
13	1586,7	43	479,7
14	1473,3	44	468,8
15	1375.	45	458,4
16	1298,1	46	448,4
17	1213,3	47	438,9
18	1145,9	48	429,7
19	1085,6	49	421.
20	1031,4	50	412,5
21	982,2	51	404,4
22	937,6	52	396,7
23	896,8	53	389,2
24	859,4	54	381,9
25	825.	55	375.
26	793,3	56	368,3
27	763,9	57	361,9
28	736,6	58	355,6
29	711,3	59	349,6
30	687,5	60	343,7

Micrometers have not only been applied to telescopes for astronomical purposes, but have also been adapted to microscopical observations. Mr. Leeuwenhoek's method of estimating the size of small objects was by comparing them with grains of sand, of which 100 in a line took up an inch. These grains he laid upon the same plate with his objects, and viewed them at the same time. Dr. Jurin's method was similar; for he found the diameter of a piece of fine silver-wire, by wrapping it as close as he could about a pin, and observing how many rings made an inch: and he used this wire in the same manner as Leeuwenhoek used his sand. Dr. Hook used to look upon the magnified object with one eye, while at the same time he viewed other objects placed at the same distance with the other eye. In this manner he was able, by the help of a ruler, divided into inches and small parts, and laid on the pedestal of the microscope, to cast as it were the magnified appearance of the object upon the ruler, and thus exactly to measure the diameter which it appeared to have through the glass; which being compared with the diameter as it appeared to the naked eye, easily shewed the degree in which it was magnified. A little practice, says Mr. Baker, will render this method exceedingly easy and pleasant. Mr. Martin in his Optics recommended such a micrometer for a microscope as had been applied to telescopes: for he advises to draw a number of parallel lines on a piece of glass, with the fine point of a diamond, at the distance of one-fortieth of an inch from one another, and to place it in the focus of the eye-glass. By this method, Dr. Smith contrived to

take the exact draught of objects viewed by a double microscope. He advises to get a lattice, made with small silver-wires or squares, drawn upon a plain glass by the strokes of a diamond, and to put it into the place of the image, formed by the object-glass: then by transferring the parts of the object, seen in the squares of the glass or lattice upon similar corresponding squares drawn on paper, the picture may be exactly taken. Mr. Martin also introduced into compound microscopes another micrometer, consisting of a screw. See both these methods described in his Optics, p. 277. The mode of actual admeasurement (Mr. Adams observes in his Microscopical Essays, p. 59,) is without doubt the most simple that can be used; as by it we comprehend, in a manner, at one glance, the different effects of combined glasses; and as it saves the trouble, and avoids the obscurity, of the usual modes of calculation: but many persons find it exceedingly difficult to adopt this method, because they have not been accustomed to observe with both eyes at once. To obviate the above-mentioned inconvenience, the late Mr. Adams contrived an instrument called the Needle-Micrometer, which was first described in his Micrographia Illustrata; and of which, as now constructed; we have the following description by his son Mr. George Adams, in the ingenious Essays above quoted. This micrometer consists of a screw, which has 50 threads to an inch; this screw carries an index, which points to the divisions on a circular plate, which is fixed at right angles to the axis of the screw. The revolutions of the screw are counted on a scale, which is an inch divided into 50 parts



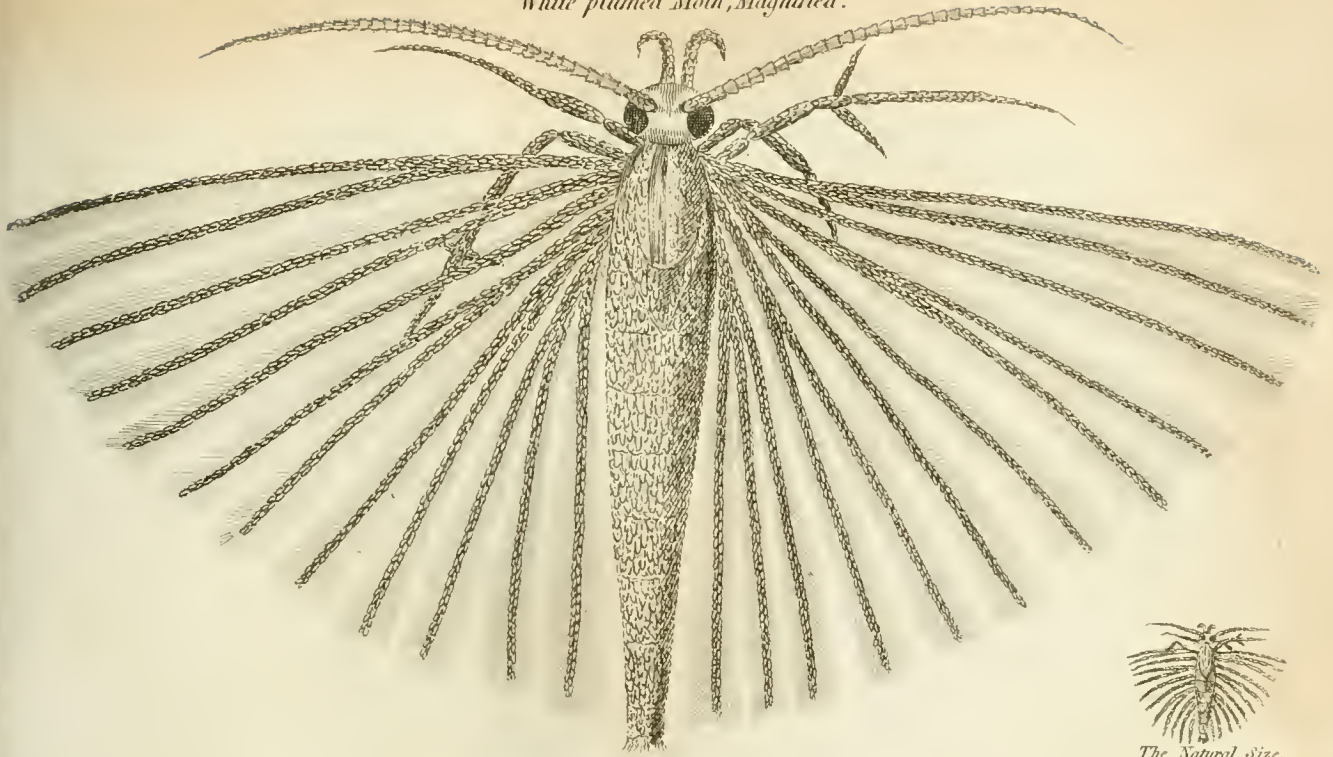




MICROSCOPIC OBJECTS.

Fig. 1.

White plumed Moth, Magnified.

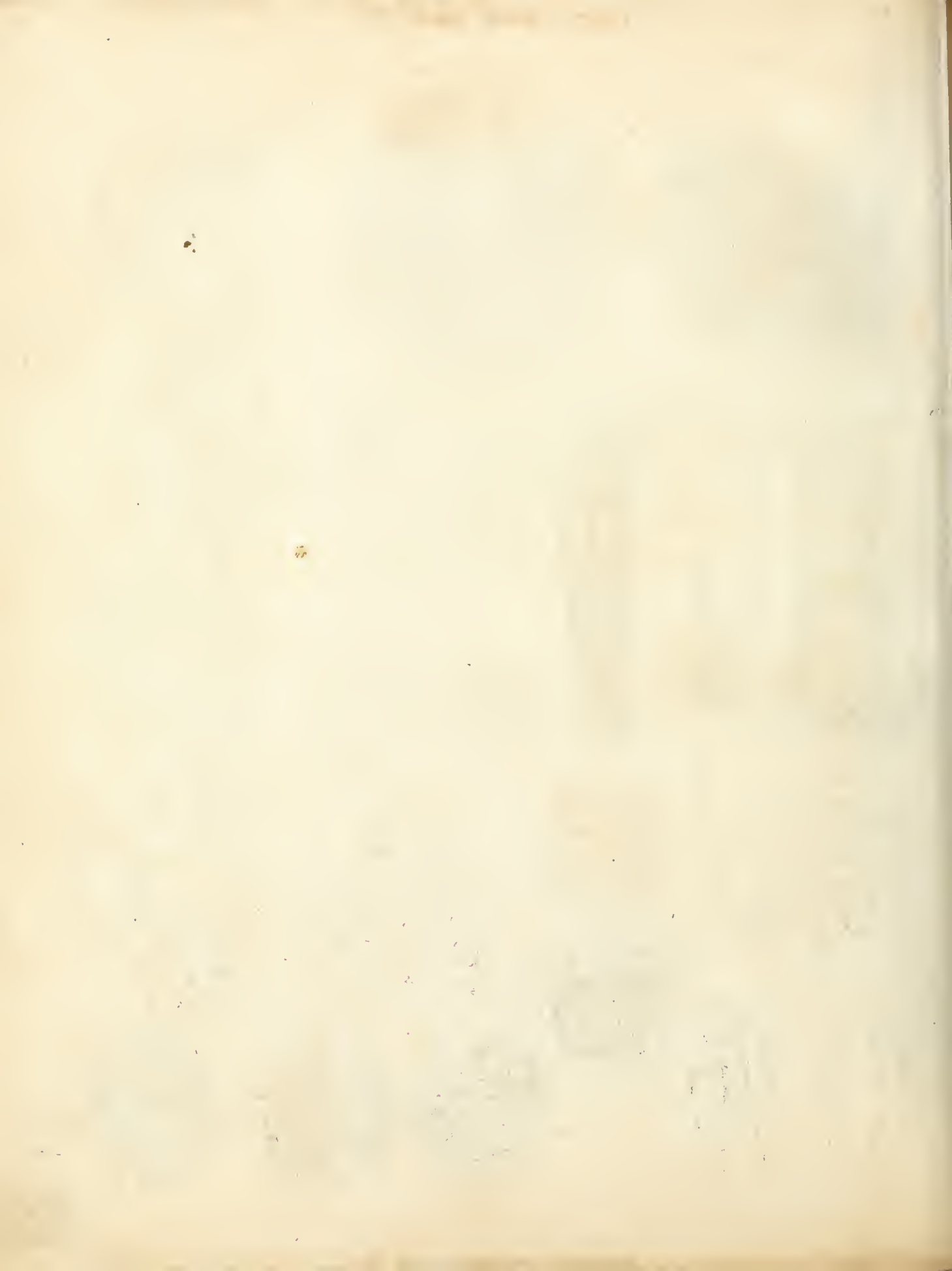


The Natural Size.

Fig. 2.

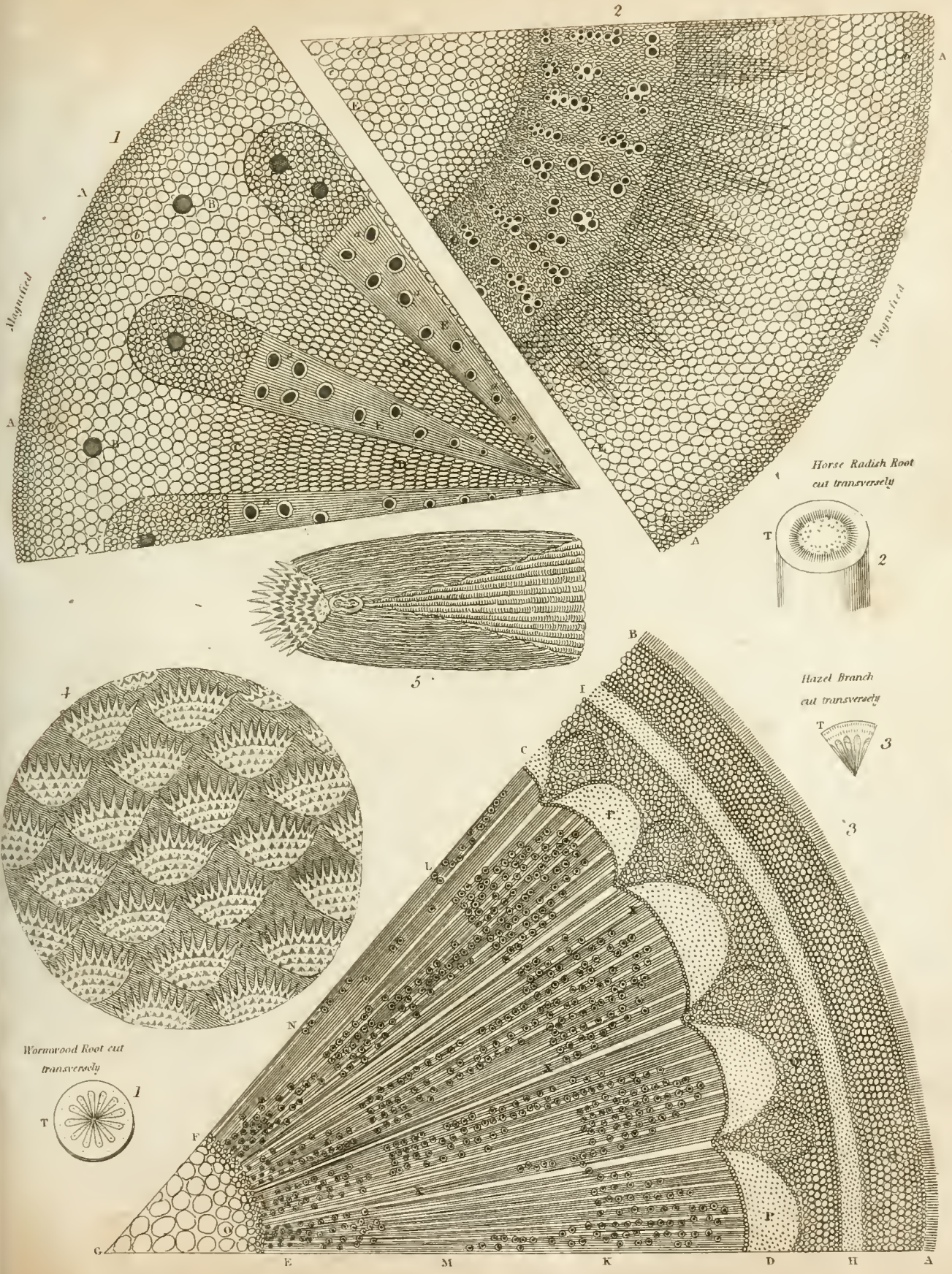
A Flea Magnified.

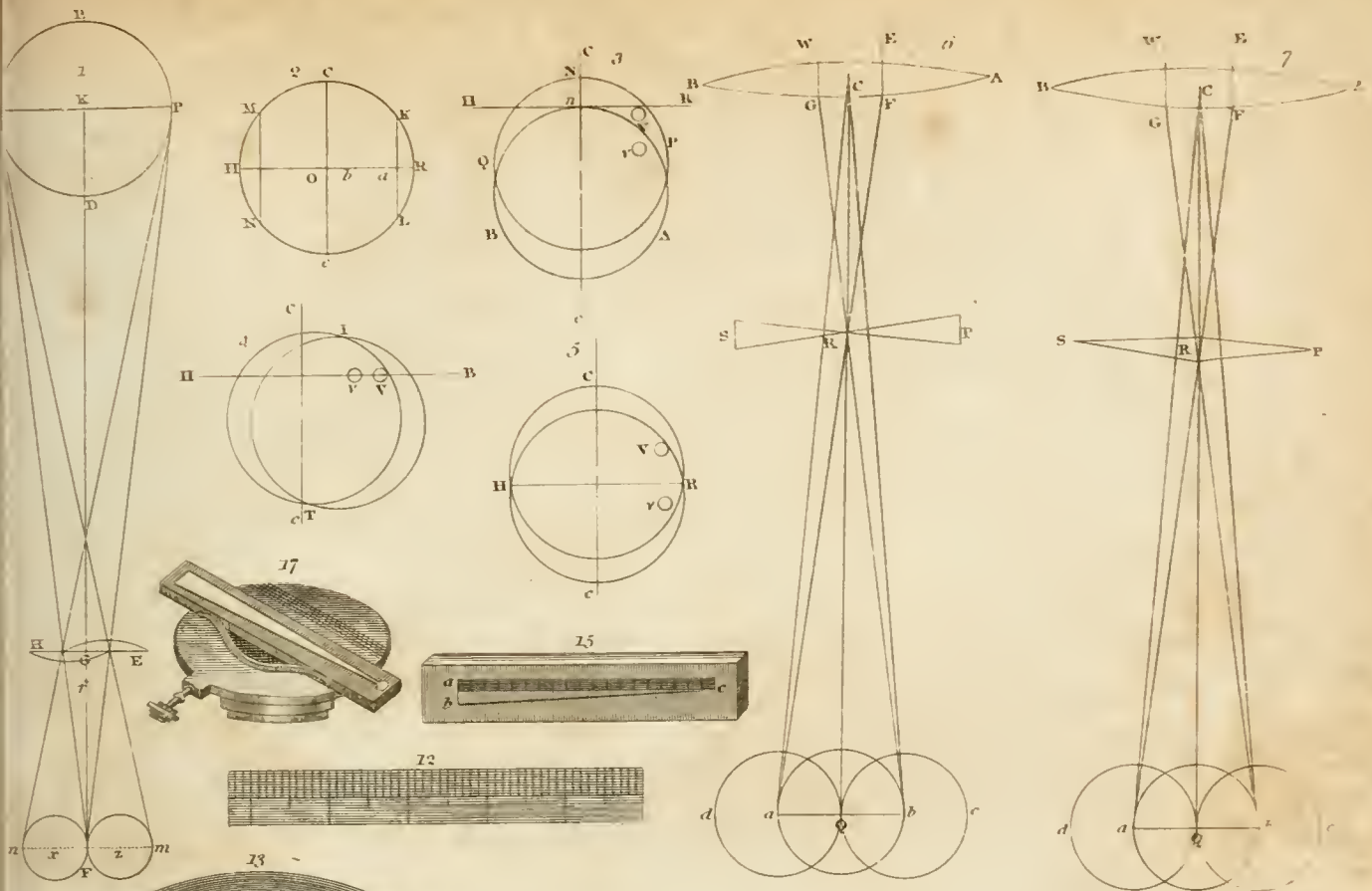




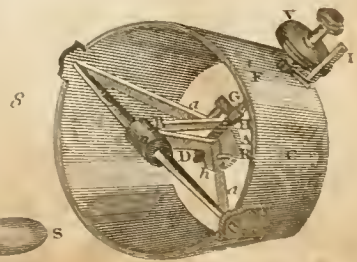
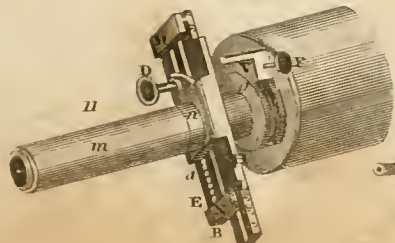
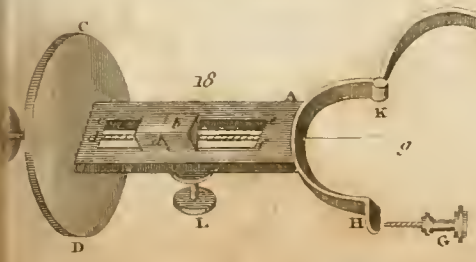
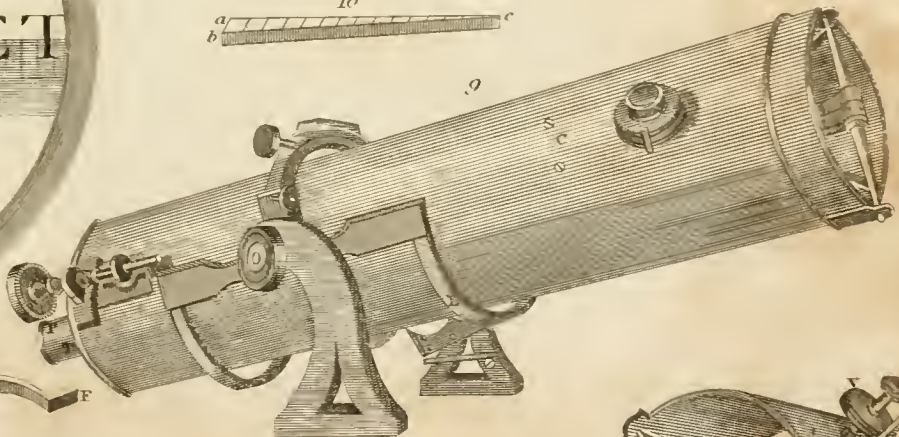
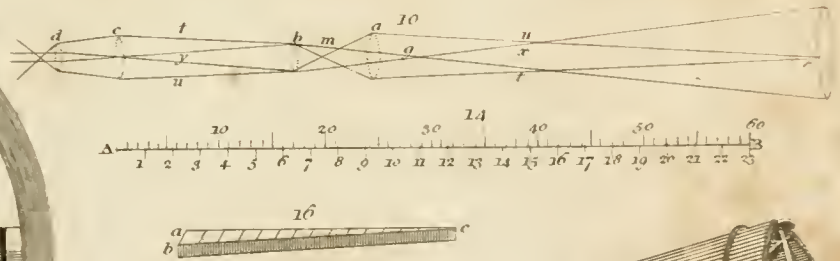








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parts; the index to these divisions is a flower-de-luce marked upon the slider, which carries the needle-point across the field of the microscope. Every revolution of the micrometer-screw measures one-50th part of an inch, which is again subdivided by means of the divisions on the circular plate, as this is divided into 20 equal parts, over which the index passes at every revolution of the screw; by which means we obtain with ease the measure of 1000th part of an inch: for 50, the number of threads on the screw in one inch, being multiplied by 20, the divisions on the circular plate are equal to 1000; so that each division on the circular plate shews that the needle has either advanced or receded 1000th part of an inch. To place this micrometer on the body of the microscope, open the circular part FKH, fig. 18, by taking out the screw G, throw back the semicircle FK, which moves upon a joint at K, then turn the sliding tube of the body of the microscope, so that the small holes which are in both tubes may exactly coincide, and let the needle *g* of the micrometer have a free passage through them; after this, screw it fast upon the body by the screw G. The needle will now traverse the field of the microscope, and measure the length and breadth of the image of any object that is applied to it. But further assistance must be had, to measure the object itself, which is a subject of real importance; for though we have ascertained the power of the microscope, and know that it is so many thousand times, yet this will be of little assistance towards ascertaining an accurate idea of its real size; for our ideas of bulk being formed by the comparison of one object with another, we can only judge of that of any particular body, by comparing it with another whose size is known: the same thing is necessary, to form an estimate by the microscope; therefore, to ascertain the real measure of the object, we must make the point of the needle pass over the image of a known part of an inch placed on the stage, and write down the revolutions made by the screw, while the needle passed over the image of this known measure; by which means we ascertain the number of revolutions on the screws, which are adequate to a real and known measure on the stage. As it requires an attentive eye to watch the motion of the needle-point as it passes over the image of a known part of an inch on the stage, we ought not to trust to one single measurement of the image, but ought to repeat it at least six times; then add the six measures thus obtained together, and divide their sum by six, or number of trials; the quotient will be the mean of all the trials. This result is to be placed in a column of a table next to that which contains the number of the magnifiers. By the assistance of the sectoral scale, we obtain with ease a small part of an inch. This scale is shewn at fig. 15, 16, 17, in which the two lines *ca*, *cb*, with the side *ab*, form an isosceles triangle; each of the sides is two inches long, and the base still only of one-tenth of an inch. The longer sides may be of any given length, and the base still only of one-10th of an inch. The longer lines may be considered as the line of lines upon a sector opened to one-10th of an inch. Hence whatever number of equal parts *ca*, *cb*, are divided into, their transverse measure will be such a part of one-10th as is expressed by their divisions. Thus if it be divided into ten equal parts, this will divide the inch into 100 equal parts; the first division next *c* will be equal to 100th part of an inch, because it is the tenth part of one-10th of an inch. If these lines are divided into twenty equal parts, the inch will be by that means divided into 200 equal parts. Lastly, if *ab*, *ca*, are made three inches long, and divided into 100 equal parts, we obtain with ease the 1000th part. The scale is represented as solid at fig. 16, but as perforated at fig. 15, and 17, so that the light passes through the aperture, when the sectoral part is placed on the stage. To use this scale, first fix the micrometer, fig. 18, to the body of the microscope; then fit the sectoral scale, fig. 17, in the stage, and adjust the microscope to its proper focus or distance from the scale, which is to be moved till the base appears in the middle of the field of view; then bring the needle-point *g*, fig. 18, (by turning the screw L) to touch one of the lines *ca*, exactly at the point answering to 20 on the sectoral scale. The index *a* of the micrometer is to be set to the first division, and that on the dial-plate to 20, which is both the beginning and end of its divisions; we are then prepared to find the magnifying power of every magnifier in the compound microscope which we are using.

Example. Every thing being prepared agreeably to the fore-

going directions, suppose you are desirous of ascertaining the magnifying power of the lens marked N° 4, turn the micrometer-screw until the point of the needle has passed over the magnified image of the tenth part of one inch; then the division, where the two indices remain, will shew how many revolutions, and parts of a revolution, the screw has made, while the needle-point traversed the magnified image of the one-tenth of an inch; suppose the result to be 26 revolutions of the screw, and 14 parts of another revolution, this is equal to 26 multiplied by 20, added to 14; that is, 534,000 parts of an inch. The 26 divisions found on the straight scale of the micrometer, while the point of the needle passed over the magnified image of one-tenth part of an inch, were multiplied by 20, because the circular plate CD, fig. 18, is divided into 20 equal parts; this produced 520; then adding the 14 parts of the next revolution, we obtain 534,000 parts of an inch, or 5-10ths and 3400 parts of another tenth, which is the measure of the magnified image on one-tenth of an inch, at the aperture of the eye-glasses, or at their foci. Now if we suppose the focus of the two eye-glasses to be one inch, the double thereof is two inches; or if we reckon in the 1000th part of an inch, we have 2000 parts for the distance of the eye from the needle-point of the micrometer. Again, if we take the distance of the image from the object at the stage at 6 inches, or 6000, and add thereto 2000, double the distance of the focus of the eye-glass, we shall have 8000 parts of an inch for the distance of the eye from the object; and as the glasses double the image, we must double the number 534 found upon the micrometer, which then makes 1068; then, by the following analogy, we shall obtain the number of times the microscope magnifies the diameter of the object; say, as 240, the distance of the eye from the image of the object, is to 800, the distance of the eye from the object; so is 1068, double the measure found on the micrometer, to 3563, or the number of times the microscope magnifies the diameter of the object. By working in this manner, the magnifying power of each lens used with the compound microscope may be easily found, though the result will be different in different compound microscopes, varying according to the combination of the lenses, their distance from the object and one another, &c. Having discovered the magnifying power of the microscope, with the different object-lenses that are used therewith, our next subject is to find out the real size of the objects themselves, and their different parts; this is easily effected, by finding how many revolutions of the micrometer-screw answer to a known measure on the sectoral scale or other object placed on the stage; from the number thus found, a table should be constructed, expressing the value of the different revolutions of the micrometer with that object-lens, by which the primary number was obtained. Similar tables must be constructed for each object-lens. By a set of tables of this kind, the observer may readily find the measure of any object he is examining; for he has only to make the needle-point traverse over this object, and observe the number of revolutions the screw has made in its passage, and then look into his table for the real measure which corresponds to this number of revolutions, which is the measure required.

MICROPHONES, [*μικρὸς*, and *φωνή*, a voice,] instruments contrived to magnify small sounds, as microscopes do small objects.

MICROPUS, **BASTARD CUDWEED**; a genus of the polygamia necessaria order, and syngenesia class of plants; natural order, Compositæ. Receptacle chaffy; no pappus; calyx caliculated: no radius of the corolla: female florets wrapped in the scales of the calyx. There are two species, *M. Erectus*, and *M. Supinus*. The latter only is cultivated in gardens. It is an annual plant, growing naturally in Portugal, in places near the sea.

MICROSCOPE, [*μικρὸς* and *σκοπεῖν*, to view,] an optical instrument, contrived various ways to give to the eye a large appearance of small objects. It consists of lenses, or mirrors, by means of which small objects appear larger than they do to the naked eye. Single microscopes consist of a single lens or mirror; or if more lenses or mirrors be made use of, they only serve to throw light upon the object, but do not contribute to enlarge the image of it. The famous microscopes used by Mr. Leeuwenhoek were all of the single kind, and the construction of these was the most simple possible; each consisting only of a single lens set be-

tween two plates of silver, perforated with a small hole, with a moveable pin before it to place, the object on and adjust it to the eye of the beholder. Double or compound microscopes are those in which the image of an object is composed by means of more lenses or mirrors than one. The chief advantages they possess over the single are, that the objects are represented under a larger field of view, and with a greater amplification of reflected light: for the principles on which the construction of microscopes depends, see OPTICS. We shall here describe a few of the most approved microscopes. The best single microscope for general observation is that invented by Mr. John Ellis, author of *An Essay upon Corallines, &c.* It is portable, simple in its construction, expeditious, and commodious in use. See Plate CXII. fig. 1, K, represents the box containing the whole apparatus: it is generally made of fish-skin; and on the top there is a female screw for receiving the screw that is at the bottom of the pillar A: this is a pillar of brass, and is screwed on the top of the box. D, is a brass-pin which fits into the pillar; on the top of this pin is a hollow socket to receive the arm which carries the magnifiers; the pin is to be moved up and down in order to adjust the lenses to their focal or proper distance from the object. E, the bar which carries the magnifying lens; it fits into the socket X, which is at the top of the pin or pillar D. This arm may be moved backwards and forwards in the socket X, and sideways by the pin D; so that the magnifier, which is screwed into the ring at the end, E, of this bar may be easily made to traverse over any part of the object that lies on the stage or plate B. FF is a polished silver-speculum, with a magnifying lens placed at the centre thereof, which is perforated for this purpose. The silver-speculum screws into the arm E, as at F; of these there may be two or three having different magnifying powers. H, the semicircle, which supports the mirror I; the pin R, affixed to the semicircle H, passes through the hole which is towards the bottom of the pillar A. B, the stage, or the plane, on which the objects are to be placed; it fits into the dove-tailed arm which is at the upper end of the pillar A. C, a plane glass, with a small piece of silk stuck on it; this glass is to lay in a groove made in the stage B. A hollow glass may be laid occasionally on the stage instead of the plane glass-block C. L, a pair of nippers. These are fixed to the stage by the pin R; the steel-wire of these nippers slides backwards and forwards in the socket, and this socket is moveable upwards and downwards by means of the joint, so that the position of the object may be varied at pleasure. The object may be fixed in the nippers, stuck on the point, or affixed, by a little gum-water, &c. to the ivory cylinder N, which occasionally screws to the point of the nippers. To use this microscope: take all the parts of the apparatus out of the box; then begin by screwing the pillar A to the cover thereof; pass the pin R of the semicircle which carries the mirror through the hole that is near the bottom of the pillar A; push the stage into the dove-tail at B, slide the pin into the pillar; then pass the bar E through the socket X, and screw one of the magnifying lenses into the ring at F. The microscope is now ready for use: and has this peculiar advantage, that it is difficult to put any of the pieces in a place which is appropriated to another. Let the object be now placed either on the stage or on the nippers, L, and in such manner that it may be as nearly as possible over the centre of the stage; bring the speculum F over the part you mean to observe: then throw as much light on the speculum as you can, by means of the mirror I, and the double motion of which it is capable; the light received on the speculum is reflected by it on the object. The distance of the lens F from the object is regulated by moving the pin D up and down, until a distinct view of it is obtained. The best rule is, to place the lens beyond its focal distance from the object, and then to gradually slide it down till the object appears sharp and well defined. The adjustment of the lenses to their focus, and the distribution of the light on the object, require the most attention. Fig. 2 represents Mr. Lyonet's single anatomical dissecting microscope; a curious and extremely useful instrument for microscopic preparations, and the best adapted of any for dissection. With this instrument Mr. Lyonet made his very curious microscopical dissection of the chenille de saule, as related in his *Traité Anatomique de la chenille qui ronge le bois de saule*, 4to. AB is the anatomical table, which is supported by a pillar NO; this is screwed on the foot CD. The table AB is prevented from turning round by means of two steady pins. In this table there is a

hole G, exactly over the centre of the mirror EF, that is to reflect the light on the object; the hole G is designed to receive a flat or concave glass, on which the objects for examination are to be placed. RXZ is an arm formed of several balls and sockets, by which means it may be moved into every possible situation; it is fixed on the hasard by means of the screw H. The last arm IZ has a female screw, into which a magnifier may be screwed, as at Z. By means of the screw H, a small motion may be occasionally given to the arm IZ, for adjusting the lens with accuracy to its focal distance from the object. Another chain of balls is sometimes used, carrying a lens to throw light upon the object; the mirror is likewise so mounted as to be taken from its place at K, and fitted on a clamp, by which it may be fixed to any part of the table AB. Let the operator sit with his left side near a light window; the instrument being placed on a firm table, the side DH towards the stomach, the observation should be made with the left eye. Fig. 3 represents a small portable botanical microscope, contrived by Dr. Withering, and described by him in his *Botanical arrangements*. It consists of three brass-plates, A, B, C, which are parallel to each other; the wires D and E are rivetted into the upper and lower plates, which are by these means united to each other; the middle plate or stage is moveable on the aforesaid wires by two little sockets which are fixed to it. The two upper plates each contain a magnifying lens, but of different powers; one of these confines and keeps in their places the fine point F, the forceps G, and the small knife H. To use this instrument, unscrew the upper lens, and take out the point, the knife, and the forceps; then screw the lens on again, place the object on the stage, and then move it up or down till you have gained a distinct view of the object, as one lens is made of a shorter focus than the other; and spare lenses of a still deeper focus may be had if required. The most convenient microscope of any yet constructed, appears to be that contrived, in regard to the form of the mounting, by the late Mr. Benjamin Martin; and is what he called a hand-megascop, because it is well adapted for viewing all the larger sort of small objects universally, and by only three lenses it has seven different magnifying powers. Fig. 4 represents the case with the three frames and lenses, which are usually one, one and a half, and two inches focus: they all turn over each other, and shut into the case, and are turned out at pleasure. The three lenses, singly, afford three magnifying powers; and by combining two and two we make three more; for d with e makes one, d with f another, and e with f a third; which, with the three singly make six; and lastly, all three combined together make another; so that, upon the whole, there are seven powers of magnifying with these glasses only. When the three lenses are combined, it is better to turn them in, and look through them by the small apertures in the sides of the case. The eye in this case is excluded from extra light; the aberration of the superfluous rays through the glasses is cut off; and the eye coincides more exactly with the common axes of the lenses. A very useful microscope, either for botanical objects or animals, but adapted chiefly for confining and viewing any living insects, small animals, &c. is shewn at fig. 5, where A represents a glass-tube, about an inch and three quarters diameter, and two inches high. B, a case of brass or wood, containing a sliding tube, with two or three magnifying glasses that may be used either separately or combined. In the inside, at the bottom, is a piece of ivory, black and white on opposite sides, that is occasionally removed, and admits a point to be screwed into the centre. The cap unscrews at D, to admit the placing of the object: the proper distance of the glasses from the object is regulated by pulling up or down the brass-tube E at top, containing the eye-glasses. This microscope is particularly useful for exhibiting the curculio imperialis, or diamond-beetle, to the greatest advantage; for which, as well as for other objects, a glass-bottom and a polished reflector at the top are often applied, to condense the light upon the object. In this case, the stand and brass-bottom F, as shewn in the figure, are taken away by unscrewing. The double microscope, originally invented by Mr. Culpeper, has been successively improved by Messrs. Cuffe, Martin, Adams, and others. Fig. 1, Plate CXIII. represents it with the latest improvements, as described by Mr. Adams in his essays: AB represents the body of the microscope, containing a double eye-glass and a body-glass: it is here shewn as screwed to the arm CD, from whence it may be occasionally removed, either for the convenience of packing, or when

the instrument is to be used as a single microscope. The eye-glasses and the body-glasses are contained in a tube which fits into the exterior tube AB; by pulling out this tube a little when the microscope is in use, the magnifying power of each lens is increased. The body AB of the microscope is supported by the arm CD; this arm is fixed to the main pillar CF, which is screwed firmly to the mahogany-pedestal GH; there is a drawer to this pedestal, which holds the apparatus. NIS, the plate or stage which carries the slider-holder KL: this stage is moved up or down the pillar CF, by turning the milled-nut M; this nut is fixed to a pinion, that works in a toothed rack cut on one side of the pillar. By means of this pinion, the stage may be gradually raised or depressed, and the object adjusted to the focus of the different lenses. KL is a slider-holder, which fits into a hole that is in the middle of the stage NIS; it is used to confine and guide either the motion of the sliders which contain the objects, or the glass-tubes that are designed to confine small fishes for viewing the circulation of the blood. The sliders are to be passed between the two upper plates, the tubes through the bent plates. L is a brass-tube, to the upper part of which is fixed the condensing lens before spoken of: it fits into the under part of the slider-holder KL, and may be set at different distances from the object, according to its distance from the mirror or the candle. O is the frame which holds the two reflecting mirrors, one of which is plane, the other concave. These mirrors may be moved in various directions, in order to reflect the light properly, by means of the pivots on which they move, in the semicircle QSR, and the motion of the semicircle itself on the pin S: the concave mirror generally answers best in the day-time; the plane mirror combines better with the condensing lens, and a lamp or candle. At D there is a socket for receiving the pin of the arm Q, fig. 22, to which the concave speculum, for reflecting light on opaque objects, is fixed. At S is a hole and slit for receiving either the nippers L, fig. 17, or the fish-pan I, fig. 14; when these are used, the slider-holder must be removed. T, a hole to receive the pin of the convex lens M, fig. 18. To use this microscope: take it out of the box. Screw the body into the upper end of the part of the arm CD. Place the brass-sliders, which contain the magnifiers, in a dove-tailed slit which is on the under side of the afore-said arm, as seen at E, and slide it forwards until the magnifier you mean to use is under the centre of the body; opposite to each magnifier in this slit there is a notch, and in the dove-tailed part of the arm CD there is a spring, which falls into the above-mentioned notch, and thus makes each magnifier coincide with the centre of the body. Pass the ivory-slider you intend to use between the upper plates of the slider-holder KL, and then reflect as strong a light as you can on the object by one of the mirrors; after this, adjust the object to the focus of the magnifier and your eye, by turning the milled screw M, the motion of which raises and depresses the stage NIS. When opaque objects are to be examined, remove the slider-holder, and place the object on a flat glass, or fix it to the nippers L, fig. 17, the pin of these fit into the hole on the stage; screw the concave speculum H, fig. 13, into the arm Q, fig. 22, and then pass the pin of this arm through the socket D, fig. 1, the light is now to be reflected from the concave mirror to the silver-speculum, and from this down on the object. The speculum must be moved lower or higher, to suit the focus of the different magnifiers and the nature of the object. The foregoing directions apply equally to the using of this instrument as a single microscope; with this difference only, that the body AB is then removed, and the eye is applied to the upper surface of the arm CD, exactly over the magnifiers. This microscope is sometimes made with the following alterations, to render it still more convenient and useful. The arm CD that carries the body and magnifiers is made both to turn on a pin, and to slide backwards and forwards in a socket at C; so that, instead of moving the objects below on the stage, and disturbing them, the magnifiers are more conveniently brought over any part of the objects as desired. The condensing glass is made larger, and slides upon the square bar CF quite distinct from the stage, like the mirrors below; and it is thereby made useful for any other objects that may be applied on glasses fitted to the stage, as well as those put into the slider-holder K. It is thereby not confined to this stage alone, as in the preceding. When the body AB is taken away, the arm CD may be slipped away from its bar, with the magnifiers, and the forceps-wire, and joint,

applied to it; and it thereby serves the purpose of a small hand single or opaque microscope, for any object occasionally applied to this wire. The magnifiers in the slider E are mounted in a wheel-case, which perhaps prevents its being in the way so much as the long slider E before described. This contrivance is represented at N.

MICROSCOPE, LUCERNAL, or the CAMERA OBSCURA MICROSCOPE. The great facility with which objects can be represented on paper or a rough glass in the camera obscura, and copies drawn from them by any person though unskilled in drawing, suggested the application of the microscope to this instrument. The greatest number of experiments, that appear to have been made with this view, were by the late Mr. Martin and Mr. Adams; the former of whom frequently applied the microscope to the portable camera, and with much effect and entertainment. But these instruments being found to answer only with the assistance of the sun, Mr. Adams directed his experiments to the construction of an instrument of more extended utility, which could be equally employed in the day-time and by night. He accordingly succeeded so far as to produce, by candle-light, the images of objects refracted from a single magnifier upon one or two large convex lenses, (of about five inches or upwards in diameter,) at the end of a pyramidal-shaped box, in a very pleasing and magnified appearance, so as to give opaque objects as well as transparent ones the utmost distinctness of representation; but still the light of a candle or lamp was found generally insufficient to throw the requisite degree of illumination upon the objects. The invention of Argand's lamp offered a complete remedy for this defect, by the intensity and steadiness of its light. This did not escape Mr. Adams (the son of the former), who immediately applied it; and who had likewise so altered and improved his father's instrument both in construction and form, as to render it far more perfect and useful. The advantages and properties of this excellently contrived instrument are numerous and important. "As the far greater part of the objects which surround us are opaque (says our author), and very few are sufficiently transparent to be examined by the common microscopes, an instrument that could be readily applied to the examination of opaque objects has always been a desideratum. Even in the examination of transparent objects, many of the fine and more curious portions are lost, and drowned, as it were, in the light which must be transmitted through them; while different parts of the same object appear only as dark lines or spots, because they are so opaque as not to permit any light to pass through them. These difficulties, as well as many more, are obviated in the lucernal microscope; by which opaque objects of various sizes may be seen with ease and distinctness: the beautiful colours with which most of them are adorned are rendered more brilliant, without changing in the least the real tint of the colour; and the concave and convex parts retain also their proper form. The facility with which all opaque objects are applied to this instrument, is another considerable advantage, and almost peculiar to itself; as the texture and configuration of the more tender parts are often hurt by previous preparation, every object may be examined by this instrument, as opaque, and afterwards (if the texture will admit of it) as transparent. The lucernal microscope does not in the least fatigue the eye; the object appears like nature itself; giving ease to the sight and pleasure to the mind: there is also, in the use of this instrument, no occasion to shut the eye which is not directed to the object. A further advantage peculiar to this microscope is, that by it the outlines of every object may be taken, even by those who are not accustomed to draw; while those who can draw well will receive great assistance, and execute their work with more accuracy and in less time, than they would otherwise have been able to have performed it. Transparent objects as well as opaque may be copied in the same manner. The instrument may be used at any time of the day, but the best effect is by night; in which respect it has a superiority over the solar microscope, as that instrument can only be used when the sun shines. Transparent objects may be examined with the lucernal microscope in three or four different modes, from a blaze of light almost too great for the eye to bear, to that which is perfectly easy to it: and by the addition of a tin-lantern to the apparatus, may be thrown on a screen, and exhibited at one view to a large company, as by the solar microscope. The instrument and apparatus are thus described: fig. 6, Plate CXII. represents

the improved lucernal microscope, mounted to view opaque objects. ABCD is a large mahogany pyramidal box, which forms the body of the microscope; it is supported firmly on the brass-pillar FG, by means of the socket H, and the curved piece IK. LMN is a guide for the eye, to direct it in the axis of the lenses; it consists of two brass-tubes, one sliding within the other, and a vertical flat piece, at the top of which is a hole for the eye. The outer tube is seen at MN, the vertical piece is represented at LM. The inner tube may be pulled out, or pushed in, to adjust it to the focus of the glasses. The vertical piece may be raised or depressed, that the hole, through which the object is to be viewed, may coincide with the centre of the field of view; it is fixed by a milled screw at M, which could not be shewn in this figure. At N is a dove-tailed piece of brass, made to receive the dove-tail at the end of the tubes MN, by which it is affixed to the wooden box ABCDE. The tubes MN may be removed from this box occasionally, for the convenience of packing it up in a less compass. OP, a small tube which carries the magnifiers. O, one of the magnifiers; it is screwed into the end of a tube, which slides within the tube P; the tube P may be unscrewed occasionally from the wooden body. QRSTVX, a long square bar, which passes through the sockets YZ, and carries the stage or frame that holds the objects; this bar may be moved backward or forward, in order to adjust it to the focus by means of the pinion which is at *a*. *b*, Is a handle furnished with an universal joint, for more conveniently turning the pinion. When the handle is removed, the nut, fig. 7, may be used in its stead. *de*, A brass-bar, to support the curved piece KI, and keep the body AB firm and steady. *fghi*, The stage for opaque objects: it fits upon the bar QRST by means of the socket *hi*, and is brought nearer to, or removed farther from, the magnifying lens by turning the pinion *a*: the objects are placed in the front-side of the stage (which cannot be seen in this figure) between four small brass-plates; the edges of two of these are seen at *kl*. The two upper pieces of brass are moveable; they are fixed to a plate, which is acted on by a spiral spring, that presses them down, and confines the slider with the objects: this plate, and the two upper pieces of brass, are lifted up by the small nut *m*. At the lower part of the stage, there is a semicircular lamp of glass *n*, which is designed to receive the light from the lamp, fig. 8, and to collect and throw it on the concave mirror *o*, whence it is to be reflected on the object. The upper part *fgrs*, fig. 6, of the opaque stage takes out, that the stage for transparent objects may be inserted in its place. Fig. 9, represents the stage for transparent objects; the two legs 5 and 6 fit into the top of the under part *rshi* of the stage for opaque objects; 7 is the part which confines or holds the sliders, and through which they are to be moved; 9 and 10 a brass-tube, which contains the lenses for condensing the light, and throwing it upon the object; there is a second tube within that, marked 9 and 10, which may be placed at different distances from the object by the pin 11. When this stage is used as a single microscope, without any reference to the lucernal, the magnifiers, or object-lenses, are to be screwed into the hole 12, and to be adjusted to a proper focus by the nut 13. N. B. At the end AB, fig. 6, of the wooden body there is a slider, which is represented as partly drawn out at A: when quite taken out, three grooves will be perceived; one of which contains a board that forms the end of the box; the next contains a frame with a greyed glass; and the third, or that farthest from the end AB, two large convex lenses. Fig. 8, represents one of Argand's lamps, to be used with the microscope. The oil must be of the spermaceti kind, called chamber-oil, which, in every respect, is said to be best adapted for microscopic purposes. *To examine opaque objects.* Take out the wooden slider, fig. 6, then lift out the cover and the grey glass from their respective grooves under the slider A. Put the end N of the guide for the eye LMM into its place, so that it may stand in the position which is represented in this figure. Place the socket which is at the bottom of the opaque stage, on the bar QXT, so that the concave mirror *o* may be next the end DE of the wooden body. Screw the tubes PO into the end DE. The magnifier you intend to use is to be screwed on the end O of these tubes. The handle Gb, or the milled nut, fig. 7, must be placed on the square end of the pinion *a*. Place the lamp lighted before the glass-lamp *n*, and the object you intend to examine between the spring-plates of the stage; and the instrument is ready for use. In all microscopes

there are two circumstances which must be particularly attended to; first, the modification of the light, or the proper quantity to illuminate the object; 2dly, the adjustment of the instrument to the focus of the glasses and eye of the observer. In the use of the lucernal microscope there is a third circumstance, which is, the regulation of the guide for the eye. 1. To throw the light upon the object. The flame of the lamp is to be placed rather below the centre of the glass-lamp *n*, and as near it as possible; the concave mirror *o* must be so inclined and turned as to receive the light from the glass-lamp, and reflect it thence upon the object; the best situation of the concave mirror and the flame of the lamp depends on a combination of circumstances, which a little practice will discover. 2. To regulate the guide for the eye, or to place the centre of the eye-piece L, so that it may coincide with the focal-point of the lenses and the axis of vision: lengthen and shorten the tubes MN, by drawing out or pushing in the inner tube, and raising or depressing the eye-piece ML, till you find the large lens, which is placed at the end AB of the wooden body, filled by an uniform field of light, without any prismatic colours round the eye; for till this piece is properly fixed, the circle of light will be very small, and only occupy a part of the lens: the eye must be kept at the centre of the eye-piece L, during the whole of the operation; which may be rendered somewhat easier to the observer, on the first use of the instrument, if he hold a piece of white paper parallel to the large lens, removing it from, or bringing it nearer to them, till he find the place where a lucid circle, which he will perceive on the paper, is brightest and most distinct; then he is to fix the centre of the eye-piece to coincide with that spot; after which a very small adjustment will set it perfectly right. 3. To adjust the lenses to their focal distance. This is effected by turning the pinion *a*, the eye being at the same time at the eye-piece L. The grey glass is often placed before the large lenses, while regulating the guide for the eye, and adjusting for the focal distance. If the observer, in the process of his examination of an object, advance rapidly from a shallow to a deep magnifier, he will save himself some labour by pulling out the internal tube at O. The upper part *fgrs* of the stage is to be raised or lowered occasionally, in order to make the centre of the object coincide with the centre of the lens at O. To delineate objects, the grey glass must be placed before the large lenses; the picture of the object will be formed on this glass, and the outline may be accurately taken by going over the picture with a pencil. The opaque part may be made use of in the day-time without a lamp, provided the large lenses at AB are screened from the light. *To examine transparent objects.* The instrument is to remain as before; the upper part *fgrs* of the opaque stage must be removed, and the stage for transparent objects, represented at fig. 9, put in its place; the end 9 10 to be next the lamp. Place the greyed glass in its groove at the end AB, and the objects in the slider-holder at the front of the stage; then transmit as strong a light as you are able on the object, which you will easily do by raising or lowering the lamp. The object will be beautifully depicted on the grey glass: it must be regulated to the focus of the magnifier, by turning the pinion *a*. The object may be viewed with or without the guide for the eye. A single observer will see an object to the greatest advantage by using this guide, which is to be adjusted as we have described above. If two or three wish to examine the object at the same time, the guide for the eye must be laid aside. Take the large lens out of the groove, and receive the image on the grey glass; in this case, the guide for the eye is of no use; if the grey glass be taken away, the image of the object may be received on a paper-screen. Take out the grey glass, replace the large lenses, and use the guide for the eye; attend to the foregoing directions, and adjust the object to its proper focus. You will then see the object in a blaze of light almost too great for the eye, a circumstance that will be found very useful in the examination of particular objects. The edges of the object in this mode will be somewhat coloured: but as it is only used in this full light for occasional purposes, it has been thought better to leave this small imperfection, than, by remedying it, to sacrifice greater advantages; the more so, as this fault is easily corrected, and a new and interesting view of the object is obtained, by turning the instrument out of the direct rays of light, and permitting them to pass through only in an oblique direction, by which the upper surface is in some degree illuminated, and the

object is seen partly as opaque, partly as transparent. It has been already observed, that the transparent objects might be placed between the slider-holders of the stage for opaque objects, and then be examined as if opaque. Some transparent objects appear to the greatest advantage when the lens at 9 10 is taken away; as, by giving too great a quantity of light, it renders the edges less sharp. The variety of views which may be taken of every object, by means of the improved lucernal microscope, will be found to be of great use to an accurate observer: it will give him an opportunity of correcting or confirming his discoveries, and investigating those parts in one mode which are invisible in another.—*To throw the image of transparent objects on a screen.* It has been long a microscopical desideratum, to have an instrument by which the image of transparent objects might be thrown on a screen, as in the common solar microscope: and this not only because the sun is so uncertain in this climate, and the use of the solar microscope requires confinement in the finest part of the day, when time seldom hangs heavy on the mind; but as it also affords an increase of pleasure, by displaying its wonders to several persons at the same instant, without the least fatigue to the eye. This purpose is now effectually answered, by affixing the transparent stage of the lucernal to a lanthorn, with Argand's lamp. The lamp is placed within the lanthorn, and the end 9 10 of the transparent stage is screwed into a female screw, which is rivetted in the sliding part of the front of the lanthorn; the magnifying lenses are to be screwed into the hole represented at 12, and they are adjusted by turning the milled nut. The quantity of light is to be regulated by raising and lowering the sliding-plate or the lamp. Mr. Jones of Holborn has made several improvements in the construction of this instrument.

MICROSCOPE, SOLAR, which is esteemed the best for amusement, is composed of a tube, a looking-glass, a convex lens, and a single microscope. The sun's rays being reflected through the tube by means of the mirror upon the object, the image of the object is thrown distinctly and beautifully upon a screen of white paper or a linen-sheet, placed at a proper distance to receive it; and may be magnified to a size not to be conceived by those who have not seen it: for the farther the screen is removed, the larger will the object appear; insomuch, that a louse may thus be magnified to the length of five or six feet, or even more; though it is more distinct when not enlarged to above half that size. The common solar microscope, in its improved state, is well adapted for magnifying transparent objects, but will not serve for opaque objects, and as these form the most considerable part of the curious collections in the works of art as well as nature, a solar microscope for this purpose was a long time wanted. Mr. Benjamin Martin made several essays towards the construction of such an instrument; and at last completed one about 1774, which he named the opaque solar microscope. With this instrument all opaque objects, whether of the animal, vegetable, or mineral, kingdom, may be exhibited in great perfection, in all their native beauty; the lights and shades, the prominences and cavities, and all the varieties of different hues, tints, and colours; being heightened by reflection of the solar rays condensed upon them. Transparent objects are also shewn with greater perfection than by the common solar microscope. Fig. 2, Plate CXIII. represents this microscope mounted for exhibiting opaque objects. ABCDEF, represents the body; one part thereof, ABCD, is conical; the other, CDEF, is cylindrical. The cylindrical part receives the tube G of the opaque box, or the tube Y of the single microscope, fig. 3. At the large end AB of the conical part, there is a lens to receive the rays from the mirror, and refract them towards the box HIKL. NOP is a brass-frame, which is fixed to the moveable circular plate *abc*: in this frame there is a plane mirror, to reflect the solar rays on the fore-mentioned lens. This mirror may be moved into the most convenient position for reflecting the light, by the nuts Q and R. By the nut Q it may be moved from east to west; and it may be elevated or depressed by the nut R. *d, c*, Two screws to fasten the microscope to a window-shutter. The box for opaque objects is represented at HIKL: it contains a plane mirror M, for reflecting the light which it receives from the large lens to the object, and thereby illuminating it; S is a screw to adjust this mirror, or place it at a proper angle for reflecting the light. VX, two tubes of brass, one sliding within the other, the exterior one in the box HIKL; these carry the magnifying lenses:

the interior tube is sometimes taken out, and the exterior one is then used by itself. Part of this tube may be seen in the plate within the box HIKL. At H there is a brass-plate, the back part of which is fixed to the hollow tube *h*, in which there is a spiral wire, which keeps the plate always bearing against the side H of the brass-box HIKL. The sliders, with the opaque objects, pass between this plate and the side of the box; to put them there, the plate is to be drawn back by means of the nut *g*: *ik* is a door to one side of the opaque box. The foregoing pieces constitute the several parts necessary for viewing opaque objects. We now proceed to describe the single microscope which is used for transparent objects: but in order to examine these, the box HIKL must be first removed, and in its place we must insert the tube Y of the single microscope now to be described. Fig. 3, represents a large single tooth and pinion microscope: which is used for shewing transparent objects; the cylindrical tube Y being made to fit into the tube FE of the solar microscope. At *m*, within the body of this microscope, are two thin plates, that are to be separated, in order to let the ivory-sliders to pass between them; they are pressed together by a spiral spring, which bears up the under plate, and forces it against the upper one. The slider S, 4, which contains the magnifiers, fits into the hole *n*; and any of the magnifiers may be placed before the object, by moving the aforesaid slider: when the magnifier is at the centre of the hole P, a small spring falls into one of the notches which is on the side of the slider. Under the plate *m* are placed two lenses, for enlarging the field of view on the screen: the smallest of the two is fixed in a piece of brass, and is nearest the plate *m*; this is to be taken out when the magnifiers, N° 4, 5, or 6, are used, or when the megala-scope-lens T, fig. 5, is used, but it is to be replaced for N° 1, 2, 3. This microscope is adjusted to the focus by turning the milled nut O. To use the solar microscope: make a round hole in the window-shutter, a little larger than the circle *abc*; pass the mirror ONP through this hole, and apply the square plate to the shutter; then mark with a pencil the places which correspond to the two holes through which the screw is to pass; take away the microscope, and bore two holes at the marked places, sufficiently large to let the milled screws *de* pass through them. The screws are to pass from the outside of the shutter, to go through it; and being then screwed into their respective holes in the square plate, they will, when screwed home, hold it fast against the inside of the shutter, and thus support the microscope. Screw the conical tube ABCD to the circle *abc*, and then slide the tube G of the opaque box into the cylindrical part CDEF of the body, if opaque objects are to be examined; but if they be transparent objects you mean to shew, then place the tube Y within the tube CDEF. The room is to be darkened as much as possible, that no light may enter but what passes through the body of the microscope; for, on this circumstance, together with the brightness of the sunshine, the perfection and distinctness of the image in a great measure depend. When the microscope is to be used for opaque objects, 1. Adjust the mirror NOP, so as to receive the solar rays, by means of the two finger-screws or nuts QR; the first, Q, turns the mirror to the right or left; the second, R, raises or depresses it: this you are to do till you have reflected the sun's light through the lens at AB strongly upon a screen of white paper placed at some distance from the window, and formed thereon a round spot of light. An inexperienced observer will find it more convenient to obtain the light, by forming this spot before he puts on either the opaque box, or the tooth and pinion microscope. Now put in the opaque box, and place the object between the plates at H; open the door at *ik*, and adjust the mirror M till you have illuminated the object strongly. If you cannot effect this by the screw S, you must move the screws Q, R, in order to get the light reflected strongly from the mirror NOP, or the mirror M, without which the latter cannot illuminate the object. The object being strongly illuminated, shut the door *ik*, and a distinct view of the object will soon be obtained on your screen, by adjusting the tubes VX, which is effected by moving them backwards or forwards. A round spot of light cannot always be procured in northern latitudes, the altitude of the sun being often too low; neither can it be obtained when the sun is directly perpendicular to the front of the room. As the sun is continually changing its place, it will be necessary, in order to keep his rays full upon the object, to keep them continually direct-

ed through the axis of the instrument, by the two screws Q and R. To view transparent objects, remove the opaque box, and insert the tube Y, fig. 3, in its place; put the slider S into its place at *n*, and the slider with the objects between the plates at *m*; then adjust the mirror NOP, as before directed, by the screws Q, R, so that the light may pass through the object, and regulate the focus of the magnifier by the screw O. The most pleasing magnifiers in use are the fourth and fifth. The size of the object may be increased or diminished, by altering the distance of the screen from the microscope: five or six feet is a convenient distance. To examine transparent objects of a larger size, or to render the instrument what is usually called a megalascope, take out the slider S from its place at *n*, and screw the button T, fig. 5, into the hole at P, fig. 3, and remove the glass which is under the plate at *m*, and regulate the light and focus agreeable to the foregoing directions. N. B. At the end of the tube G there is a lens for increasing the density of the rays, for burning or melting any combustible or fusible substance; this lens must be removed in most cases, lest the objects should be burnt. The intensity of the light is also varied by moving this tube backwards or forwards.

MICROSCOPES, APPARATUS COMMON TO THE MOST OF. A and B, fig. 6 and 7, represent the brass-cells which contain the magnifiers belonging to the different kinds of compound microscopes. The magnifiers are sometimes contained in a slider. The lenses of A and B are confined by a small cap; on unscrewing this, the small lens may be taken out and cleaned. The magnifiers A of the lucernal microscope are so contrived, that any two of them may be screwed together, by which means a considerable variety of magnifying power is obtained. To get at the lenses in the slider S, fig. 4, take out the two screws which hold on the cover. C, fig. 8, represents the general form of the slider-holder. It consists of a cylindrical tube, in which an inner tube is forced up by a spring. It is used to receive the ivory or any other slider, in which the transparent objects are placed; these are to be slid between the two upper plates: the hollow part in one of the plates is designed for the glass-tubes. D, fig. 9, the condensing lens and its tube, which fits into the slider-holder C, and may be moved up and down in it. When this piece is pushed up as far as it will go, it condenses the light of a candle, which is reflected on it by the plain mirror of the compound microscope, and spreads it uniformly over the object; in this case it is best adapted to the shallowest magnifiers. If the deeper lenses are used, it should be drawn down, or rather removed further from the object, that it may concentrate the light in a small compass, and thus render it more dense. The condensing lens is sometimes fitted up differently; but the principle being the same, it will be easy to apply it to use notwithstanding some variations in the mechanism. E, fig. 10, a brass-cone. It fixes under the slider-holder, and is used to lessen occasionally the quantity of light which comes from the mirror to any object. F, fig. 11, a box with two flat glasses, which may be placed at different distances from each other in order to confine a small living insect. G, fig. 12, a small brass-box to hold the silver-speculum H. H, fig. 13, a small silver concave speculum, designed to reflect the light from the mirror on opaque objects; it should only be used with the shallow magnifiers. It is applied in different ways to the compound microscope; sometimes to a tube similar to that represented at X, fig. 26, which slides on the lower part of the body; sometimes it is screwed into the ring of the piece Q, fig. 22; the pin of this generally fits into one of the holes in the stage. When the speculum is used, the slider-holder should be removed. I, fig. 14, is a fish-pan, whereon a small fish may be fastened, in order to view the circulation of the blood: its tail is to be spread across the oblong hole at the smallest end, and tied fast by means of the ribbon fixed thereto, by shoving the knob which is on the back of it through the slit made in the stage: the tail of the fish may be brought under the lens which is in use. K, fig. 15, a cylindrical piece, intended for the solar opaque microscope: by pulling back the spiral spring, smaller or larger objects may be confined in it. K, fig. 16, A pair of triangular nippers for taking hold of, and confining, a large object. L, fig. 17, a long steel-wire, with a small pair of pliers at one end, and a steel-point at the other: the wire slips backwards or forwards in a spring-tube, which is affixed to a joint, at the bottom of which is a pin to fit one of the holes in the stage; this piece is used to confine small objects. At *l*, is a

small ivory-cylinder that fits on the pointed end of the steel-wire *l*; it is designed to receive opaque objects. Light-coloured ones are to be stuck on the dark side, and vice versa. M, fig. 18, a convex lens, which fits to the stage by means of the long pin adhering to it. This piece is designed to collect the light from the sun or a candle, and to throw it on any object placed on the stage. N, fig. 19, a brass-slider, into which is fitted a flat piece of glass, and a brass-slider containing four small glasses, one or two of them concave, the others flat; it is designed to confine small living objects, and when used is to be placed between the two upper plates of the slider-holder. O, fig. 20, a glass-tube to receive a small fish, &c. P, fig. 21, one of the ivory-sliders, wherein objects are placed between two pieces of talc, and confined by a brass-ring. Q, fig. 22, a piece to hold the speculum H, fig. 13; this piece is generally fitted to the microscope represented at fig. 1. R, fig. 23, a pair of forceps, to take up any occasional object. S, fig. 24, a camel's-hair pencil to brush the dust off the glasses; the upper part of the quill is scooped out, to take up a drop of any fluid, and place it on either of the glasses for examination. T, fig. 25, an instrument for cutting thin transverse sections of wood. It consists of a wooden base, which supports four brass-pillars; on the top of the pillars is placed a flat piece of brass, near the middle of which there is a triangular hole. A sharp knife, which moves in a diagonal direction, is fixed on the upper side of the plate, in such a manner that the edge always coincides with the surface thereof. The knife is moved backwards and forwards by means of the handle *a*. The piece of wood is placed in the triangular trough which is under the brass-plate, and is to be kept steady therein by a milled screw which is fitted to the trough; the wood is to be pressed forward for cutting by the micrometer-screw *b*. The pieces of wood should be applied to this instrument immediately on being taken out of the ground, or else they should be soaked for some time in water, to soften them so that they may not hurt the edge of the knife. When the edge of the knife is brought in contact with the piece of wood, a small quantity of spirits of wine should be poured on the surface of the wood, to prevent its curling up; it will also make it adhere to the knife, from which it may be removed by pressing a piece of blotting-paper on it. Y, fig. 27, is an appendage to the cutting-engine, which is to be used instead of the micrometer-screw, being preferred to it by some. It is placed over the triangular hole, and kept flat down upon the surface of the brass-plate, while the piece of wood is pressed against a circular piece of brass which is on the under-side of it. This circular piece of brass is fixed to a screw, by which its distance from the flat plate on which the knife moves may be regulated. Z, fig. 28, an ivory-box, containing at one end spare talc for the ivory-sliders, and at the other spare rings for pressing the talcs together, and confining them to the slider. Microscopes cannot be said to be complete without the valuable addition of a MICROMETER. See that article.

MICROSCOPES, METHOD OF USING. In applying the microscope to use, examine whether the glasses be clean: if not, they must be wiped with soft leather, taking care not to soil them with the fingers; not to place them in an oblique situation; not to let the breath fall upon the glasses, nor to hold that part of the body of the instrument where the glasses are placed with a warm hand; because the moisture expelled by the heat from the metal will condense upon the glass, and prevent the object from being distinctly seen. The object should be brought as near the centre of the field of view as possible; for there only it will be exhibited in the greatest perfection. The eye should be moved up and down from the eye-glass of a compound microscope, till the situation is found where the largest field and most distinct view of the object are to be had: but every person ought to adjust the microscope to his own eye, and not to depend upon the situation it was placed in by another. A small magnifying power should always be begun with; by which means the observer will best obtain an exact idea of the situation and connection of the whole; and will of consequence be less liable to form any erroneous opinion when the parts are viewed separately by a lens of greater power. Objects should also be examined first in their most natural position: for if this be not attended to, we shall be apt to form very inadequate ideas of the structure of the whole, as well as of the connection and use of the parts. A living animal ought to be as little hurt or decomposed as possible. From viewing an object properly,

perly, we may acquire a knowledge of its nature. Mr. Baker advises not to form an opinion too suddenly after viewing a microscopical object; nor to draw our inferences till after repeated examinations of the object in many different lights and positions; to pass no judgement upon things extended by force, or contracted by dryness, or in any manner out of a natural state, without suitable allowances. The true colour of objects cannot be properly determined by very great magnifiers; for as the pores and interstices of an object are enlarged according to the magnifying power of the glasses made use of, the component particles of its substance will appear separated many thousand times farther asunder than they do to the naked eye: hence the reflection of the light from these particles will be very different, and exhibit different colours. It is likewise somewhat difficult to observe opaque objects: and as the apertures of the larger magnifiers are but small, they are not proper for the purpose. If an object be so very opaque, that no light will pass through it, as much as possible must be thrown upon the upper surface of it. Some consideration is likewise necessary in forming a judgement of the motion of living creatures, or even of fluids, when seen through the microscope; for as the moving body, and the space within which it moves, are magnified, the motion will also be increased. On the management of the light depends in a great measure the distinctness of the vision: and as, to have this in the greatest perfection, we must adapt the quantity of light to the nature of the object and the focus of the magnifier, it is necessary to view it in various degrees of light. In some objects, it is difficult to distinguish between a prominence and a depression, a shadow or a black stain; or between a reflection of light and whiteness, which is particularly observable in the eye of the libella and other flies: all of these appearing very different in one position from what they do in another. The brightness of an object likewise depends on the quantity of light, the distinctness of vision, and on regulating the quantity to the object; for some will be in a manner lost in a quantity of light scarce sufficient to render another visible. There are various ways in which a strong light may be thrown upon objects; as by means of the sun and a convex lens. For this purpose, the microscope is, to be placed about three feet from a southern window; then take a deep convex lens, mounted on a semicircle and stand, so that its position may easily be varied: place this lens between the object and the window, so that it may collect a considerable number of solar rays, and refract them on the object or the mirror of the microscope. If the light thus collected from the sun be too powerful, it may be lessened by placing a piece of oiled paper, or a piece of glass lightly greyed, between the object and lens. Thus a proper degree of light may be obtained, and diffused equally all over the surface of an object: a circumstance which ought to be particularly attended to; for if the light be thrown irregularly upon it, no distinct view can be obtained.

MICROSCOPIC OBJECTS. Proper objects to be examined by microscopes, are, as Mr. Hooke very judiciously observes, "exceeding small bodies, exceeding small pores, or exceeding small motions." Exceedingly small bodies, must either be the parts of larger bodies, or things the whole whereof is exceedingly minute; such as small seeds, insects, sands, salts, &c. Exceedingly small pores are the interstices between the solid parts of bodies, as in stones, minerals, shells, &c. or the mouths of minute vessels, such as the air-vessels in vegetables, the pores in the skin, bones, &c. of animals. Exceedingly small motions, are the movements of the several parts or members of minute animals, or the motion of the fluids contained either in animal or vegetable bodies. Under one or other of these three heads almost every thing around us affords matter of examination, and may conduce both to our amusement and instruction. Most objects require some management, in order to bring them properly before the glasses. If they be flat and transparent, and such as will not be injured by pressure, the best method is to inclose them in sliders, between two Muscovy tales or isinglass, or between two slips of thin and ground glass. This way the feathers of butterflies, the scales of fishes, the farina of flowers, &c. the several parts, and even whole bodies of minute insects, and a thousand other things, may very conveniently be preserved. Every curious observer will therefore have them always ready to receive any accidental object, and secure it for future examination: and a dozen or two of these sliders, judiciously furnished, are a fine natural history, where we may read delightful

lessons of the high perfection of God's works, and his wisdom in their contrivance. In making a collection of objects, the sliders should not be filled promiscuously, but care taken to sort the objects according to their size and transparency: in such manner, that none be put together in the same slider; but what may properly be examined by the same magnifier: and then the slider should be marked with the number of the magnifier its objects are fittest for: that is, the most transparent, or minutest objects of all, which require the first magnifier to view them by, should be placed in a slider, or sliders marked with number 1. Those of the next degree in sliders marked with number 11, and so of the rest. This method will save abundance of time and trouble in shifting the magnifiers. Small living objects, such as lice, fleas, gnats, small bugs, minute spiders, mites, &c. may be placed between these tales, without killing or hurting them, if care be taken not to press down the brass-rings that keep in the tales: and will remain alive even weeks in this manner. But if they be larger than to be treated thus, either put them in a slider with concave glasses, as above described, or else examine them stuck on the pin, or held between the piers; either of which ways they may be viewed at pleasure. If fluids come under examination, to discover the animalcules that may be in them, take up a small drop with your pen or hair-pencil, and place it on a single isinglass, (which you should have in a slider ready) or else in one of the little concave glasses, and so apply it. But in case, upon viewing it, you find, as often happens, the animalcules swarming together, and so exceedingly numerous, that running continually over one another, their kind and real form cannot be known; some part of the drop must be taken off the glass, and then a little fair water put to the rest, will make them separate, and shew them distinct and well. And this mixture of water is particularly requisite in viewing the semen masculinum of all creatures: for the animalcules therein contained are so inconceivably minute, and yet crowded together in such infinite numbers, that unless it be diluted a great deal, they cannot be sufficiently separated to distinguish their true shape. But, if we view a fluid, to find what salts it may have in it, a method quite contrary to the foregoing must be employed: for, then, the fluid must be suffered to evaporate, that the salts being left behind upon the glass, may more easily be examined. Another, and indeed the most curious way of examining fluids, is, by applying them to the microscope, in exceedingly small capillary tubes made of the thinnest glass possible. This was Mr. Leeuwenhoek's method for discovering the shapes of salts floating in vinegar, wine, and several other liquors; and such tubes should be always ready to use as occasion requires. For the circulation of the blood, frogs, newts, or fishes, are commonly made use of; and there are glass-tubes in the single microscope, and a fish-pan as well as tubes in the double one, on purpose to confine these creatures, and bring the proper parts of them to view: which, in newts and fishes, are the tails, and in frogs the fine filmy membrane between the toes of the hinder legs. Though, if we can contrive to fasten down the creature, and bring our object to the magnifier, the circulation cannot possibly be seen so plainly any where, as in the mesentery, or thin transparent membrane that joins the guts together; and this part, by pulling out the gut a little, may easily be adjusted to the magnifier. To dissect minute insects, as fleas, lice, gnats, mites, &c. and view their internal structure, requires a great deal of patience and dexterity: yet even this may be done, in a very satisfactory manner, by means of a fine lancet and needle, if they are placed in a drop of water or spirit of wine: for their parts will then be separated with ease, and lie fair before the microscope, so that the stomach and other bowels may plainly be distinguished and examined. We should always have ready for this purpose little slips of glass about the bigness of a slider, to place objects on, occasionally; some of which slips should be made of green, blue, and other different coloured glass; many objects being much more distinguishable when placed on one colour than on another. We should likewise be provided with glass-tubes, of all sizes, from the finest capillaries that can be blown, to a bore of half an inch diameter. To prepare opaque objects, cut cards into small slips, about half an inch in length, and the tenth of an inch broad: wet them half their length with a strong but very transparent gum-water, and with that stick on your object. As the spots of cards are red and black, by making your slips of such spots you will obtain a contrast to

objects of almost any colour: and by fixing black things on the white, white on the black, blue or green on the red or white, and all other coloured objects on slips most contrary to themselves, they will be shewn to the best advantage. The bodies of many minute insects, when their life is destroyed, instantly shrivel up; and this is observable even in plants as well as insects, the surface of these small bodies being affected by the least change of air; which is particularly the case with the ant. If this creature, however, be dropped into rectified spirit of wine, it will instantly be killed; and when it is taken out, the spirit of wine evaporates, leaving the animal dry, and in its natural posture, or at least in such a state that it may easily be placed in whatever posture we please. The wings, in many insects, are so transparent, that they require no previous preparation: but some of those that are folded up under elytra or cases, require a considerable share of dexterity to unfold them; for these wings are naturally endowed with such a spring, that they immediately fold themselves again, unless care be taken to prevent them. The wing of the earwig, when expanded, is of a tolerable size, yet is folded up under a case not one-eighth part of its bulk; and the texture of this wing renders it difficult to be unfolded. This is done with the least trouble immediately after the insect is killed. Holding then the creature by the thorax, between the finger and thumb, with a blunt pointed pin endeavour gently to open it, by spreading it over the fore-finger, and at the same time gradually sliding the thumb over it. When the wing is sufficiently expanded, separate it from the insect by a sharp knife or a pair of scissors. The wing should be pressed for some time between the thumb and finger before it be removed; it should then be placed between two pieces of paper, and again pressed for at least an hour; after which time, as there will be no danger of its folding up any more, it may be put between the tales, and applied to the microscope. Similar care is requisite in displaying the wings of the notonecta and other water-insects, as well as most kinds of grylli. The minute scales or feathers, which cover the wings of moths or butterflies, afford very beautiful objects for the microscope. Those from one part of the wing frequently differ in shape from such as are taken from other parts; and, near the thorax, shoulder, and on the fringes of the wings, what we generally meet with, are instead of scales. The whole may be brushed off the wing, upon a piece of paper, by means of a camel's-hair pencil; after which the hairs can be separated with the assistance of a common magnifying-glass. It is likewise a matter of considerable difficulty to dissect properly the proboscis of insects, such as the gnat, tabanus, &c. and the experiment must be repeated a great number of times before the structure and situation of the parts can be thoroughly investigated, as the observer will frequently discover in one what he could not in another. The collector of the bee, which forms a very curious object, ought to be first carefully washed in spirit of turpentine; by which means it will be freed from the unctuous matter adhering to it: when dry, it is again to be washed with a camel's-hair pencil to disengage and bring forward the small hairs which form part of this microscopic beauty. The best method of managing the stings of insects, which are in danger of being broken by reason of their hardness, is to soak the case and the rest of the apparatus for some time in spirit of wine or turpentine; then lay them on a piece of paper, and with a blunt knife draw out the sting, holding the sheath with the nail of the finger or any blunt instrument; but great care is necessary to preserve the feelers, which when cleaned add much to the beauty of the object. The beard of the *lepas antifer* is to be soaked in clean soft water, frequently brushing it while wet with a camel's-hair pencil: after it is dried, the brushing must be repeated with a dry pencil to disengage and separate the hairs, which are apt to adhere together. To view to advantage the fat, brains, and other similar substances, Dr. Hooke advises to render the surface smooth, by pressing it between two plates of thin glass, by which means the matter will be rendered much thinner and more transparent: without this precaution, it appears confused, by reason of the parts lying too thick upon one another. For muscular fibres, take a piece of the flesh, thin and dry; moisten it with warm water, and after this is evaporated the vessels will appear more plain and distinct; and by repeated macerations they appear still more so. The exuviae of insects afford a pleasing object, and require but little preparation. If bent or curled up, they will become so relaxed by being kept a few hours in a moist atmosphere, that you may easily extend them to

their natural positions; or the stream of warm water will answer the purpose very well. The eyes of insects in general form very curious and beautiful objects. Those of the libellula and other flies, as well as of the lobster, &c. must first be cleaned from the blood, &c. after which they should be soaked in water for some days; one or two skins are then to be separated from the eye, which would be otherwise too opaque and confused; but some care is requisite in this operation; for if the skin be rendered too thin, it is impossible to form a proper idea of the organization of the part. In some substances, however, the organization is such, that by altering the texture of the part, we destroy the objects which we wish to observe. Of this sort are the nerves, tendons, and muscular fibres, many of which are viewed to most advantage when floating in some transparent fluid. Thus very few of the muscular fibres can be discovered when we attempt to view them in the open air, though great numbers may be seen if they be placed in water or oil. By viewing the thread of a ligament in this manner, we find it composed of a vast number of smooth round threads lying close together. Elastic objects should be pulled or stretched out while they are under the microscope, that the texture and nature of those parts, the figure of which is altered by being thus pulled out, may be more completely discovered. To examine bones by the microscope, they should be viewed as opaque objects; but afterwards by procuring thin slices of them, they may be viewed as transparent. The sections should be cut in all directions, and be well washed and cleaned: and in some cases maceration will be useful, or the bones may be heated red-hot in a clear fire, and then taken out; by which means the bony cells will appear more conspicuous. The pores of the skin may be examined by cutting off a thin slice of the upper skin with a razor, and then a second from the same place; applying the latter to the microscope. The lizard, guane, &c. have two skins, one very transparent, the other thicker and more opaque; and separating these two, you obtain very beautiful objects. To view the scales of fish to advantage, they ought to be soaked in water for a few days, and then carefully rubbed to clean them from the skin and dirt which may adhere to them. The scales of the eel are a great curiosity; and the more so, as this creature was not known to have any scales till they were discovered by the microscope. The method of discovering them is this: Take a piece of the skin of an eel from off its side, and spread it while moist on a piece of glass, that it may dry very smooth: when thus dried, the surface will appear all over dimpled or pitted by the scales, which lie under a sort of cuticle or thin skin; which may be raised with the sharp point of a pen-knife, together with the scales, which will then easily slip out; and thus we may procure as many as we please. The leaves of many trees, as well as of some plants, when dissected, form very agreeable objects. To dissect them, take a few of the most perfect leaves you can find, and place them in a pan with clean water. Let them remain there three weeks or a month, without changing the water; then take them up; and if they feel very soft, and almost rotten, they are sufficiently soaked. They must then be laid on a flat board, and holding them by the stalk, draw the edge of a knife over the upper side of the leaf, which will take off most of the skin. Then turn the leaf, and do the same with the under side; and when the skin is taken off on both sides, wash out the pulpy matter, and the fibres will be exhibited in a very beautiful manner. The leaf may be slit into two parts, by splitting the stalk; and the skins peeled from the fibres will also make a good object. This operation is best performed in the autumn: the fibres of the leaves are much stronger at that season, and less liable to be broken. The internal structure of shells may be observed by grinding them down on a hone: and all ores and minerals should be carefully washed and brushed with a small brush to remove any sordes that may adhere to them. To view the circulation of the blood, we must observe living animals of the most transparent kind. A small eel is sometimes used for this purpose; in which case it must be cleaned from the slime naturally adhering to it; after which it may be put into a tube filled with water, where it can be viewed in a satisfactory manner. The tail of any other fish may be viewed in the same manner, or put upon a slip of flat glass, and thus laid before the microscope. By filling the tube with water when an eel is made use of, we prevent in a great measure the sliminess of the animal from soiling the glass. The particles of the blood form a very curious object, and have been carefully viewed by different philosophers;

Iosophers; who nevertheless, differ from one another very much in their accounts of them. The best method of viewing these is to take a small drop of blood when warm, and spread it as thin as possible upon a flat piece of glass. By diluting it a little with warm water, some of the large globules will be separated from the smaller, and many of them subdivided; or a small drop of blood may be put into a capillary glass-tube, and then placed before the microscope. Mr. Baker advises warm milk as proper to be mixed with the blood; but Mr. Hewson, who is accounted the most accurate observer, diluted the blood with that fluid which undoubtedly is more natural to it, viz. its own serum: by this method he could preserve the small particles entire, and view them distinctly; and thus he found that they were not globular, as had been imagined by other anatomists, but flat. Having shaken a piece of the crassamentum of the blood in serum till the latter became a little coloured, he spread it with a soft hair-pencil on a piece of thin glass, which he placed under the microscope, in such a manner as not to be quite horizontal, but rather higher at one end than the other. Thus the serum flows from the higher to the lower part; and, as it flows, some of the particles will be found to swim on their flat sides, and will appear to have a dark spot in the middle; while others will turn over from one side to the other as they roll down the glass. Many cruel experiments have been tried, in order to observe the circulation of the blood in living creatures, and an apparatus has been invented for viewing the circulation in the mesentery of a frog; but as this can answer no useful purpose, and will never be put in practice by persons of humanity, we forbear to mention it. Besides the objects for the microscope already mentioned, there are innumerable others, some hardly visible, and others, totally invisible, to the naked eye; and which therefore, in a more peculiar sense, are denominated microscopic animals. These are the animalcules or moving bodies in water, in which certain substances have been infused; and of which there are innumerable different kinds. These animalcules are sometimes found in water which we would call pure, did not the microscopes discover its minute inhabitants; but not equally in all kinds of water, or even in all parts of the same kind of it. The surfaces of infusions are generally covered with a scum which is easily broken, but acquires thickness by standing. In this scum the greatest number of animalcules are usually found. Sometimes it is necessary to dilute the infusions; but this ought always to be done with water, not only distilled, but viewed through a microscope, lest it should also have animalcules in it, and thus prove a source of deception. It is, however, most proper to observe those minute objects after the water is a little evaporated; the attention being less diverted by a few objects than when they appear in great numbers. One or two of the animalcules may be separated from the rest by placing a small drop of water on the glass near that of the infusion; join them together by making a small connection between them with a pin; and as soon as you perceive that an animalcule has entered the clear drop, cut off the connection again. Eels in paste are obtained by boiling a little flour and water into the consistence of a book-binder's paste; then exposing it to the air in an open vessel, and beating it frequently together to keep the surface from growing mouldy or hard. In a few days it will be found peopled with myriads of little animals visible to the naked eye. They may be preserved for a whole year by keeping the paste moistened with water; and while this is done, the motion of the animals will keep the surface from growing mouldy. Mr. Baker directs a drop or two of vinegar to be put into the paste now and then. When they are applied to the microscope, the paste must be diluted in water for them to swim in. Numberless animalcules are observed by the microscope in infusions of pepper. To make an infusion for this purpose, bruise as much common black-pepper as will cover the bottom of an open jar, and lay it thereon about half an inch thick: pour as much soft water into the vessel as will rise about an inch above the pepper. Shake the whole well together; after which they must not be stirred, but be left exposed to the air for a few days; in which time a thin pellicle will be formed on the surface, in which innumerable animals are to be observed by the microscope. The microscopic animals are so different from those of the larger kinds, that scarcely any sort of analogy seems to exist between them; and one would almost be tempted to think, that they lived in consequence of laws directly opposite to those, which preserve ourselves

and other visible animals in existence. They have been systematically arranged by O. F. Muller; though it is by no means probable that all the different classes have yet been discovered. Such as have been observed, however, are by this author divided in the following manner:—1. Such as have no external organs. 1. Monas: Punctiforma. A mere point. 2. Proteus: Mutabilis. Mutable. 3. Volvox: Sphæricum. Spherical. 4. Eucheilus: Cylindracea. Cylindrical. 5. Vibrio: Elongatum. Long. Membranaceous. 6. Cyclidium: Ovale. Oval. 7. Paramecium: Oblongum. Oblong. 8. Kolpoda: Sinuatum. Sinuous. 9. Gonium: Angulatum. With angles. 10. Bursaria. Hollow like a purse. 11. Those that have external organs. Naked or not inclosed in a shell. 1. Cercaria: Caudatum. With a tail. 2. Trichoda: Crinitum. Hairy. 3. Kerona: Corniculatum. With horns. 4. Himantopus: Cirratum. Cirrated. 5. Leucopha: Ciliatum undique. Every part ciliated. 6. Vorticella: Ciliatum apice. The apex ciliated. Covered with a shell. 7. Brachionius: Ciliatum apice. The apex ciliated. These are all the different kinds of animalcules which have yet been discovered. To what is said of them in general under the article ANIMALCULE, we shall here add the following observations from Mr. Adams: "How many kinds of these invisibles there may be is yet unknown; as they are discerned of all sizes, from those which are barely invisible to the naked eye, to such as resist the force of the microscope as the fixed stars do that of the telescope, and with the greatest powers hitherto invented appear only as so many moving points. The smallest living creatures our instruments can shew, are those which inhabit the waters; for though animalcula equally minute may fly in the air, or creep upon the earth, it is scarcely possible to get a view of them; but as water is transparent, by confining the creatures within it we can easily observe them by applying a drop of it to the glasses. Animalcules in general are observed to move in all directions with equal ease and rapidity, sometimes obliquely, sometimes straight forward; sometimes moving in a circular direction, or rolling upon one another, running backwards and forwards through the whole extent of the drop, as if diverting themselves; at other times greedily attacking the little parcels of matter they meet with. Notwithstanding their extreme minuteness, they know how to avoid obstacles, or to prevent any interference with one another in their motions: sometimes they will suddenly change the direction in which they move, and take an opposite one; and by inclining the glass on which the drop of water is, as it can be made to move in any direction, so the animalcules appear to move as easily against the stream as with it. When the water begins to evaporate, they flock towards the place where the fluid is, and shew a great anxiety and uncommon agitation of the organs with which they draw in the water. These motions grow languid as the water fails, and at last cease altogether, without a possibility of renewal if they be left dry for a short time. They sustain a great degree of cold as well as insects, and will perish in much the same degree of heat that destroys insects. Some animalcules are produced in water at the freezing point, and some insects live in snow. By mixing the least drop of urine with the water in which they swim, they instantly fall into convulsions and die. The same rule seems to hold good in those minute creatures, which is observable in the larger animals, viz. that the larger kinds are less numerous than such as are smaller, while the smallest of all are found in such multitudes, that there seem to be myriads for one of the others. They increase in size like other animals, from their birth until they have attained their full growth; and when deprived of proper nourishment, they in like manner grow thin and perish." The modes of propagation among these animalcules are various, and the observation of them is extremely curious. Some multiply by a transverse division; and it is remarkable, that though in general they avoid one another, it is not uncommon, when one is nearly divided, to see another push itself in upon the small neck which joins the two bodies in order to accelerate the separation. Others, when about to multiply, fix themselves to the bottom of the water; then becoming first oblong, and afterwards round, turn rapidly as on a centre, but perpetually varying the direction of their rotatory motion. In a little, two lines forming a cross are perceived; after which the spherule divides into four, which grow, and are again divided as before. A third kind multiply by a longitudinal division, which in some begins in the fore part, in others in the hind part; and from others a small fragment detaches itself, which in a

short

short time assumes the shape of the parent animalcule. Lastly, others propagate in the same manner as the more perfect animals. Some doubts have arisen whether all those minute bodies really do enjoy animal life; or whether they are not in many cases to be accounted only inanimate and exceedingly minute points of matter actuated by the internal motion of the fluid. But to all hypotheses of this kind, Mr. Adams makes the following reply: "From what has been said it clearly appears, that their motions are not purely mechanical, but are produced by an internal spontaneous principle; and that they must therefore be placed among the class of living animals, for they possess the strongest marks and the most decided characters of animation; and consequently, that there is no foundation for the supposition of a chaotic and neutral kingdom, which can only have derived its origin from a very transient and superficial view of these animalcules." For a more full information concerning these and other microscopical objects, of which there is an almost infinite variety, the reader may consult "Essays on the Microscope," by Mr. Adams, who has made the most valuable collection that has yet appeared on the subject. We have given in the plates a view of several objects as magnified by the microscope. Fig. 1. Plate CXIV. is the white plumed moth distinguished from other species, by this that its wings are not membranous, but composed of fine, distinct, and most elegant feathers. Fig. 2, is the common flea magnified. Plate CXV. fig. 1, is a leaf of the sweet-brier, and fig. 2, a leaf of sage magnified: the little globules, which appear on these and other aromatic plants are supposed to give rise to their fragrance. Fig. 3, shews the stings of a nettle, and fig. 4, the antennae of a gnat as seen through the microscope. Fig. 5, exhibits those exceedingly small creatures which appear scarcely bigger than points, and which, when they are hatched from eggs, (altogether invisible even by the greatest magnifier) make that greenish scum, which often suddenly appears on the surface of stagnant water in vessels, &c. They are of a roundish figure, extremely agile, and always in motion. Fig. 6, 7, 8, present us with animalcules of the same form and kind, but of different sizes, larger; they all appear like animated jellies, but of no distinct parts externally; indeed in the larger sort fig. 8, you will observe a different appearance of the internal parts, which are always in motion, and shew themselves by different lights and shades; and it is somewhat droll and diverting to see the odd manner in which they move about in the water. Fig. 9 and 10, present the smaller sizes of animalcules of an oblong figure, and almost pointed at each end; they seldom ever change their form, but they can occasionally make themselves longer or shorter; they move with a direct and librating motion. Fig. 11, shews that very curious animalcule that is usually called the wheel-animal. It is a mere proteus, varying its form continually, as represented in the figure; most of them are in the common form; a few are represented with their horns put out with something like the appearance of a wheel on the top of each; these also have the appearance of a circular motion, and very swift; by this means they make little whirlpools in the water, which bring down small objects for their food; when they catch any they draw in their horns and wheels, and contract themselves into that roundish form which you see in one or two. Fig. 12, represents the anguicular, or small microscopic eels, in vinegar, paste, and some sorts of water. They may be shewn by the solar microscope in a darkened room, seven, eight, or ten, feet long, and two or three inches thick, and more than 100 in one view, and in all their natural motions and anguicular forms. Fig. 13, shews the animalcules found in the semen masculinum of most animals; their forms do not much vary in different animals, they resemble tadpoles, only that their tails have a greater proportion of length, and when greatly magnified several other differences may be seen. Fig. 14 shews those of the dog, and fig. 15, those of the rabbit. Fig. 16, represents small grains of fine sand magnified, appear which as transparent as clear crystals. Fig. 17, 18, 19, exhibit the crystals which appear when a drop of water impregnated with some kind of salt is suffered to evaporate, if common salt be used the crystals are cubical as in fig. 17, nitre gives needle-like crystals, as in fig. 18, and those of sugar are globules as in fig. 19. Plate CXVI. fig. 1, is a view of a very singular species of animalcules which Mr. Benj. Martin thus describes. AB is a single stem of duck-weed, and its leaves floating on the surface of water, such as is commonly seen in ponds, &c. As I was viewing several of these for polypusses, I met with an appear-

ance, on one part of the fibrous stem, of something which I thought in motion, about the bigness of a large pin's head, as represented at C; and while I was considering how I should examine it more thoroughly, to my great surprise, the jelly-like substance, in a moment, expanded itself all around in the form of an umbrella, in the manner as represented at D E F, which is but a part only of the whole to shew the manner of it; the numberless filaments by which they were connected with the stem at the node D, were so exceedingly fine, as to be but just perceived through the microscope; at the end of these were small roundish heads, about a tenth part as big as those represented in the print. When I viewed them with the largest magnifier, I thought I could perceive a motion in these small heads; and having singled one of them out, and placed it in a fair light, I perceived the form of it was nearly such as represented at G, fig. 2, and that, on the upper part of the head I saw a little part rise up, as shewn at H, which moved with incredible swiftness, backwards and forwards, perpetually, and the upper surface of the head seemed to be uneven, and of a hollow, spongy substance within. After viewing these animalcules, thus expanded, a very short time, they suddenly contracted, and in a moment were gathered into their first form. What appeared to me extraordinarily wonderful was, that those exceedingly fine filaments had all of them the appearance, and effect of a natural spring; for they would often appear coiled more or less in the manner as represented in the figure, and some of them in a zigzag form. They would thus expand, and contract themselves with the utmost velocity several times in a minute. Such wonderful mechanism, in the minutest of animals, filled me with equal amazement and pleasure: I often viewed them in the waters of Somersetshire, particularly at South Petherton. Fig. 3, exhibits a curious animalcule of which Mr. Baker speaks thus: "We sometimes find in our infusions of vegetable productions, and in other waters that have stood a while uncovered, an animal of a very singular and surprising form. This little creature is in its middle state; it lately was a worm, and will soon become a gnat. For gnats deposit their eggs in a kind of slimy matter on the surface of the water, and fasten them to something that may prevent their being washed away or separated too soon. From these eggs proceed a number of minute worms, which sinking to the bottom of the water, make for themselves cases or coverings of fine sand or earth cemented together with a sort of glue, but open at both ends, for them to come out of, or retire into, as they find occasion. After a time, quitting their habitations, and the figure of worms, they reascend to the top of the water in the shape now before us, shelled all over, with a large head and mouth, a couple of black eyes, two horns, several tufts of hairs or bristles on different parts of the body, and a tail with a brush of hair at the end of it, which being smeared over with an oily fluid, serves like a cork to keep them above water; their heads being sometimes lifted into the air, and sometimes plunged into the water, while the tail slides along the surface. And if the oil on the tail begins to dry, they shed from their mouth a new supply upon it, which restores its ability of steering where they please, without being wetted or prejudiced by the water. After living in this manner the time appointed by Providence, a stranger change succeeds: for resigning their eyes, horns, and tail, and casting off their whole skin, there issues forth a race of insects of a quite different element: the most beautiful and delicate plumage adorns their heads; their limbs are constituted with the finest texture; they have wings curiously fringed and ornamented; their whole bodies are invested with scales and hair, and they are actuated by a surprising agility: in short, they become gnats, and spring into the air. And, what is most amazing, a creature that but a minute since was an inhabitant of the water, would now be drowned if it were plunged therein. I have been the more particular in my account of this metamorphosis, as I apprehend many sorts of the animalcules in fluids undergo changes in somewhat a like manner. I shall only add here, that the little creature, whose picture I have given, is a delightful object for the microscope, its white heart beating distinctly, and the motion of all its intestines being perfectly visible and extraordinary." We may find in the waters of our ditches several species both of testaceous and crustaceous animalcules: two of the latter sort, which are most remarkable, are shewn, fig. 4, in a swimming posture, with their backs towards the eye. Their legs are somewhat like shrimps or lobsters, but of a much more curious structure. They are

are less than a very small flea, but are all breeders, and carry their spawn either under their tail, or in two seeming bags hanging from their sides, as in fig. 5. They appear to have but one eye, and are to be found so transparent, that the motion of their bowels is seen distinctly by the microscope, together with a regular pulsation in a little part, which therefore we may suppose to be the heart. Fig. 9, is an extraordinary kind of animalcule which appears in a sheath, or case, *a, b, c*, the end whereof it fastens to the duck-weed roots. This little creature has two seeming wheels with a great many teeth or notches, coming from its head, and turning round as it were upon an axis, *d, e*. At the least touch it draws the wheel-work into its body, and its body into the sheath, after which it appears as in fig. 10. But when all is quiet, it thrusts itself out again, and the rotation of the wheel-work is renewed. The true form of the wheel-work is shewn at fig. 11. The eggs of the Ox-fly, or Gad-bee, are deposited in the waters, and produce an extraordinary kind of little worm or maggot, the extremity of whose tail is incircled with moveable hairs, which, being expanded on the surface of the water, enable it to float along, as in fig. 12. When it would descend towards the bottom, these hairs are made to approach each other in an oval form, and inclose a little bubble of air; by means whereof it is able to rise again: and if this bubble escapes, as sometimes it will, the insect immediately squeezes out of its own body another like bubble to supply the place thereof. The maggot, as descending, is shewn, fig. 13. Human blood, and the blood of land-animals, is found by the microscope to consist of round red globules floating in a transparent water or serum. Each red globule is made up of six smaller and more transparent ones; and Mr. Leeuwenhoek has discovered, that each of these again is composed of six globules still more minute and colourless; so that every common red globule is compounded of at least thirty-six smaller ones; and perhaps the division may still go on much farther. The specific gravity of these globules is somewhat more than of the serum wherein they float, as is shewn by their subsiding in blood extracted from the veins and at rest. They have also a considerable attraction to each other, and when brought in contact, cohere so strongly (unless soon separated again by motion) as to form a substance resembling soft flesh. Fig. 6, shews one such large globule, wherein five of the smaller sort that compose it appear in contact, the sixth lying behind. Fig. 7, shews, how by their mutual attraction to, or pressure against, each other, they readily unite to form a perfectly round body. It is easy to conceive, that these six globules, and even the more minute ones still whereof they are compounded, may occasionally be separated, in order to pass through such extremely minute vessels as without separation they cannot possibly enter; and may re-unite when they meet again in vessels where they have more room. And we are very certain, that sometimes they cohere in greater numbers, and form larger masses than are consistent with a free and healthy circulation. The transparent membrane between a frog's hind-foot-toes is the object most commonly employed for viewing the current and circulation of the blood; and, in this, if well expanded, it may be seen fairly and distinctly, both in the veins and arteries, in the manner represented fig. 8. *A A* two toes of a frog's hinder foot. *B* the thin membrane between the toes, extended. *C C C* the trunks of the arteries. *DD* trunk of a vein. *EEE* arteries and veins in the fine membrane, with the blood-globules circulating through them. The tails or fins of small fishes may likewise be used very commodiously to this purpose, and present to view great numbers of veins and arteries with the blood passing different ways through them. The sections of the roots and branches of different kinds of woods and vegetables are very curious when viewed with the microscope, and afford matter of observation worthy of the rational mind of man, Plate CXVII. fig. 1, shews a root of wormwood, and fig. 2, a horse-radish-root, in each of which, *T* represents the root cut transversely as it appears to the naked eye. The other figures are parts of the section *T*, magnified, which thus enlarged, shew the various organical parts of which they are composed, and by which vegetation is performed. *Ab* is the skin or rind. From *A* to *C* in the wormwood-root is the bark, which is a membranous substance, consisting partly of a great number of little bladders or vesicles *BBB*; the same is represented by *AB* in the horse-radish-root. It also consists in part of a ligneous or woody substance, as from *B* to *L*. The wood of the root is all that part between *B* and *E* in the horse-radish-root; and from *CC*, to the very centre in the wormwood-

root. The wood of the root consists also of two different substances, viz. a ligneous one, properly the wood as *EEE*, and pulpy one, like that of the bark, as *DDD*, inserted regularly between the portions of wood; these are very distinct in the wormwood-root, but in the radish-root, and in several others, they are not so visible. In the wood appear the orifices of several tubes, or hollow veins *aaaa*, which are the mouths of air-vessels. From *G* to *E*, in the radish-root, is another little circle of vessels, like those of the bark. Lastly, from *E* to the centre, in the radish-root, is the pith, which consists of the same spongy substance of bladders, as does the bark, and part of the wood. From this we may perceive how admirably the roots are calculated to take in the juices and proper nutritive substances from the soil for their growth, and the great difference in the minute parts of plants points out the varied differences of their natures. The same variety is observable in the organization of the stem and branches. Thus, in fig. 3, *T* represents part of a section of a hazel-branch as it appears to the eye; *AGB* is the same magnified; wherein *AB* is the skin; *ABCD* the bark; *QQQ* a pulpy substance composed of bladders, or sap-vessels; *HH* a ring of a special sort of vessels; *PP* common sap-vessels; *CDEF* the ligneous substance, or wood, of three years growth; *KLFE* the wood of two years; *MNEF* the wood of the first year; *XX* the spongy insertions; *O* the pith full of vesicles; the black parcels are the solid wood; those numerous holes appearing all over the same, are the mouths of air-vessels: thus it appears the organical constitution of the stalk or trunk, is the same with that of the root. The scales of fishes also afford curious objects for the microscope, and matter of investigation to the naturalist. Fig. 4, shews part of the skin of a sole-fish with the scales on it; fig. 5, is the appearance of a single scale.

MICROTEA, in botany, a genus of the pentandria digynia class and order; natural order, Oleraceæ. Calyx five-leaved, spreading; corolla none; drupe dry, echinate. There is only one species, viz. *M. debilis*, a native of the West Indies.

MICROUSTICS, [*μικρος*, small, and *ακουω*, to hear,] instruments for magnifying small sounds.

MIDAS, in fabulous history, the son of Gordius by the goddess Cybele, a famous king of Phrygia, who having received Bacchus with great magnificence, that god offered to grant him whatever he should ask. Midas desired that every thing he touched should be changed into gold. Bacchus consented; and Midas, with extreme pleasure, every where found the effects of his touch. But he had soon reason to repent of his folly; for wanting to eat and drink, the aliments no sooner entered his mouth than they were changed into gold; a striking emblem of the folly of misers who can hardly allow themselves the necessities of life. This obliged him to have recourse to Bacchus again, to beseech him to restore him to his former state; on which the god ordered him to bathe in the river Pactolus, which from thence forward had golden sands.

MIDAS, the EAR-SHELL, the smooth ovato-oblong buccinum, with an oblong and very narrow mouth. It consists of six volutions, but the lower one alone makes up almost the whole shell.

MIDDLEBURG, or **MIDDELBURG**, a large commercial city of Holland, capital of the department of the Mouths of the Scheldt and of the island of Walcheren, as it formerly was of the department of the Meuse, and of the province of Zeeland. It lies 20 miles N. E. of Bruges, 30 N. W. of Ghent, and 72 S. W. of Amsterdam. Lon. 3. 39. E. Lat. 51. 32. N.

MIDDLEBURG, one of the Friendly Islands in the South Sea, called by the natives *Eaooa*, or *Ea-Oo-whe*. It is about sixteen miles long from N. to S. and in the widest part about eight miles from E. to W. The skirts are chiefly laid out in plantations, the S. W. and N. W. sides especially. The interior parts are but little cultivated, but add greatly to the beauty of the island; as they abound with groves of cocoa-nut and other trees, lawns covered with thick grass, interspersed with plantations and paths leading to every part of the island, in such beautiful irregularity, as greatly to enliven the prospect. The hills are low; the air is delightful; but water is rather deficient. Yams, with other roots, bananas, and bread-fruit, are the principal articles of food. The men go almost naked, having only a small piece of cloth round the loins, but some wrap it in great abundance round them from their waist: this cloth is manufactured much like that at Otahete, but overspread with a strong glue, which makes it stiff, and fit to

resist the wet. The women are likewise covered from the waist downwards: they often have loose necklaces, consisting of several strings of small shells, seeds, teeth of fishes, and in the middle of all, the round operculum, or cover of a shell as large as a crown-piece.

MIDDLESEX, a county of England, which derives its name from its situation amidst the three kingdoms of the East, West, and South Saxons. It is bounded on the N. by Hertfordshire; on the S. by the river Thames, which divides it from Surrey; on the W. by the Colne, which separates it from Buckinghamshire; and on the E. by the Lea, which divides it from Essex. It is about 24 miles long, from E. to W. 18 broad, and not above 115 in circumference; but as it comprehends the two vast cities of London and Westminster, it is the wealthiest and most populous county in England. It is divided into 602 liberties, containing 200 parishes, besides a vast number of chapels of ease, five market-towns, and two cities. The air is very pleasant and healthy, to which a fine gravelly soil contributes greatly. It produces plenty of corn, and the county abounds with fertile meadows and gardens. The greater part of the county is so prodigiously assisted by the rich compost from London, that the whole of the cultivated part is like a garden. The natural productions are cattle, corn, and fruit; and there is hardly a single manufacture practised in Great Britain but what is also established in this county.

MIDDLESEX, a county of Connecticut, bounded on the N. by Hartford, E. by New London, and W. by New Haven counties; and S. by Long Island Sound. Middletown is the capital.

MIDDLESEX, a county of Massachusetts. Charlestown and Concord are the chief cities.

MIDDLESEX, a fertile county of New Jersey. New Brunswick is the capital.

MIDDLESEX, a county of Virginia. Urbanna is the chief town.

MIDDLETON, **DR. CONYERS**, a very celebrated English divine, the son of a clergyman in Yorkshire, was born at Richmond in 1683. He distinguished himself, while fellow of Trinity College, Cambridge, by his controversy with Dr. Bentley his master, relating to some mercenary conduct of the latter in that station. He afterwards had a controversy with the whole body of physicians, on the dignity of the medical profession; concerning which he published, *De Medicorum apud veteres Romanos degentium Conditione Dissertatio*; qua, contra Viros celeberrimos Jacobum Sponium et Richardum Meadium, servilem atque ignobilem esse, ostenditur. Hitherto he had stood well with his clerical brethren; but he drew their resentment on him in 1729, by writing "A letter from Rome, shewing an exact Conformity between Popery and Paganism," &c. which appeared dangerous to the cause of miracles in general. In 1741, came out his great work, *The History of the Life of M. Tullius Cicero*, 2 vols. 4to; which is indeed a fine performance. In 1748, he published, "A Free Inquiry into the Miraculous Powers which are supposed to have subsisted in the Christian Church from the earliest ages, through several successive centuries." He was now attacked from all quarters; but before he took any notice of his antagonists, he supplied them with another subject in "An Examination of the Lord Bishop of London's Discourses concerning the Use and Extent of Prophecy," &c. He was in 1723 chosen principal librarian of the public library at Cambridge; and if he rose not to dignities in the church, he was in easy circumstances, which enabled him to assert a dignity of mind often forgotten in the career of preferment. He died in 1750, at Hildersham in Cambridgeshire, an estate of his own purchasing; and in 1750, all his works, except the *Life of Cicero*, were collected in 4 vols. 4to.

MIDDLETON, a commercial city of Connecticut, fourteen miles S. of Hartford. Lon. 77. 12. W. Lat. 41. 35. N.

MIDDLEWICH, or **MIDDLEWICK**, a town of Cheshire, 24 miles E. of Chester. Lon. 2. 30. W. Lat. 53. 13. N.

MID-HEAVEN is the point of the ecliptic that culminates, or in which it cuts the meridian.

MIDHURST, a town of Sussex, 11 miles N. by E. of Chester, and 50 W. by S. of London. Lon. 0. 46. W. Lat. 51. 0. N.

MIDIAN, or **MADIAN**, in ancient geography, a town on the S. side of Arabia Petrea; so called from a son of Abraham by Keturah.

MID-LOTHIAN. See **LOTHIAN**, and **EDINBURGH**.

MID-MARR, a district of Scotland, in Aberdeenshire.

MIDRIFF, or **DIAPHRAGM**. See **ANATOMY**.

MIDSHIP-FRAME, a name given to that timber, or combination of pieces formed into one timber, which determines the extreme breadth of the ship, as well as the figure and dimension of all the inferior timbers. See **SHIP-BUILDING**.

MIDSHIPMAN, is a sort of naval cadet, appointed by the captain of a ship of war. The number of midshipmen is always in proportion to the size of the ship. Thus, a first-rate man of war has twenty-four, and the inferior rates a suitable number in proportion. No person can be appointed lieutenant without having previously served two years in the royal navy in that capacity, or that of mate, besides having been at least four years in actual service at sea, either in merchant-ships or in the royal navy.

MIDWIFERY, the art of assisting women in the birth of children. It comprehends also the management of women both before and after delivery, as well as the treatment of the child in its most early state. This art was practised among the ancients by women only; nor do we hear of men being employed on this occasion, except in very particular cases, till about the middle of the seventeenth century; indeed some women, through modesty, have chose to sacrifice life rather than to have recourse to a male practitioner of surgery. But the case is now quite altered in the civilized part of the world, and now men generally have the preference. The state of child-bearing cannot be reckoned a disease, since it occurs in the course of nature; hence it is probable that most of the dangers and diseases attendant on this state arise from mismanagement, intemperance, or some improper conduct tending to obstruct the regular proceedings of nature. It deserves here to be remarked, that every degree of anxiety, or impatient conduct, in midwives or nurses, is highly reprehensible on such occasions; for Nature rarely fails to perform her kind offices to the mother as well as to the infant. Hence it will be found by experience, that those accoucheurs are uniformly the most successful in the exercise of their profession, who possess a due share of knowledge of the human constitution, together with a philosophical coolness to resist the solicitous applications made by timorous, and often mischievous, relations. Were women equally as well informed as men in what relates to this art, and possessed of equal skill in the practice, they would certainly on all occasions deserve the preference, and ought universally to be employed. But we are well assured, whatever may be the cause, that women in general are very deficient in the requisite qualifications; and, therefore, we cannot omit this opportunity of expressing our conviction of the benefits which society has already derived from professional accoucheurs; and, if the lower classes are still inclined to employ their favourite midwives, we trust the day is not far distant, when such persons will be subjected to a rigorous examination of their talents and qualifications to undertake an office equally important and fraught with responsibility. We express these sentiments, neither with a view to decry the propriety of employing women (who, as we have already observed, if possessed of equal skill and information, certainly deserve the preference) in this primary department of the healing art; nor is it our intention indiscriminately to introduce into families an inexperienced young accoucheur, instead of a grave and expert old matron. The former would be an encroachment on female privilege; while the latter might prove a rash and dangerous measure.

MIEGIA, in botany, a genus of the triandria monogynia class and order. Calyx one-flowered; corolla two-valved; nectary one-valved, involving the germ; seed triquetrous, rounded, included within the calyx, corolla, and nectary. There is but one species, *M. maritima*, a native of Cayenne and Goiana.

MIEZAVA, or **MIECHAU**, a town of Poland, in Cujavia, on the Vistula, ten miles from Thorn. Lon. 18. 46. E. Lat. 52. 58. N.

MIFFLIN, a county of Pennsylvania, containing 1851 square miles, and divided into eight townships. The mountains abound with iron-ore, which is manufactured. Lewistown is the capital.

MIFFLIN, a town in the above county, on the E. side of the Juniatta, twelve miles E. of Lewistown.

MIGRATION, [*migratio*, *migro*, Lat.] the act of changing residence; removal from one habitation to another.

MIGRATION OF BIRDS. It is generally believed, that many different kinds of birds annually pass from one country to another, and

and spend the summer or winter where it is most agreeable to them; and that even the birds of our own island seek the most distant southern regions of Africa, when directed by a peculiar instinct to leave their own country. It has long been an opinion generally received, that swallows reside during winter in the warm southern regions; and Mr. Adanson mentions his having seen them at Senegal. Mr. Pennant enumerates many other birds which migrate from Britain at different times of the year, and are then to be found in other countries; after which they again leave these countries, and return to Britain. The reason of these migrations he supposes to be a defect of food at certain seasons of the year, or the want of a secure asylum from the persecution of man during the time of courtship, incubation, and nutrition. The following is his list of the migrating species: 1. Crows. Of this genus, the hooded crow migrates from England, regularly with the woodcock, though it inhabits Scotland the whole year. 2. The Cuckoo disappears early in autumn. 3. The Wrenneck leaves us before winter, and re-visits us in spring a little earlier than the cuckoo. 4. The Hoopoe comes to England only by accident. 5. Grouse. Of this tribe, the quail alone leaves us. 6. Pigeons. Some few of the ring-doves breed here; but the greatest part quit the country in spring. The wild pigeons make the northern retreat, and visit us in winter. The turtle also leaves us in winter. 7. Stares breed here, but as their produce seems unequal to the clouds of them that appear in winter, it is supposed that many migrate into Sweden, where Mr. Berger says they return in spring. 8. Thrushes. The fieldfare and the redwing breed in Norway and other cold countries; their food is berries, which, abounding in our kingdoms, tempt them here in winter. These, and the Royston crow, are the only land-birds that constantly migrate into England, and do not breed here. 9. Chatterers appear annually about Edinburgh in flocks during winter. In South Britain they are accidental visitants. 10. The cross-beak and cross-bill come here but seldom; they breed in Austria. 11. Bantings. All the genus inhabit England throughout the year; except the greater brambling, which is forced from the north in very severe seasons. 12. Finches all continue in some parts of these kingdoms, except the finch, which is an irregular visitant from Russia. 13. Larks, fly-catchers, wagtails, and warblers, all feed on insects and worms; yet only part of them quit these kingdoms. The nightingale, black-cap, fly-catcher, willow-wren, wheat-ear, and white-throat, leave us before winter, while the small and delicate golden-crested wren braves our severest frosts. They continue longest in the southern counties, the winter in those parts being later than in those of the north. Mr. Stillingfleet observed several wheat-ears in the isle of Purbeck on the 18th Nov. 14. Swallows and goat-suckers. Every species disappears at the approach of winter. Of the vast variety of water-fowls that frequent Great Britain, it is amazing how few breed here: the cause that urges them to leave this country, seems to be not merely the want of food, but of a secure retreat. Our country is too populous for birds so shy and timid as most of these are. When great part of our island was a tract of woods and fens, doubtless many species of birds (which now migrate) remained in security throughout the year. Egrets, a species of heron now scarcely known in this island, were formerly in prodigious plenty; and the crane, that has totally forsaken this country, bred familiarly in our marshes: their place of incubation being on the ground, and exposed to every one. As rural economy increased, these animals were more and more disturbed; till at length they were necessitated to seek, during summer, some lonely safe habitation. 15. Herons. The white heron visits us at uncertain seasons; the common kind, and the bittern never leave us. 16. Curlews breed sometimes on our mountains; but, the greater part migrate to other countries; the whimbrel breeds on the Grampians. 17. Snipes. Some snipes breed here, but the greatest part migrate elsewhere: as do every other species of this genus. 18. Sandpipers. The lapwing continues here the whole year; the ruff breeds here, but retires in winter; the redshank and sandpiper breed and reside here. All the others migrate during summer. 19. Plovers, &c. The long-legged plover and sanderling visit us only in winter; the dotterel appears in spring and in autumn; yet, it does not breed in South Britain. The oyster-catcher lives with us the whole year. The Norfolk plover and sea-lark breed in England. The green plover breeds on the mountains of the north of England, and on the

Grampians. Every species of curlews, woodcocks, sandpipers, and plovers, that forsake us in spring, retire to Sweden, Poland, Prussia, Norway, and Lapland, to breed: as soon as the young can fly, they return to us again, as the frosts, which set in early in those countries, harden the ground, and prevent them from penetrating it with their bills, in search of worms, which are their natural food. Mr. Ekmark gives similar accounts of the cloven-footed water-fowls of Sweden; and Mr. Klein gives the same of those of Poland and Prussia. 20. Rails and gallinules. Every species of these continue with us the whole year, the land-rail excepted; which is not seen in Britain or Ireland in winter. Great numbers appear in Anglesea in the end of May. As these birds light on ships in the Channel and Bay of Biscay, their winter quarters are supposed to be in Spain. 21. Phalaropes visit us but seldom; they breed in Lapland, and other arctic regions. 22. Grebes. The great-crested grebe, the black and white-grebe, and little grebe, breed with us, and never migrate; the others visit us occasionally, and breed in Lapland. 23. Avosets breed near Fossdike in Lincolnshire; but migrate in winter. 24. Auks and guillemots. The great auk or penguin sometimes breeds in St. Kilda. The auk, the guillemot, and puffin, inhabit most of the maritime cliffs of Britain, in amazing numbers, during summer. The black guillemot breeds in the Bass, St. Kilda, and Llandidno rocks. The lesser guillemot and black-billed auk, during winter, visit in vast flocks the Frith of Forth. 25. Divers chiefly breed in the lakes of Sweden and Lapland, and countries near the pole; but some of the red-throated divers, breed in the north of Scotland and its isles. 26. Terns. All the species breed here; but leave us in winter. 27. Petrels. The fulmar breeds in St. Kilda, and continues there the whole year except Sept. and part of Oct. the shearwater visits the Isle of Man in April and breeds there, but leaves it in August or September, and flies over the Atlantic. The stormfinch is seen at all distances from land on the same vast watery tract; Mr. Pennant found it on some little rocky isles, off the N. of Skie. It also breeds in St. Kilda. 28. Mergansers. This whole genus fill the Lapland lakes during summer. Mr. Pennant has seen the young of the redbreasted in the N. of Scotland. 29. Ducks. Of the numerous species, that form this genus, few breed in England; except swans, geese, shield-ducks, eider-ducks, a few shovellers, garganies, teal, and wild ducks. The rest contribute to form that amazing multitude of water-fowls that annually repair from most parts of Europe to the woods and lakes of Lapland and other arctic regions. They quit their retreat in September, and disperse themselves over Europe. With us they appear in October; circulate first round our shores; and, when compelled by severe frost, betake themselves to our lakes and rivers. Some divers, wild swans, swallow-tailed shield-ducks, and different sorts of goosanders, then visit our coasts. These birds make Iceland a resting place, in spring, and after a short stay retire still further north. 30. Corvorants and shags breed on most of our high rocks; gannets in some of our isles, and on the coast of Kerry. Gannets spread all round the seas of Britain, in pursuit of the herring and pilchard, and even as far as the Tagus. Of these numerous species of fowls there seems to be scarcely any but may be traced to Lapland, a country of lakes, rivers, swamps, and alps, covered with thick and gloomy forests, that afford shelter in summer to those fowls, which in winter disperse over the greatest part of Europe. In those arctic regions, by the thickness of the woods, the ground remains moist and penetrable to the woodcocks, and other slender-billed fowls; and for the web-footed birds, the waters afford larva innumerable. The days there are long; and the beautiful meteorous nights afford them every opportunity of collecting so minute a food; where they are little disturbed by mankind.

MIGRATION OF FISHES. See CLUPEA.

MIGUEL, St. or St. MICHAEL, one of the principal and most fertile of the Azores. This island was almost destroyed in 1638, by an earthquake, which continued 8 days from the 26th of June. It lies in Lon. 22. 45. W. Lat. 38. 10. N.

MIGUEL, St. a town of Mexico, in Guatimala, 180 miles from Guatimala. Lon. 87. 45. W. Lat. 12. 25. N.

MIGUEL, St. a town of Peru, in Quito. Lon. 80. 50. W. Lat. 5. 0. S.

MIHIEL, St. a town of France, in the department of the Meuse, seated on the Meuse. Lon. 5. 20. E. Lat. 48. 53. N.

MIKALIDI,

MIKALIDI, a town of Turkey, in Natolia.

MILAN, a country and late duchy of Italy, now forming the department of Olona. It was bounded by the late duchy of Savoy, the principality of Piedmont, and duchy of Montferrat, on the W. by Switzerland on the N. by the late Venetian territories, the duchies of Mantua, Parma, and Placentia, on the E. and by the Appennines, and the Genoese territories on the S.—extending about 100 miles from N. to S. and 108 from E. to W. It is esteemed one of the finest provinces in Italy; being watered by the Tessino, Sesia, Adda, Po, Oglio, Lambro, Serio, and other rivers; as well as by several canals and lakes; particularly lakes Como, Garda, Lugano, and Maggiore. See these articles. The soil is extremely fertile; producing all kinds of grain, fruits, and vegetables. Anciently this duchy, containing the N. part of the old Liguria, was called Insubria, from its inhabitants the Insubres, who were conquered by the Romans.

MILAN, a city of Italy, capital of the department of Olona, 70 miles N. of Genoa, 72 N. E. of Turin, 145 N. W. of Florence, and 270 N. W. of Rome. Lon. 9. 16. E. Lat. 45. 28. N.

MILANESE, the citizens of Milan.

MILBORN PORT, a town of Somersetshire, 38 miles W. by S. of Salisbury. Lon. 2. 38. W. Lat. 50. 53. N.

MILDENHALL, a town of Suffolk, 13 miles N. by E. of Newmarket, and 70 N. N. E. of London.

MILDEW, or ERYSIPIHLE, a disease of plants, consisting of a thick, clammy, sweetish, juice, that is supposed to exhale from, or descend on, the leaves and blossoms of vegetables. The mildew occurs most frequently on wheat, hops, the dead-nettle, maple, and the gromwell. It sometimes rests on vegetables in the form of a fatty juice; which, being naturally tough and viscous, acquires these properties in a still greater degree in consequence of its finer and more fluid parts being exhaled by the sun; so that the plants affected by it, cannot perform the important office of perspiration, and thus never attain to maturity. According to Dr. Darwin, the mildew is a plant of the fungus kind, which vegetates without light, or change, or air, in the same manner as the generality of mushrooms; and penetrates with its roots the vessels to which it adheres. He suspects, however, the plants affected, to have been previously injured by internal disease; and directs them to be thinned; or to remove those which are contiguous to the diseased, in order to admit more light, and greater ventilation: thus the mildew may be remedied, and the plant at the same time restored to its former vigour. Common wheat is more subject to this destructive disease than that which is bearded, especially if the land be newly dunged. As, however, it is highly probable, that the greater dampness of some soils, together with their being over-shadowed by too thick foliage, affords one permanent cause of mildew, Dr. Darwin recommends the land to be properly drained; the ashes of coals, bones, or other drier manures, to be employed; and likewise to thin the crops. And, as this malor particularly affects late crops, he is farther of opinion, that the seed should be sown early in the season; by which means the mildew will not only be prevented, but a forward crop will be obtained. Where this disease has already infested the plants, a brisk shower of rain, succeeded by a smart wind, is believed to be the most efficacious remedy, to prevent its farther progress. If the mildew be observed before the sun rises to its meridian-power, it will be advisable to send two men into the field, furnished with a long cord, of which each should hold one end: by dexterously drawing this rope over the ears of corn, the dew will be removed, before the heat of the sun dries and reduces it to that viscous state, in which it obstructs the perspiration of plants. Lastly, it has been confidently asserted, that lands, which have been affected with the mildew for several successive years, have been effectually cured by sowing soot, either together with, or immediately after, corn; and that hop-plantations may be secured from its injurious effects, by manuring them with hog's-dung.

MILE, [*mille passus*,] a measure of length or distance, containing eight furlongs. The English statute-mile is 80 chains. Three miles make one league, but it varies in different countries. TABLE of the miles in use among the principal nations of Europe, in geometrical paces, 60,000 of which make a degree of the equator.

Geom. Paces. Yards.

Mile of Russia..... 750 or 1100
— Italy..... 1000 or 1467

Geom. Paces. Yards.

Mile of England..... 1250 or 1760
— Scotland and Ireland ... 1500 or 2200
The small league..... 2000 or 2933
The mean league..... 2500 or 3666
The great league of France ... 3000 or 4400
Mile of Poland..... 3000 or 4400
— Spain..... 3248 or 5028
— Germany..... 4000 or 5866
— Sweden..... 5000 or 7233
— Denmark..... 5000 or 7233
— Hungary..... 6000 or 8800

MILETUS, in ancient geography, a celebrated town of Asia Minor, on the confines of Ionia and Caria. It was the capital of all Ionia, and famous both for the arts of war and peace. It was situated about ten stadia S. of the mouth of the Mæander, near the sea-coast.

MILFOIL, or YARROW. See ACHILLEA.

MILFORD, a town of S. Wales, in Pembrokeshire, on the N. coast of Milford Haven, six miles W. N. W. of Pembroke, and six S. S. W. of Haverford West.

MILFORD HAVEN, one of the finest harbours in Europe, and indisputably the best in Britain, is situated in Pembrokeshire in S. Wales, and lies on the N. side of the Bristol Channel. It is very large, safe, and deep; there is no danger of going in or out with the tide, or almost with any wind. If a ship come in without a cable or anchor, she may run ashore on the ooze, and there lie safe till she is refitted; and in an hour she may get out of the harbour into the open sea. It is very convenient for ships bound from the English or Bristol Channels to Ireland, or farther W. and 1000 sail of any size may ride secure in it. It has sixteen deep and safe creeks, five bays, and thirteen roads. The spring-tide rises thirty-six feet; so that ships may at any time be laid ashore. Dale harbour is a ready outlet for small vessels, where they may ride in two or three fathoms at low-water.

MILFORD HAVEN, a deep bay on the coast of Nova Scotia, S. W. of Canso.

MILHAU, or MILHAUD, a town of France, in the department of Aveyron, on the Tarn, 27 miles S. E. of Rhodéz, and 50 N. W. of Montpellier. Lon. 3. 11. E. Lat. 44. 3. N.

MILIANE, an ancient town and castle of Algiers, in Tremesen. Lon. 2. 35. E. Lat. 35. 15. N.

MILIARY FEVER, or MILIARIA, a disease which affects both sexes, at every age, but particularly reclude and sedentary women. It is accompanied with continued fever, anxiety, a sensation of punctures in the skin, and profuse unctuous sweats. The causes are excessive watching; the indulgence of the more violent passions; suppression of the natural discharges, as also too great evacuations; eating of unripe fruit, and similar pernicious trash; a weak watery diet, and impure or putrid water. It is, in general, a primary disease, though it is sometimes consequent on quartan and puerperal fevers. See MEDICINE.

MILITARY, [*militaris*, Lat.] something belonging to the soldiery or militia.

MILITARY ARCHITECTURE, the same with fortification. See FORTIFICATION.

MILITARY ART, the science or art of making or sustaining war to advantage.

MILITARY DISCIPLINE, the training of soldiers, and the due enforcement of the regulations instituted by authority for their conduct. Next to the forming of troops, military discipline is the first object that presents itself to our notice: it is the soul of all armies; and unless it be established amongst them with great prudence, and supported with unshaken resolution, they are no better than so many contemptible heaps of rabble, who are more dangerous to the very state that maintains them than even its declared enemies.

MILITARY EXECUTION, the ravaging or destroying of a country or town that refuses to pay the contribution demanded of them.

MILITARY TENURES. See FEODAL SYSTEM, KNIGHTHOOD, and TENURE.

MILITARY WAYS, [*via militares*,] are the large Roman roads which Agrippa procured to be made through the empire, in the time of Augustus, for the more convenient marching of troops, and conveyance of carriages. N. Bergier has written the history of

of these military roads, which were paved from the gates of Rome to the extreme parts of the empire.

MILITIA, in general, denotes the body of soldiers, or those who make profession of arms. In a more restrained sense, militia denotes those citizens who arm themselves upon a short warning, for their own defence: so that, in this sense, militia is opposed to regular or stated troops.

MILIUM, MILLET; in botany, a genus of the digynia order, and triandria class of plants; natural order, Gramina. Calyx bivalved, uniflorous; corolla very short; stigmata pencil-like. There are twelve species; of which the most remarkable is the

MILIUM PANICUM, COMMON MILLET, a native of India, but now commonly cultivated in many parts of Europe as an esculent grain. It rises, with a reed-like stalk, three or four feet high, and channelled: at every joint there is one reed-like leaf, which is joined on the top of the sheath, and embraces and covers that joint of the stalk below the leaf; this sheath is closely covered with soft hairs, but the leaf which is expanded has none. The top of the stalk is terminated by a large loose panicle, which hangs on one side, having a chaffy flower, which is succeeded by a small round seed. There are two varieties; one with white, and the other with black seeds; but they differ in no other particular. This plant is seldom cultivated in Britain but in small gardens, for feeding poultry; the seeds generally ripen very well. They must be sown in the beginning of April, upon a warm dry soil, but not too thick, because the plants divide into several branches, and should have much room.

MILK, is a fluid secreted by the female of all those animals denominated mammalia, and intended evidently for the nourishment of her offspring. When milk newly taken from the animal is allowed to remain at rest, a thick white fluid, called cream, collects on the surface, and the fluid beneath is more watery. When the milk is allowed to stand after the spontaneous separation of the cream, it suffers another change; it first becomes acedent, and then coagulates. When the coagulum is pressed gently, a serous fluid is forced out, and the remainder is the caseous part of milk, or pure cheese. Butter and cheese are obtained artificially: the former by the operation of churning, and the latter by the addition of rennet to the milk. The best cheese is obtained by coagulating the milk at the temperature of 100°, and expressing the whey slowly and gradually, without breaking down the curd. Whey expressed from coagulated milk, if boiled, and the whole curd precipitated, becomes transparent and colourless. By slow evaporation it deposits crystals of sugar, with some muriate of potass, muriate of soda, and phosphate of lime. The liquid which remains after the separation of the salts, is converted, by cooling, into a gelatinous substance. If whey be kept, it becomes sour, by the formation of an acid, which is the lactic acid; and it is to this that the spontaneous coagulation of milk after it remains at rest is owing. Milk may, after it is sour, be fermented, and it will yield a vinous intoxicating liquor. This is practised by the Tartars on the milk of the mare. Milk is likewise susceptible of the acetous fermentation. The results of very minute experiments prove that the constituent parts which enter into the composition of milk are

Water	Muriate of soda
Oil	Muriate of potass
Curd	Phosphate of lime
Gelatine	Sulphur
Sugar of milk	

The milk of different animals is found to be composed of nearly the same substances; but the proportions vary so much, as to give them very different properties. The milk of women, mares, and asses, nearly agree in their qualities, being very dilute, sweet, though acedent, and when coagulated, easily broken down. That of cows, goats, and sheep, possess properties widely different. Of these, cows' milk approaches nearest to that yielded by the female breast. But the milk obtained from goats, is of a peculiar nature; as its oily and coagulable parts do not separate spontaneously, throw up no cream, and yield no butter. That of sheep is rich and nourishing; produces abundance of butter, but which is so unpalatable as to render it unfit to be eaten. Both these fluids afford a large proportion of strong and tough cheese. Cows' milk forms a very essential part of human sustenance, being adapted to every state and age of the body, but particularly to infants,

after being weaned. It should, therefore, be drawn from sound, young, and healthy animals; as it is most nutritious, when these are between three and four years old. Good milk is perfectly white, and totally divested of smell. As, however, it contains a great portion of the fatty or oily particles, known under the name of cream, it ought always to be diluted with water, before it is given to children. But, to scorbutic persons, or those troubled with inveterate ulcers, it will be found of great benefit, in a pure, undiluted state; as it combines both saccharine and oleaginous particles. From its balsamic nature, milk promotes the different evacuations, especially insensible perspiration: in a serous or diluted state, it has often afforded considerable relief in obstinate coughs; in disorders induced by worms, hysterics, the putrid sore-throat, the gout, and stone, and various other diseases, with which mankind are afflicted. But, if a person be debilitated, or otherwise exhausted by sickness, milk ought by no means to be used; as it is apt to generate cramps or violent spasms in the stomach, the heart-burn, &c. Corpulent and plethoric persons; those who are recovering from febrile complaints; and particularly such as are accustomed to drink wine and spirituous liquors; cannot with advantage of safety adopt a milk-diet; because the fatty and viscid properties of that fluid tend to oppress the stomach, and occasion indigestion. When milk is used medicinally, it ought to be taken as speedily as possible after it has been drawn from the cow; for its most nourishing and attenuating particles exhale, if it be boiled, or even for a short time exposed to the air. Lastly, if milk be suffered to become sour, it cannot be easily digested; and though it is in that state unfit to serve as an article of beverage, its utility does not cease. There is a liquor, distilled from acid milk, butter-milk, or whey, which is asserted to be a valuable menstruum in the preparation of colours.

MILK, METHOD OF KEEPING. Dr. James Anderson, in his "View of the Agriculture of the County of Aberdeen," has the following remark on the proper method of keeping milk and butter, which we quote, as it may prove useful. "The pernicious practice (says he) of keeping milk in leaden vessels, and salting butter in stone-jars, begins to gain ground among some of the fine ladies in this county, as well as elsewhere, from an idea of cleanliness. The fact is, it is just the reverse of cleanliness; for in the hands of a careful person, nothing can be more cleanly than wooden dishes, but under the management of a slattern they discover the secret which stone-dishes indeed do not. In return, these latter communicate to the butter and the milk, which has been kept in them, a poisonous quality, which inevitably proves destructive to the human constitution. To the prevalence of this practice, I have no doubt, we must attribute the frequency of palsies, which begin to prevail so much in this kingdom; for the well known effect of the poison of lead is bodily debility, palsy—death!"

MILK-GUAGE, or LACTOMETER, an instrument resembling a hydrometer, invented for trying the strength and goodness of milk. See Plate CII, fig. 10, Mr. Holt, in his "General View of the Agriculture of the County of Lancaster;" (p. 160,) communicated to the Board of Agriculture, gives a particular account of the advantages to be derived from the use of this instrument in large dairies.

MILK-WORT. See **POLYGALA**.

MILKY WAY. See **ASTRONOMY**, art. 209.

MILL, [*μύλος, mela*, Lat.] a machine for grinding corn. There are various kinds of mills, for grinding, breaking, or working, various other substances, according to the different methods of applying the moving power; as water-mills, wind-mills, mills worked by horses, &c. See **MECHANICS**, (art. 20.) We shall here add a description of Mr. Terry's improved mill for grinding hard substances: fig. 1, Plate CXVIII A, is the hopper; B, a spiral wire, in the form of a reversed cone, to regulate the delivery of the articles to be ground; C, an inclined iron-plate, hung upon a pin on its higher end; the lower end rests on the grooved axis D, and agitates the wire B; D is the grinding cylinder, which acts against the channelled iron-plate E; F, a screw on the side of the mill, by means of which the iron-plate E is brought nearer to, or removed farther from, the axis D, according as the article is wanted finer or coarser; G, the handle by which motion is given to the axis; H, the tube whence the articles, when ground, are received.

MILLENNIUM, [from *mille anni*, 1000 years.] Though there

there has been no age of the church in which the millennium was not admitted by individual divines of the first eminence, yet it is evident from the writings of Eusebius, Irenæus, Origen, and others among the ancients, as well as from the histories of Dupin, Mosheim, and all the moderns, that it was never adopted by the whole church, or made an article of the established creed in any nation. About the middle of the 4th century, the Millennarians held the following tenets: 1st, That the city of Jerusalem shall be rebuilt, and that the land of Judea shall be the habitation of those who are to reign on earth 1000 years. 2dly, That the first resurrection is not to be confined to the martyrs: but that after the fall of Antichrist all the just are to rise, and all that are then on the earth are to continue for that space of time. 3dly, That Christ shall then come down from heaven, and be seen on earth, and reign there with his servants. 4thly, That the saints during this period shall enjoy all the delights of a terrestrial paradise. These opinions were founded upon several passages of scripture, which the millennarians among the fathers understood in a literal sense, but which the moderns, who hold that opinion, consider as partly literal and partly metaphorical. Of these passages, that upon which the greatest stress has been laid, is in Rev. xx. 1—6. Modern critics contend, that the prophecies of the millennium point, not to a resurrection of martyrs and other just men to reign with Christ 1000 years in a visible kingdom upon earth, but to that state of the Christian church, which for 1000 years before the general judgement, will be so pure and so widely extended, that, when compared with the state of the world in the ages preceding, it may be called a resurrection from the dead.

MILLE PASSUS, or **MILLIA PASSUUM**; a very common expression among the ancient Romans for a measure of distance, commonly called a mile. Milliarium was rarely used. Hesychius made it to consist of seven stadia; Plutarch, little short of 8; but Strabo, Polybius, and many others, make it just eight stadia. The reason of this difference seems to be, that the former had a regard to the Grecian foot, which is greater than the Roman or Italian. See **MEASURE**, and **MILE**.

MILLEPES, or **WOOD-LOUSE**, in entomology, the wood-louse. See **ONISCUS**.

MILLEPOEA, in natural history, a genus of insects of the class and order, vermes zoophyta. Animal, an hydra, or polype; coral, generally branched and covered with cylindrical turbinated pores. Upwards of thirty species have been enumerated. For figures of two species, see Plate XCVIII.

MILLERIA, a genus of the polygamia necessaria order, and syn-genesia class of plants; natural order, Compositæ. Calyx three-valved; ray of the corolla bisected; down none; receptacle naked. There are three species.

MILLES, **JEREMIAH**, F. R. S. a learned antiquary and divine, born in Hampshire, in 1713, and educated at Eton and Balliol College, Oxford, of which his father, Jeremiah, was tutor and fellow. He took his degree of M. A. in 1735, and of D. D. in 1747. His uncle, Thomas Miller, bishop of Waterford, gave him a prebend, and left him a large fortune in 1740. He married a daughter of archbishop Potter, through whom he obtained various preferments in England, the last of which was the deanery of Exeter, in 1762. In 1759, he was elected president of the Antiquarian Society. He published an elegant edition of Rowley's Poem's, with a glossary; but was treated with great asperity by his opponents in that controversy. He also published a sermon, several papers in the *Archæologia*, and left much curious matter on Doomesday Book, on the Danish Coinage, and ample materials for a History of Devonshire. He died at London, Feb. 13, 1784, aged 71, leaving three sons and two daughters.

MILLET, in botany. See **MILMIUM**.

MILLIARE, in the new French measures, a fractional superficial measure, containing the 1000th part of the are. See **MEASURE**. Ten milliares make one centiare; ten centiares make one deciare; ten deciares one are; ten ares one decare, &c.

MILLIARE, or **MILLIARIUM**, a Roman mile, which consisted of 1000 paces, milie passus, whence the name.

MILLIARIUM AUREUM, was a gilded pillar in the forum of Rome, at which all the highways of Italy met, as one common centre.

MILLIGRAMME, [Fr.] in the new system of French measures, a fractional measure of weight, containing the 1000th part

of the gramme. Ten milligrammes make one centigramme; ten centigrammes make one decigramme; ten decigrammes make one gramme; ten grammes make one decagramme; ten decagrammes one hectogramme; ten hectogrammes one kilogramme; and ten kilogrammes one myriagramme.

MILLILITRE, [Fr.] a new French fractional measure of capacity, containing the 1000th part of the litre; and bearing the same increasing decadary proportion to the centilitre, decilitre, litre, hectolitre, kilolitre, and myrialitre, as the milligramme does to the new measures above enumerated. See **MEASURE**.

MILLOMETRE, [Fr.] a new French fractional measure of length, containing the 1000th part of the metre, and bearing a similar increasing decadary proportion from the centimetre to the myriametre, with those of the milligramme and millitre to the new measures above them. See **MEASURE**.

MILLING OF CLOTH. See **FULLING**.

MILLION, in arithmetic, a thousand times a thousand. See **ARITHMETIC**.

MILL ISLAND, an island near the N. W. end of Hudson's Straits. Lon. 80. 30. W. Lat. 64. 36. N.

MILLISTRE, [Fr.] a new French fractional measure of wood containing the 1000th part of the Stere; (or 19 cubical feet;) bearing the same increasing decadary proportion to the centistere, decistere, stere, decastere, hecostere, kilostere, and myriastere, that the milligramme bears to the new measures above it. See **MILLIGRAMME**.

MILLREE, a Portuguese gold-coin, worth 5s. 7½d. English.

MILO, T. ANNIVS, a native of Lanuvium, who attempted to obtain the consulship at Rome by intrigue and seditious tumults. Clodius the tribune opposed his views, and Milo killed him in a scuffle on the Appian way, for which he was banished to Massilia, though defended by Cicero himself, who was prevented from exerting his usual powers, by the popular clamour. The friendship of Cicero and Milo were the fruits of long intimacy and familiar intercourse. It was to the successful labours of Milo that the orator was recalled from banishment, and restored to his friends.

MILO, an island in the Archipelago, anciently called Melos, about 60 miles in circumference. This island was formerly rich and populous. From the earliest times of antiquity it enjoyed liberty; but the Melians having refused to join the Athenians in the Peloponnesian war, the latter made a descent upon the island; and although in two different expeditions they failed of their purpose, they accomplished it in the third, and killed or carried captive all the inhabitants. This act of cruelty disgraces the Athenian name. But Lysander, the Lacedæmonian general, expelled the Athenian colony and re-established the remains of its original inhabitants. Melos afterwards lost its liberty when the Romans conquered all the isles of the Archipelago. In the partition of the empire, it fell to the eastern emperors, was governed by dukes, and was at last conquered by Soliman II. Since that period, it has groaned under the yoke of Turkish despotism, and has lost its opulence and splendor. It was very fertile in corn, wine, and fruits; and the whole space from the town to the harbour, which is nearly two miles, was laid out in beautiful gardens.

MILO, the capital of the above island. Lon. 25. 15. E. Lat. 36. 38. N.

MILTHORP, a town of Westmoreland, at the mouth of the Can, 7 miles S. from Kendal.

MILTIADES, an Athenian general, son of Cypselus. He obtained a victory in a chariot-race at the Olympic games. He led a colony of Athenians to the Chersonesus. The causes of this appointment are striking and singular. The Thracian Dolonci, harassed by a long war with the Absynthians, were directed by the oracle of Delphi to take for their king the first man they should meet in their return home, who should invite them to come under his roof and partake his entertainments. They met Miltiades, whom their appearances, with their strange arms and garments, struck. He invited them to his house, and was made acquainted with the commands of the oracle. He obeyed; and when the oracle of Delphi had approved a second time the choice of the Dolonci, he departed for the Chersonesus, and was invested by the inhabitants with sovereign power. The first measure he took was to stop the further incursions of the Absynthians, by building a strong wall across the Isthmus. When he had established him-

self, and fortified his dominions, he turned his arms against Lamp-sacus. He was taken in an ambuscade. His friend Cræsus king of Lydia was informed of his captivity, and procured his release. He lived a few years after he had recovered his liberty. As he had no issue, he left his kingdom and possessions to Stesagoras the son of Cimon, who was his brother by the same mother. The memory of Miltiades was greatly honoured by the Dolonci, and they regularly celebrated festivals and exhibited shows in commemoration of a man to whom they owed their greatness and preservation.

MILTIADES, the son of Cimon, and brother of Stesagoras above mentioned, was some time after the death of the latter, who died without issue, sent by the Athenians with one ship to take possession of the Chersonesus. At his arrival, Miltiades appeared mournful, as if lamenting the recent death of his brother. The principal inhabitants of the country visited the new governor to condole with him; but Miltiades abused their confidence, seized their persons, and made himself absolute in Chersonesus. To strengthen himself, he married Hegesipyla, the daughter of Olorus king of the Thracians. His triumph was short. In his third year, his dominions were invaded by the Scythian Nomades. He fled, but was soon restored to his kingdom. Three years after, he left Chersonesus; and set sail for Athens, where he was received with great applause. At the celebrated battle of Marathon, all the chief officers ceded their power to him; and by his superior abilities, an important victory was gained over the more numerous forces of the Persians. Some time after, Miltiades was intrusted with a fleet of seventy ships, and ordered to punish those islands which had revolted to the Persians. He was successful at first; but on a sudden report that the Persian fleet was coming to attack him, as he was besieging Paros, he raised the siege, and returned to Athens. He was accused of treason. The falsity of the accusation might have appeared, if Miltiades had been able to come into the assembly. But a wound which he had received before Paros detained him at home; and his enemies, taking advantage of his absence, became more eager in their accusations. He was condemned to death; but the rigour of his sentence was retracted on account of his great services to the republic, and he was put in prison till he should pay a fine of fifty talents to the state. His inability to discharge so great a sum detained him in confinement; and his wounds becoming incurable, he died a prisoner about B. C. 489. His body was ransomed by his son Cimon; who was obliged to borrow the fifty talents, to give his father a decent burial. The accusations against him were the more readily believed, because he had made himself absolute in Chersonesus. But in condemning the barbarity of the Athenians towards a general, who was the source of their military prosperity, we must remember the jealousy which ever reigns among a free people, and how watchful they are in defence of those rights, which they see wrested from others by violence. Cornelius Nepos has written the life of Miltiades, but he confounds the actions of the son of Cimon with those of the son of Cypselus. Herodotus was indisputably better informed, and more capable of giving an account of the exploits of men who flourished in his own age, as he was born about six years after the battle of Marathon; whereas Nepos flourished about 450 years after it.

MILTON, JOHN, the most illustrious of the English poets, was descended of a genteel family, seated at Milton, in Oxfordshire. He was born December 9, 1608, and received his education first under a private tutor; afterwards at London; in which his father had settled as a scrivener. At the age of 17, he was sent to Christ's college, Cambridge; where he made a great progress in all parts of academical learning. In 1628, he proceeded A. B. having performed his exercise for it with great applause. His father designed him for the church; but young Milton's attachment to the Muses was so strong, that it became impossible to engage him in any other pursuit. In 1632, he took the degree of A. M. and retired to the residence of his parents at Horton, near Colnbrook, in Bucks, where he enriched his mind with the choicest stores of Grecian and Roman literature: and wrote his poems of *Comus*, *L'Allegro*, *Il Penseroso*, and *Lycidas*. About five years afterwards, he travelled into France and Italy; and at Paris became acquainted with the celebrated Grotius. Upon his return he set up a genteel academy in Aldersgate-street, London. In 1641, he began to write in defence of the Presbyterian party;

and in 1642, he married the daughter of Richard Powell, Esq. of Forest Hill in Oxfordshire; who being a zealous royalist, she was soon advised to return to her relations; which so incensed her husband, that he resolved never to take her again, and wrote and published several tracts in defence of the Doctrine and Discipline of Divorce. He also paid his addresses to another lady; but this incident proved the means of a reconciliation with Mrs. Milton; who purposely threw herself in his way at the house of a mutual relation, and on her knees intreated and received his forgiveness. This affecting incident made a deep impression on Milton's sensibility, and enabled him to paint to life the beautiful scene in his *Paradise Lost*, B. x. v. 940; where describing Adam's feelings he says,

“ Soon his heart relented;

“ Towards her, his life so late and sole delight,

“ Now at his feet submissive in distress.”

In 1644, he wrote his *Tract upon Education*; and the restraint on the liberty of the press being continued by act of parliament, he wrote boldly and nobly against that restraint. In 1641, he published his juvenile poems; and about two years after, on the death of his father, he took a smaller house in High Holborn, the back of which opened into Lincoln's Inn Fields. Here he quietly prosecuted his studies, till the death of Charles I. on which occasion he published his *Tenure of Kings and Magistrates*, in justification of the fact. He was now taken into the service of the commonwealth, and made Latin secretary to the council of state, who resolved neither to write to foreign princes, nor to receive any answers, except in the Latin tongue, which was common to them all. The famous *ΕΙΣΩΝ ΒΑΣΙΛΙΚΗ* coming out about the same time, Milton wrote and published his *Iconoclastes* the same year. It was also by order of his masters, backed by the reward of 1000*l.* that, in 1651, he published his celebrated piece, intitled, *Pro Populo Anglicano Defensio*, A Defence of the People of England, in answer to Salmasius's Defence of the King; which work spread his fame over all Europe. He now dwelt in a pleasant house, with a garden, in Petty France, Westminster. In 1652, he buried his wife, who died not long after the delivery of her fourth child; and about the same time he lost his eye-sight, by a gutta serena, which had been growing upon him many years. In 1653, Cromwell took the reins of government into his own hands, but retained Milton in his office. His leisure-hours he employed in prosecuting his studies; wherein he was so far from being discouraged by the loss of his sight, that he even conceived hopes this misfortune would add new vigour to his genius; which, in fact, seems to have been the case. Thus animated, he again ventured upon matrimony: and married the daughter of Captain Woodstock of Hackney, who died in childbed about a year after. On the deposition of the protector, Richard Cromwell, and on the return of the long parliament, Milton being still continued secretary, he appeared again in print; pleading for a farther reformation of the laws relating to religion; and, during the anarchy that ensued, he drew up several schemes for re-establishing the commonwealth, exerting all his abilities to prevent the return of Charles II. England's destiny, however, and Charles's good fortune, prevailing, Milton retired to a friend's house in Bartholomew Close. A prosecution was intended against him, but the just esteem to which his admirable genius and extraordinary accomplishments entitled him, had raised him so many friends, even among those of the opposite party, that he was included in the general amnesty. This storm over, he married his third wife, Elizabeth, daughter of Mr. Minshall a Cheshire gentleman; and not long after he took a house in the Artillery Walk. This was his last stage: where he resided longer than he had done any where. He now applied himself to finish his grand work *Paradise Lost*; one of the noblest poems that ever was produced by human genius. It was published in 1667, and his *Paradise Regained* in 1670. After this he published many pieces in prose; for which we refer our readers to Millar's Edition of his whole works, in two vols. 4to. 1753. This great man died at his house in Bunhill Fields, November 10, 1674, in his 66th year. A monument was erected to his memory, in 1737, in Westminster Abbey, by Mr. Benson. His person was remarkably handsome, but his constitution was tender, and by no means equal to his incessant studies. Though he had lost great part of his fortune at the restoration, yet he died worth 1500*l.* in money, besides household goods. He left behind him

him three daughters, whom he had by his first wife; the youngest of whom was married and had ten children. The best edition of Milton's poetical works is that of Mr. Todd, in six vols. 8vo. The late Mr. Thomas Warton published his smaller poems in one volume, 8vo. enriched with very curious notes. The whole of his political works have been printed in three vols. folio, and also in quarto and octavo.

MILTON, or **MIDDLETON**, a town of Dorsetshire, S. W. of Blandford, near the road to Dorchester, 114 miles W. by S. of London.

MILTON, a town of Kent, near Sittingbourn and the Isle of Sheppey, 6 miles N. W. of Faversham, and 42 E. of London.

MILVIUS, in ornithology, a species of Falco.

MIMI, **MIMES**, [from *mimēō*, to imitate,] in the ancient comedy, buffoons or mimics, who entertained the people by taking off certain characters, using such gestures as suited the persons or subjects they represented. There were on the Roman stage female performers of this kind, called *mimæ*. Some of the mimi acted their parts to the sound of the tibia; these they called *mimauli*.

MIMI were also a kind of farces or ludicrous comedies, generally performed by one person. They had no acts, nor any exordium.

MIMOSA, the **SENSITIVE PLANT**; a genus of the polygamia order, and monœcia class of plants; natural order, Lomentaceæ. Hermaphrodite, calyx five-toothed; corolla five-cleft; stamina five or more; pistillum one; legume; male, calyx five-toothed; corolla five-cleft; stamina five, ten, or more. It has eighty-five species. The name *mimosa* signifies mimic; and is given to this genus on account of the sensibility of the leaves, which, by their motion, mimic the motion of animals.

M. ARBOREA, the **WILD TAMARIND-TREE**, is common in all the woodlands in Jamaica. It rises to a considerable height, and is proportionably thick. The timber is excellent, and serves many purposes in rural economy: it is of the colour of cedar, pretty hard, and takes a good polish.

M. ASPERATA, the **PANAMA SENSITIVE PLANT**. This curious species has been well described by Dr. Browne. It grows in moist places, and by the sides of rivulets, in Jamaica. It seldom rises above three feet; but its slender branches extend considerably on the neighbouring bushes. It is armed with crooked sharp spines; so thickly set on the trunk, branches, and leaves, that there is no touching it with safety. But it is very beautiful; the flowers are yellow and globular, growing at the extremity of the branches. The pods are hairy, brown, and jointed: each containing a small, flat, and brown seed. The leaves are numerous, small, and winged; and very irritable; contracting with the least touch, and remaining so for several minutes after. This species would form a good hedge round a garden; and by being trimmed now and then may be easily kept from spreading.

MIMOSA CATECHU, according to Mr. Kerr, grows only to 12 feet in height, and one foot in diameter; it is covered with a thick rough brown bark, and towards the top divides into many close branches: the leaves are bipinnated, or doubly winged, and placed alternately upon the younger branches. See Plate XCIX.

M. PLENA, the **ANNUAL**, or **DOUBLE-FLOWED SENSITIVE MIMOSA**, rises with an herbaceous, erect, round, unarmed stem, closely branching and spreading every way, three or four feet high; bipinnated leaves of four or five pairs of winged lobes, of many pairs of pinne; and at the axillas and termination of the branches spikes of yellow pentandrous flowers, the lower ones double; succeeded by short broad pods. It is only sensitive in the foliola, but extremely sensible of the touch or air.

M. PUDICA, the **BASHFUL HUMBLE PLANT**, rises with an under, shrubby, declinated, prickly stem, branching two or three feet around, armed with hairy spines; pinnated, digitated leaves, each leaf being of five or more long folioles, attached by their base to a long footstalk, and spread out above like the fingers of a hand; and at the sides and ends of the branches roundish heads of greenish white flowers, succeeded by small jointed prickly pods. This is truly of the humble sensitive kind; for by the least touch the leaves instantly recede, contract, close, and with the footstalk quickly decline downward, as if ashamed.

M. SCANDENS, **CACOOBS**, **MAFOOTO WYTH**, or the **CLIMBING MIMOSA**. This species is frequent in all the upland vallies

and woodlands on the N. side of Jamaica. It climbs up the tallest trees, and spreads itself in every direction by its cirrhi or claspers, so as to form a complete arbour, and to cover an English acre from one root. This has a bad effect on the trees or bushes so shaded. Light air and rain being shut out, the leaves drop off, the tree gradually rots, and the limbs fall down by the weight of this parasite. See Plate XCIX.

M. SENSITIVA, the **COMMON SENSITIVE HUMBLE PLANT**, rises with an undershrubby prickly stem, branching six or eight feet high, armed with crooked spines; conjugated, pinnated leaves, with bijugated partial lobes or wings, having the inner ones least, each leaf on a long footstalk; and at the sides and ends of the branches many purple flowers in roundish heads; succeeded by broad, flat, jointed pods, in radiated clusters. The leaves and footstalks recede from the touch, though not with such facility as in some other species.

MIMULUS, **MONKEY-FLOWER**; in botany, a genus of the angiospermia order, and didynamia class of plants; natural order, Personate. Calyx four-toothed, prismatic; corolla ringent; capsule two-celled; seeds many. It has four species natives of America.

MIMUSOPS, a genus of the octandria monogynia class and order. Corolla eight-petaled; fruit a drupe. There are three species, trees of the East Indies.

MINA, or **MANEH**, in Jewish antiquity, a species of money, which properly signifies one part or ounce. This word occurs in the books of Kings, Chronicles, Ezra, and Ezekiel. This last prophet (xlv. 12,) tells us, that the minah or maneh was valued at 60 shekels; which in gold make of our English money about 54l. 15s. and in silver almost 7l.

MINA, in Grecian antiquity, or the Attic mina, which is probably that mentioned in the books of the Maccabees and in the New Testament, is valued at 100 drachmæ, or about 2l. 17s. sterling. There was also a less mina, valued at 75 drachmæ.

MINAES-GERAES, a province of Brasil. Lon. from 25° to 33° N. Lat. from 15° to 22° S.

MINCHA, in the Jewish customs, offerings of meal, cakes, or biscuits, made in the temple.

MINCIO, a river of Italy, which rises from Lake Garda, passes by Peschiera, Monzanbano, &c. and runs into the Po, near Sacketta.

Mincio, a department of Italy, comprehending the late duchies of Mantua and Verona.

MINCIUS, in ancient geography, a river of Gallia Transpadana; now called Mincio. See **MINCIO**.

MIND, [*mens*, Lat.] a thinking intelligent; being otherwise called spirit, in opposition to matter or body. See **METAPHYSICS**.

MINDANAO, or **MAGINDANAO**, a large island of Asia, in the E. Indian Sea, and one of the Philippines; 180 miles long, and 120 broad. The form of this island is triangular. The interior parts contain several chains of lofty mountains, which abound with gold and sulphur; and between which are extensive plains, and deep valleys, through which, during the rainy seasons, vast torrents pour from the mountains. In these valleys are also some considerable rivers. The soil is very exuberant, producing fruits, sago, rice, &c. in the greatest abundance; a pecul, or 133lb. of rice being sold for a Spanish dollar. The island abounds with buffaloes, cows, hogs, goats, a variety of fowls, &c. Mindanao is 600 miles S. E. of Manila.

MINDANAO, the capital of the above island is situated on the S. E. side. Lon. 123. 14. E. Lat. 8° N.

MINDELHEIM, a district of Germany, in Algow, Suabia, between the bishopric of Augsburgh and the abbacy of Kempen, and between the Iller and the Leck; 20 miles long, and 16 broad.

MINDELHEIM, a town of Suabia, capital of the above territory, 33 miles S. E. of Uhn. Lon. 10. 40. E. Lat. 48. 5. N.

MINDEN, a late principality of Germany, in Westphalia, N. of Ravensberg, and along each side of the Weser, about 22 miles square. On the 5th of March, 1811, this country, together with the whole of the kingdom of Westphalia, was ceded to France by Jerome Bonaparte, the brother of the present French emperor.

MINDEN, the capital of the above territory, seated on the Weser. Lon. 9. 5. E. Lat. 52. 22. N.

MINDORA, or **MINDORO**, an island of Asia, in the East Indian Sea, one of the Philippines, 50 miles in circumference, separated from Luconja, by a narrow channel.

MINE,

MINE, in the military art, a subterraneous passage, dug under the wall or rampart of a fortification intended to be blown up by gunpowder. The alley or passage of a mine is commonly about four feet square; at the end of this is the chamber of the mine, which is a cavity about five feet in width and in length, and about six feet in height; and here the gunpowder is stowed. The saucisse of the mine, is the train, for which there is always a little aperture left. There are various kinds of mines, which acquire various names, as royal-mines, serpentine-mines, forked-mines, according as their passages are straight, oblique, winding, &c. From a great number of experiments, it appears, 1. That the force of a mine is always towards the weakest side; so that the disposition of the chamber of a mine does not at all contribute to determine this effect. 2. That the quantity of powder must be greater or less in proportion to the greater or less weight of the bodies to be raised, and to their greater or less cohesion; so that we must allow for each cubic fathom, of loose earth, nine or ten pounds; of firm earth and strong sand, eleven or twelve pounds; of flat or clayey earth, fifteen or sixteen pounds; of new masonry, not strongly bound, fifteen or twenty pounds; and of old masonry, well bound, twenty-five or thirty pounds. 3. The aperture, or entonnoir, of a mine, if rightly charged, is a cone, the diameter of whose base is double the height taken from the centre of the mine. 4. That when the mine has been overcharged, its entonnoir is nearly cylindrical, the diameter of the upper extreme not much exceeding that of the chamber. 5. That besides the shock of the powder against the bodies it takes up, it likewise crushes all the earth that borders upon it, both underneath and sidewise. To charge a mine so as to have the most advantageous effect, the weight of the matter to be carried must be known; that is, the solidity of a right cone, whose base is double the height of the earth over the centre of the mine: thus, having found the solidity of the cone in cubic fathoms, multiply the number of fathoms by the number of pounds of powder necessary for raising the matter it contains; and if the cone contains matters of different weights, take a mean weight between them all, always having a regard to their degree of cohesion. As to the disposition of mines, there is but one general rule, viz. that the side towards which one would determine the effect to be the weakest; but this varies according to circumstances. The calculation of mines is generally built upon this hypothesis, That the entonnoir of a mine is the frustum of an inverted cone, whose altitude is equal to the radius of the excavation of the mine, and the diameter of the whole less base is equal to the line of least resistance; and though these suppositions are not quite exact, yet the calculations of mines deduced from them have proved successful in practice; for which reason this calculation should be followed till a better and more simple one be found out. M. De Valliere found that the entonnoir of a mine was a paraboloid, which is a solid generated by the rotation of a semiparabola about its axis; but as the difference between these two is very insignificant in practice, that of the frustum of a cone may be used.

MINE, [*myne*, Welsh, from *maen lapis*,] in natural history, implies a deep pit under ground, whence various kinds of minerals are dug out; but is more particularly applied to those which yield metals. Where stones only are procured, the appellation of quarries is universally used for the places from which they are dug out, however deep they may be.

MINES, DESCRIPTION OF THE INTERNAL PARTS OF. The internal parts of the earth, as far as they have yet been investigated, do not consist of one uniform substance, but of various strata or beds of substances, extremely different in their appearances, specific gravities, and chemical qualities, from one another. Neither are these strata similar to one another either in their nature or appearance in different districts; so that even in the short extent of half a mile, the strata are found quite different from what they are in another place. As little are they the same either in depth or solidity. Innumerable cracks and fissures, by the miners called loads or lodes, are found in every one of them; but these are so entirely different in size and shape, that it is impossible to form an inference from their size in one place to that in another. In these lodes the metallic ore is met with; and, considering the great uncertainty of their dimensions, it is evident that the business of mining, which depends on that size, must in like manner be quite uncertain and precarious. Mr. Price, in his Treatise on the Cornish Mines, observes, that "the comparative smallness of the largest fissures to the bulk of the

whole earth is really wonderful. In the finest pottery we can make, by a microscopic view, we may discover numerous cracks and fissures, so small as to be impenetrable by any fluid, and impervious to the naked eye; as, by the laws of nature originally imposed by the Creator, it happens that matter cannot contract itself into solid large masses, without leaving fissures between them, and yet the very fissures are as necessary and useful as the strata through which they pass. They are the drains that carry off the redundant moisture from the earth; which, but for them, would be too full of fens and bogs for animals to live or plants to thrive on. In these fissures, the several ingredients which form lodes, by the continual passing of waters, and the menstrua of metals, are brought out of the adjacent strata, collected and conveniently lodged in a narrow channel, much to the advantage of those who search for them; for if metals and minerals were more dispersed, and scattered thinly in the body of the strata, the trouble of finding and getting them would be endless, and the expence of procuring them exceed the value of the acquisition. The insides of the fissures are commonly coated over with a hard, crystalline, earthy substance or rind, which very often, in the breaking of hard ore comes off along with it, and is commonly called the capels or walls of the lode: but Mr. Price is of opinion, that the proper walls of the lode are the sides of the fissure itself, and not the coat, which is the natural plaster upon those walls, furnished perhaps by the contents of the fissures, or from oozings of the surrounding strata. The breadth of a lode is known by the distance betwixt the two incrustated sides of the stones of ore; and if a lode yields any kind of ore, it is a better sign that the walls be regular and smooth, or at least that one of them be so, than otherwise; but few of these fissures have regular walls until they have been sunk down some fathoms. Thus the inner part of the fissure in which the ore lies, is all the way bounded by two walls of stone, which are generally parallel to one another, and include the breadth of the vein or lode. Whatever angle of inclination some fissures make in the solid strata at their beginning, they generally continue to do the same all along. Some are small at their upper part and wide underneath, and vice versa. Their breadth, as well as depth, varies much; for though a fissure may be many fathoms wide in one place, yet a little further E. or W. it may not be one inch wide. This excessive variation happens generally in very compact strata, when the vein is squeezed, as it were, through hard rocks which seem to straighten it. A true vein, however, is never entirely obliterated, but always shews a string of metallic ore of a veinny substance; which often serves as a leader for the miners, until it sometimes leads them to a richly impregnated part. Their length is in a great measure unlimited. The richest state for copper, according to Mr. Price, is from 40 to 80 fathoms deep: for tin, from 20 to 60; and though a great quantity of either may be raised at 80 or 100 fathoms, yet "the quality is often too much decayed and dry for metal." He says, that the fissures or veins of the Cornish mines extend from E. to W. or more properly, one end of the fissure points W. and by S. or W. and by N. while the other tends E. and by S. or E. and by N. Thus they frequently pass through a considerable tract of country with few variations in their direction, unless interrupted by some intervening cause. But, besides this E. and W. direction, there is what the miners call the underlying or hade of the vein or lode, viz. the deflection or deviation of the fissure from its perpendicular line, as it is followed in depth like the slope of the roof of a house, or the descent of the steep side of a hill. This slope is generally to the N. or S. but varies much in different veins, or sometimes even in the same vein: for it will often slope or underlie a small space in different ways, as it may be forced by hard strata on either side. Some of the fissures do not vary much from a perpendicular, while some deviate more than a fathom; that is, for every fathom they descend in perpendicular height, they deviate likewise as much to the S. or N. Others differ so much from the perpendicular, that they assume a position almost horizontal; whence they are also called horizontal or flat lodes, and sometimes lode-plots. Another kind has an irregular position with regard to the rest; widening horizontally for a little way, and then descending perpendicularly almost like stairs, with only a small string or leader to follow after; and thus they alternately vary and yield ore in several flat or horizontal fissures. The fissures most common in Britain are the perpendicular and inclined. The perpendicular and horizon-

al fissures, (Mr. Price says,) remain little altered from their first position, when they were formed at the induration of the strata immediately after the waters left the land. The perpendicular fissures are more commonly situated in level ground, at a distance from hills, and from the sea-shore; but with regard to the latter, the upper and under masses of strata differ in their solidity and properties. Hence, it is plain, that inclined fissures owe their deflection to some secondary cause, violence, or subsidence, of the earth: for though perpendicular fissures are seldom to be seen, yet such as are inclined at very considerable depths, become more and more perpendicular, as the more central strata, by reason of the vast superincumbent weight, do not seem so likely to be driven out of their position as those which lie nearer the surface." The fissures are often met with fractured as well as inclined; the reason of which, Mr. Price thinks, has been a subsidence of the earth from some extraordinary cause. "The original position (says he) must have been horizontal, or parallel to the surface of the earth: but we often find these strata very sensibly declined from the first position; nay, sometimes quite reversed, and changed into perpendicular. When we see a wall lean, we immediately conclude that the foundation has given way, according to the angles which the wall makes with the horizon; and when we find the like declination in strata, we may conclude, by parity of reason, that there has been a like failure of what supported them, in proportion to that declination; or that whatever made the strata to fall so much awry, must also cause every thing included in those strata to fall proportionably. Wherever the greatest subsidence is to the N. the top of the lode or fissure will point to the N. and of consequence underlie to the S. and vice versa: the slide or heave of the lode manifests the greater subsidence of the strata; but the same lode is frequently fractured and heaved in several places: all of which, by due observation, will shew us they were occasioned by so many several shocks or subsidencies, and that the strata were not unfooted, shaken, or brought to fall once only or twice, but several times." Mr. Price further observes, that though the metallic veins generally run from E. to W. they are frequently intersected by veins or lodes of other matters, which run from N. to S. Some of these cross-veins contain lead or antimony, but never tin or copper. Sometimes one of these unmetallic veins intersects the true one at right angles, sometimes obliquely; and sometimes the mixture of both is so intimate, that the most expert miners are at a loss to discover the separated part of the true vein. When this last is intercepted at right angles, it is moved, either N. or S. a very little way, perhaps not above a fathom; in which case, having worked to a small distance in one of these directions, if they find themselves disappointed, they turn to the other hand, and seldom fail of meeting with what they expected. Sometimes they are directed in their search by the pointing of a rib or string of the true vein; but when the interruption happens in an oblique direction, the difficulty of finding the vein again is much greater. When two metallic veins near each other run in an oblique direction, and meet together, they commonly produce a body of ore at the place where they intersect; and if both are rich, the quantity will be considerable; but if one be poor and the other rich, then both are either enriched or impoverished by the meeting. After some time they separate again, and each will continue its former direction near to the other; but sometimes, though rarely, they continue united. It is a sign of a poor vein when it separates or diverges into strings; but when several of them are found running into one, it is accounted a promising sign. Sometimes there are branches without the walls of the vein in the adjacent strata, which often come either obliquely or transversely into it. If these branches are impregnated with ore, or if they underlie faster than the true vein, that is, if they dip deeper into the ground, then they are said to overtake or come into the lode, and to enrich it; or if they do not, then they are said to go off from it, and to impoverish it. But neither these nor any other marks either of the richness or poverty of a mine are to be entirely depended upon: for many mines, which have a very bad appearance at first, turn out extremely well afterwards; while others, which in the beginning seemed very rich, turn gradually worse; but in general, where a vein has a very bad appearance at first, it will be imprudent to be at much expence with it. Veins of metal are often so compressed betwixt hard strata, that they are not an inch wide; nevertheless, if they have a string of good ore, it will generally be worth while

to pursue them; and they often turn out well at last. It is an encouragement to go on, if the leaders of ore enlarge either in width or depth as they are worked; but it is a bad sign if they continue horizontal without inclining downwards; though it is not proper always to discontinue the working of a vein which has an unfavourable aspect at first. Veins of tin are worth working when only three inches wide, provided the ore be good; and copper-ores when six inches wide will pay very well for the working. Some of the great mines, however, have very large veins, with a number of other small ones very near each other. There are also veins crossing one another sometimes met with, which are called *contras*, vulgarly *caunters*. Sometimes two veins run down into the ground in such a manner that they meet in the direction of their depths; in which case the same observations apply to them which are applicable to those that meet in an horizontal direction. Sometimes a vein suddenly disappears, by becoming narrower, or of worse quality; which by the miners is called *start* or *leap*, and is common in the mines of Cornwall. A curious method of discovering mines is said to be by the *virgula divinatoria*, or divining rod; which, however incredible the stories related concerning it may be, is still relied on by some, and among others by Mr. Price. It is not known who was the inventor of this method; but Agricola supposes that it took its rise from the magicians, who pretended to discover mines by enchantment. No mention is made of it, however, before the eleventh century, since which time it has been in frequent use; and the *Corpuscular Philosophy* has even been called in to account for it. It is said to be performed in consequence of a certain unaccountable attraction, which the metals have for rods of nut, or other fruit-trees. But the account given by Price, which he had from a Mr. Cookworthy of Plymouth, who is said to have had the first information concerning this rod from one Captain Ribeira, a deserter from the Spanish service in Queen Anne's reign, and afterwards captain-commandant in the garrison of Plymouth, is so very incredible, not to add, unintelligible and unphilosophical, that we think it unnecessary to quote it. Another and very ancient mode of discovering mines, but extremely difficult and precarious, is that called *shodeing*; that is, tracing them by loose stones, fragments, or shodes, which may have been separated and carried off to a considerable distance from the vein, and are found by chance in running waters, on the surface of the ground, or a little under. "When the tinners (says Mr. Price) meet with a loose single stone of tin-ore, either in a valley, or in plowing or hedging, though at 100 fathoms distance from the vein it came from, those who are accustomed to this work will not fail to find it out. They consider, that a metallic stone must originally have appertained to some vein, from which it was severed and cast at a distance by some violent means. The deluge, they suppose, moved most of the loose earthy coat of the globe, and in many places washed it off from the upper towards the lower grounds, with such a force, that most of the backs or lodes of veins which protruded themselves above the fast were hurried downwards with the mass: whence the skill in this part of their business lies much in directing their measures according to the situation of the surface." Afterwards, however, our author complains, that this art of *shodeing*, as he calls it, is in a great measure lost. The following account of a method of finding silver-mines by Alonzo Barbo seems to be similar to that of *shodeing*: "The veins of metal (says he) are sometimes found by great stones above ground; and if the veins be covered, they hunt them out after this manner; viz. taking in their hands a sort of mattock, which has a steel-point at one end to dig with, and a blunt head at the other wherewith to break stones, they go to the hollows of the mountains, where the current of rain-water descends, or to some other part of the skirts of the mountains, and there observe what stones they meet with, breaking in pieces those that seem to have any metal in them; whereof they find many times both middling sort of stones and small ones also of metal. Then they consider the situation of that place, and whence these stones can tumble, which of necessity must be from higher ground, and follow the tract of them up the hill as long as they can find any of them," &c. "Another way (says Mr. Price) of discovering lodes is by working drifts across the country, as we call it, that is, from N. to S. and vice versa. I tried the experiment in an adventure under my management, where I drove all open at grass about two feet in the shelf, very much like a level to convey

convey water upon a mill-wheel: by so doing I was sure of cutting all lodes in my way; and did accordingly discover five courses, one of which has produced above 180 tons of copper-ore, but the others were never wrought upon. This method of discovering lodes is equally cheap and certain; for 100 fathoms in shallow ground may be driven at 50s. expence." After the mine is found, the next thing to be considered is, whether it may be dug to advantage. To determine this, we are duly to weigh the nature of the place, and its situation, as to wood, water, carriage, healthiness, and the like; and compare the result with the richness of the ore, the charge of digging, stamping, washing, and smelting. The form and situation of the spot should be well considered. A mine must either happen, 1. In a mountain; 2. In a hill; 3. In a valley; or, 4. In a flat. But mountains and hills are dug with much greater ease and convenience, chiefly because the drains and burrows, that is, the adits or avenues, may be here readily cut, both to drain the water and to form gang-ways for bringing out the lead, &c. In all the four cases, we are to look out for the veins which the rains or other accidental thing may have laid bare; and if such a vein be found, it may often be proper to open the mine at that place, especially if the vein prove tolerably large and rich: otherwise the most commodious place for situation is to be chosen for the purpose, viz. neither on a flat, nor on the tops of mountains, but on the sides. The best situation for a mine is a mountainous, woody, wholesome spot; of a safe easy ascent, and near a navigable river. The places abounding with mines are generally healthy, as standing high, and every where exposed to the air; yet some places where mines are found prove poisonous, and can on no account be dug, though ever so rich: the way of examining a suspected place of this kind, is to make experiments upon brutes, by exposing them to the effluvia, to discover their effects. Devonshire and Cornwall, where there are many mines of copper and tin, are very mountainous; which gives an opportunity to make adits or subterraneous drains to some valley at a distance, by which to carry off the water from the mine, which otherwise would prevent them from getting the ore. These adits are sometimes carried a mile or two, and dug at an expence of from 2000*l.* to 4000*l.* especially where the ground is rocky; and yet they find this cheaper than to draw up the water out of the mine quite to the top, when the water runs in plenty and the mine is deep. Sometimes, indeed, they cannot find a level near enough to which an adit may be carried from the very bottom of the mine; yet they find it worth while to make an adit at half the height to which the water is to be raised, thereby saving half the expence. The late Mr. Costar, considering that sometimes from small streams, and sometimes from little springs or collections of rain-water, one might have a good deal of water above ground, though not a sufficient quantity to turn an overshot wheel, thought, that if a sufficient fall might be had, this collection of water might be made useful in raising the water in a mine to the adit, where it may be carried off. But now the most general method of draining mines is by the steam-engine. See STEAM-ENGINE.

MINEHEAD, an ancient borough of Somersetshire, with a harbour in the Bristol channel, near Dunster castle. It was incorporated by Queen Elizabeth, with great privileges, on condition of keeping the quay in repair; but its trade falling off, the quay was neglected, and the privileges were lost. A statute was obtained in the reign of William III. for recovering the port, and keeping it in repair; and the quay was rebuilt. In pursuance of another act, a new head was built to the quay, the beach cleared, &c. so that the biggest ship may enter, and ride safe in the harbour. The town contains about 500 houses, and 2000 souls. It was formerly governed by a portreeve, and now by two constables chosen annually at a court-leet, held by the lord of the manor. Its chief trade is with Ireland, whence about 40 vessels used to come hither in a year with wool; and about 4000 chaldrons of coals are yearly imported at this place, Watchet and Porlock, from South Wales; which lies directly opposite to it, about seven leagues over, the common breadth of this channel all the way from Holmes to the Land's End. It lies 31 miles N. of Exeter, and 161 W. by S. of London. Lon. 3. 34. W. Lat. 51. 12. N.

MINERAL, [*minérale*, Lat.] any fossile body; matter dug out of mines. See MINE, and MINERALOGY.

MINERAL ACIDS. See ACIDS, and CHEMISTRY.

MINERAL ALKALI. See ALKALI, and CHEMISTRY.

MINERAL WATERS, include all such fluids as are naturally impregnated with heterogeneous matter, which they have dissolved within the bowels of the earth, whether sulphureous, metallic, or saline; and, as many of these are successfully employed in medicine, they have received the appellation of medicinal waters. Mineral waters have been divided into hot and cold, from their being either sensibly hotter or colder than the atmosphere. They have also been classed, according to their predominant ingredients, into acidulous, alkaline, martial, sulphureous, &c. It is not, however, our design to enter upon a minute investigation of their constituent parts; but, as the analysis of mineral springs may, to many inquisitive persons, afford a pleasing recreation, independently of its real utility, we shall subjoin a few rules necessary to be observed in making such experiments:

I. All experiments ought to be conducted near the spring, if it be practicable.

II. The situation of such spring, the nature of the soil, and the contiguous rising grounds (if any occur) should be carefully examined.

III. With the view of analyzing the water, it will first be necessary to observe the changes it may spontaneously undergo, as well as the various parts, or matters, into which it may separate. For this purpose, it will be advisable to fill several shallow but large cylindrical glasses at the well, or spring, which should be immediately examined by the taste, eye, and smell; after which they ought to stand at rest for two, three, or more, hours, or even as many days. At the end of this period, the investigation must be repeated; the fluid compared with water newly drawn from the spring; and, if any separation of parts take place, any scum arise, or sediment be formed at the bottom of the glass, they ought to be carefully collected for future examination.

IV. These glasses should next be deposited in a warm place; till, the watery parts being totally exhaled, a dry substance only remains; which ought to be compared with the sediment obtained from the same water by evaporation over the fire, in order that the real difference between both dry substances, may be more precisely ascertained.

V. It will next be requisite to analyze the water chemically: for this purpose, a certain portion of it ought to be taken from the spring, and poured into a retort with a wide neck, to which a clean glass-receiver, well luted, should be affixed. The whole must now be placed over a moderate fire, so as to simmer the water till all the aqueous particles are come over; when the vessels should be suffered to cool, the distilled water carefully drawn off, and deposited in a well-closed glass: then the dry substance must be separated from the bottom of the retort, weighed, and likewise preserved in a glass.

VI. The distilled-water must next be examined by various tests, to ascertain whether it materially differ from distilled common water; or whether it be impregnated with any saline or mineral particles, similar to those observed in the natural fluid, when first drawn from the well. In this process, if the water contain any common salt, it will, with a solution of silver, assume a white colour: if vitriol of iron be one of its ingredients, it will become black, on being mixed with pulverized galls.

VII. In case the water be suspected to contain any salts, it will be advisable gently to boil a quantity of the dry substance obtained by distillation, in five or six times its weight of pure common distilled water, such as is totally divested of all mineral particles. By this process, the saline matter will be dissolved or suspended in such water, in the form of a solution, which, on being filtered, and evaporated to dryness, will re-produce its salt. And, if there should be other salts in the same solution, they may all be obtained by repeating the filtration and evaporation.

VIII. After the different salts are thus evolved, it will perhaps be attended with some difficulty to ascertain those species which are denominated neutral. This may be effected by observing the appearances assumed by such salts, on being mixed with other matters. Thus, marine or sea-salt may be known by the white vapour which it emits when in contact with oil of vitriol, and also by its taste, as well as by its cubical figure, on being crystallized. Another distinguishing characteristic of neutral salts is, their property of producing or regenerating sulphur, when mixed and liquefied with salt of tartar and pulverized charcoal. If, therefore, two parts of such salt be mixed with one part of salt of tartar, and

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a similar portion of carbon in powder, and the whole be melted in a crucible, a reddish mass will be formed, possessing an alkaline sulphureous taste, and which will communicate a deep yellow or orange-colour to rectified spirit of wine.

Lastly, if there remain any matter after these various operations have been performed, it is generally denominated an earth, which, by repeated ablutions in pure distilled water, may be divided into various kinds of species, such as calcareous, siliceous, bolar, or ochreous, &c. These may be still farther examined by the test of fire; and, according to the appearances they assume, on being exposed to that element, it may be easily discovered whether they are vitrescible, or capable of being converted into glass; whether they will calcine, or become a species of lime; or whether they will yield any metallic substance. Such is the method by which the analysis of mineral-waters ought to be conducted; and it is only by a strict observance of the rules above stated, that chemists have been enabled to enrich the world with numerous discoveries in the mineral kingdom. As mineral-waters frequently contribute to the recovery of health; and as many persons are prevented from resorting to the place whence such fluids are obtained, various experiments have been made, with the view of procuring them by art, and communicating to them all the properties of the natural waters. The most complete of such chemical processes appears to be that of M. Goldschmid, who has established a manufactory of factitious waters, at Paris, in imitation of the natural springs of Seltz, Spa, and Sedlitz, which have in all respects been found equal, or superior, to those celebrated wells. His preparations have undergone a rigid examination by the ablest chemists, both with respect to their physical properties, and the nature of the salts employed. According to the reports of Buillon-la-Grange, and Chaussier, M. Goldschmid's artificial waters are very clear and transparent, possessing a strong acid flavour, and communicating a deep-red shade to the tincture of turnsol. On being

placed in contact with various re-agents, these compounds, when mixed with lime-water, produced abundance of carbonate of lime; with caustic alkalies, neutral salts; and, when poured on the filings of the purest iron, they acquired, in a short time, a ferruginous taste. With respect to the carbonic acid, or fixed air, it appears that the factitious waters contain of it twice and a half of their volume, which is considerably more than the natural springs. The advantages of these ingenious preparations are stated to be, 1. That they are not liable to be affected by rainy weather, as is the case with the natural water, which is remarkably influenced by the season. 2. That they do not part with any gas and other volatile constituents, by conveyance, and by keeping them for some length of time; and, 3. That the natural fluid can hold in solution only such a proportion of metallic ingredients as the acids and gases contained therein, are capable of dissolving; while the factitious mineral-waters are not only cheaper and more efficacious, but retain their virtues without diminution, are impregnated with a larger volume of gas, and may be composed of any quantity and quality of salt or earth, according to particular circumstances. Lastly, they are far more convenient to the purchaser, being much stronger than the natural waters, so that there will be no occasion to drink such large and nauseating doses, as are usually taken of the latter. With respect to the waters of Bath, Bristol, Buxton, &c. and the principal foreign wells, the reader will find a short account of them in the progress of the alphabet.

MINERALIZATION, that process of nature, by which any substance, animal or vegetable, is converted into a mineral. Thus plants, pieces of wood, shells of fishes, &c. are turned into stone by petrifying waters. And pit-coal is originally a mass of vegetable substances mineralized.

MINERALIZER, in mineralogy, a mineral substance, which, when combined with an animal or vegetable substance, or with a salt or metal, mineralises it.

MINERALOGY.

MINERALOGY, [from *mineral*, and λογος,] that science which teaches the properties of mineral bodies, or the solid materials of which the globe consists, and by which we learn how to characterise, distinguish, and class, them into a proper order. Mineralogy is a science of very great antiquity. Tubal-Cain, the eighth in lineal descent from Adam, was the "instructor of every artificer in brass and iron; or in other words, the inventor of metallurgy and mineralogy, a short time after the invention of music and upholstery by his two brothers. See Gen. iv. 20—22. These sciences, as well as precious stones of various kinds, were well known among the Jews and Egyptians, in the time of Moses; and even the most rude and barbarous nations appear to have had some knowledge of the ores and manufactures of various metals. Dr. Thomson, in the third book of his *System of Chemistry*, remarks, that though minerals "must at all times have attracted the attention of mankind,"—"it is only very lately that the method of ascertaining the component parts of these substances was discovered, or that it was possible to describe them so as to be intelligible to others. From the ancients no information of any consequence on these topics is to be expected. The whole science of mineralogy has been created since the year 1770, and is at present advancing towards perfection with astonishing rapidity. New minerals are every day described and analysed, collections are every where forming, and travels of discovery are succeeding each other without intermission. The science of mineralogy includes under it three different topics: 1. The method of describing minerals with so much accuracy and precision, that they may be easily distinguished from each. 2. A systematic arrangement of minerals. 3. The art of analysing minerals. In order to furnish a description of minerals, a knowledge of their structure and component parts becomes an object of the first consequence. To obtain this knowledge, chemical experiments in the large way are doubtless necessary; but as a great deal of the mineral kingdom has already been examined in this manner, we do not need to re-

peat all those experiments in their whole extent, unless some new and particular phenomena should appear in those things we are examining; else the tediousness of those processes might discourage some from going farther, and take up much of the time of others that might be better employed. An easier way may, therefore, be adopted, which even for the most part is sufficient, and which, though made in miniature, is as scientific as the common manner of proceeding in the laboratories, since it imitates that, and is founded upon the same principles. This consists in making the experiments upon a piece of charcoal with the concentrated flame of a candle or lamp directed by a blow-pipe. The heat occasioned by this is very intense; and the mineral bodies may here be burnt, calcined, melted, and scorified, &c. as well as in any great works. For a description of the blow-pipe, the method of using it, the proper fluxes to be employed, and the different subjects of examination to which that instrument is adapted, see *Blow-pipe*, and *FLUX*, where these particulars are concisely detailed. When experiments are to be made on earths or stones, we must not begin immediately with the blow-pipe; till some preliminary experiments be made, by which those in the fire may afterwards be directed. For instance, a stone is not always homogeneous, or of the same kind throughout, although it may appear to be so. A magnifying-glass is therefore necessary to discover the heterogeneous particles, if there be any; and these ought to be separated, and every part tried by itself, that the effects of two different things, examined together, may not be attributed to one alone. This might happen with some of the finer micæ, which are now and then found mixed with small particles of quartz, scarcely to be perceived by the eye. The trap (in German *schwartzstein*) is also sometimes mixed with very fine particles of felt, spar, (*spatum scintillans*) or of calcareous spar, &c. After this experiment, the hardness of the stone must be tried with steel. The flint and garnets are known to strike fire with steel; but there are also other stones, which are so hard as likewise to strike fire.

There

There is a kind of trapp of that hardness in which no particles of felt-spar are to be seen. Coloured glasses resemble true gems; but as they are very soft in proportion to these, they are easily discovered by the file. The common quartz crystals are harder than coloured glasses, but softer than gems. The loadstone discovers the presence of iron, when it is mixed in too small a quantity in the stone, and often before the stone is roasted. Some kinds of hematites, and particularly the *cœrulescens*, greatly resemble some other iron-ores; but this is distinguished from them by a red colour when pounded, the others giving a blackish powder. Of the substance to be assayed, only a small piece must be broken off, not bigger than that the flame of the candle may be able to act upon it at once, if required; which is sometimes necessary, as when the matter requires to be made red hot throughout, the piece ought to be broken as thin as possible, at least the edges; the fire having then more influence upon the subject, and the experiment being more quickly made. Some mineral bodies are very difficult to be kept steady upon the charcoal during the experiment, before they are made red hot; because as soon as the flame begins to act upon them they split asunder with violence, and are dispersed. Such often are those which are of a soft consistence, or a particular figure, and which preserve the same figure in however minute particles they are broken; for instance the calcareous spar, the sparro gypsum, sparry fluor, white sparry lead-ore, the potters ore, the tessellated mock lead, or blende, &c. and all the common fluors which have no determinate figure. These not being so compact as common hard stones, when the flame is immediately urged upon them, the heat forces into their clefts or pores, and causes this violent expansion and dispersion. Many clays are likewise apt to crack in the fire, which is mostly owing to the humidity, of which they always retain a portion. The only way to prevent this inconvenience is to heat the body as slowly as possible. First, heat that place of the charcoal where the piece is intended to be put; and afterwards lay it thereon: a little crackling will then ensue, but commonly of no great consequence. The flame is then blown very slowly towards it, in the beginning not directly upon, but somewhat above it, and so approaching nearer and nearer with the flame until it become red hot. In examining metals and ores, an exact knowledge and nicety of procedure are the more necessary, that the metals are often so disguised in their ores, as to be very difficultly known by their external appearance, and liable sometimes to be mistaken one for the other: some of the cobalt-ores, for instance, resemble much the pyrites arsenicalis; there are also some iron and lead ores which are very like one another, &c. As the ores generally consist of metals mineralized with sulphur or arsenic, or sometimes both, they ought first to be exposed to the fire by themselves, not only to determine with which of these they are mineralized, but also to set them free from those volatile mineralizing bodies: this serves instead of calcination, by which they are prepared for further assays. Whenever any metal or fusible ore is to be tried, a little concavity must be made in that part of the charcoal where the matter is to be put; to prevent it from rolling off. When an ore is to be tried, a small bit is laid upon the charcoal, and the flame blown on it slowly. Then the sulphur or arsenic begins to part from it in form of smoke; these are easily distinguished by their smell; that of sulphur being sufficiently known, and the arsenic smelling like garlic. The flame ought to be blown very gently as long as any smoke is seen to part from the ore; but after that the heat must be augmented by degrees, to make the calcination as perfect as possible. If the heat be applied very strongly from the beginning upon an ore that contains much sulphur or arsenic, the ore will presently melt, and yet lose very little of its mineralizing bodies, thus rendering the calcination very imperfect. It is, however, impossible to calcine the ores in this manner to the utmost perfection, which is easily seen in melting down a calcined potter's ore with borax, as it will bubble upon the coal, which depends on the sulphur still left, the vitriolic acid of this uniting with the borax, and causing this motion. The ores being thus calcined, the metals contained in them may be discovered, either by being melted alone or with fluxes; when they shew themselves either in their pure metallic state, or by tinging the slag with a colour peculiar to each of them.

OF THE DESCRIPTION OF MINERALS.

"Nothing, at first sight," says Mr. Thomson, "appears easier
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than to describe a mineral, and yet, in reality, it is attended with a great deal of difficulty. The mineralogical descriptions of the ancients are so loose and inaccurate, that many of the minerals to which they allude cannot be ascertained; and consequently, their observations, however valuable, are often, as far as respects us, altogether lost. It is obvious, that to distinguish a mineral from every other, we must either mention some peculiar property, or a collection of properties, which exist together in no other mineral. These properties must be described in terms rigidly accurate, which convey precise ideas of the very properties intended, and of no other properties. The smallest deviation from this would lead to confusion and uncertainty. Now it is impossible to describe minerals in this manner, unless there be a peculiar term for each of their properties, and unless this term be completely understood. Mineralogy, therefore, must have a language of its own; it must have a term to denote every mineralogical property, and each of these terms must be accurately defined. The language of mineralogy was invented by the celebrated Werner of Freyberg, and first made known by his treatise on, "The External Characters of Minerals." Of this language the following general description of the properties of minerals will convey an idea. The properties of minerals may be divided into two classes: 1. Properties discoverable without destroying the texture of the mineral; 2. Properties resulting from the action of other bodies on it. The first class has, by Werner, been called external, and by some French writers physical; the second chemical. The external properties may be arranged under the following heads: 1. Figure. 2. Surface. 3. Transparency. 4. Colour. 5. Scratch. 6. Lustre. 7. Hardness. 8. Ductility. 9. Fracture. 10. Texture. 11. Structure. 12. Fragments. 13. Feel. 14. Sound. 15. Smell. 16. Taste. 17. Gravity. 18. Magnetism. 19. Electricity.

"I. By figure is meant the shape or form, which a mineral is observed to have. The figure of minerals is either regular, particular, or amorphous. 1. Minerals which assume a regular figure are said to be crystallized. The sides of a crystal are called faces; the sharp line formed by the inclination of two faces is called an edge; and the corner, or angle, formed by the meeting of several edges in one point, is called a solid angle, or simply an angle. Thus a cube has six faces, twelve edges, and eight angles. 2. Some minerals, though not crystallized, affect a particular figure. These figures are the following: Globular, like a globe; oval, like an oblong spheroid; ovate, like an egg; cheese-shaped, a very flattened sphere; almond-shaped, like an almond; lenticular, like a double convex lens, compressed and gradually thinner towards the edges; cuneiform, like a wedge; nodulous, having depressions and protuberances like a potatoe; botryoidal, like grapes closely pressed together; dentiform, longish and tortuous, and thicker at the bottom than the top; wireform, like a wire; capillary, like hair, finer than the preceding; retiform, threads interwoven like a net; dendritic, like a tree, having branches issuing from a common stem; shrubform, branches not arising from a common stem; coraloid, branched like coral; stalactitical, like icicles; clavated, like a club, long, and thicker at one end than another; fasciform, long, straight, cylindrical bodies, united like a bundle of rods; tubular, cylindrical and hollow. 3. When minerals have neither a regular nor particular shape, they are said to be amorphous.

"II. By surface is meant the appearance of the external surface of minerals. The surface is either uneven, composed of small unequal elevations and depressions; scabrous, having very small sharp and rough elevations, more easily felt than seen; drusy, covered with very minute crystals; rough, composed of very minute blunt elevations, easily distinguishable by the feel; scaly, composed of very minute thin scale-like leaves; smooth, free from all inequality or roughness; specular, having a smooth polished surface like a mirror; or streaked, having elevated, straight, and parallel lines. This last character is confined to the surface of crystals. The streaks are either transverse; longitudinal; alternate, in different directions on different faces; plumose, running from a middle rib; or decussated, crossing each other.

"III. By transparency is meant the proportion of light which minerals are capable of transmitting. They are transparent or pellucid when objects can be seen distinctly through them; diaphanous, when objects are seen through them indistinctly; sub-diaphanous, when light passes, but in so small a quantity that objects

sects cannot be seen through them; opaque, when no light is transmitted. I have noted three degrees of transparency by the figures 4, 3, 2, when a mineral is subdiaphanous only at the edges, that is denoted by the figure 1. Opacity is denoted by 0. When opaque minerals become transparent in water, they are called hydroparous. When objects are seen double through a transparent mineral, it is said to refract doubly.

"IV. The different colours of minerals may be reduced to eight classes:

"1. *Whites*. Snow white; pure white. Reddish white: white with a light tint of red. Yellowish white: white with a light tint of yellow. Silver white, yellowish white. White with a metallic lustre. Greyish white: white with a light tint of black. Greenish white: white with a light tint of green. Milk white: white with a light tint of blue. Tin white. Milk white of a metallic lustre.

"2. *Greys*. Bluish grey: grey with a little blue. Lead grey: bluish grey with a metallic lustre. Pearl grey: light grey, with a slight mixture of violet blue. Smoke grey: dark grey with a little blue and brown. Greenish grey: light grey tinged with green. Yellowish grey: a light grey tinged with yellow. Steel grey: a dark grey with a light tint of yellow, and a metallic lustre. Black grey: the darkest of all greys mixed with a tint of yellow.

"3. *Blacks*. Greyish black: black with a little white. Brownish black: black with a tint of brown. Black: pure black. Iron black: pure black, with a small mixture of white and a metallic lustre. Bluish black: black with a tint of blue.

"4. *Blues*. Indigo blue: a dark blackish blue. Prussian blue: the purest blue. Azure blue: a bright blue, with scarce a tint of red. Smalt blue: a light blue. Violet blue: a mixture of azure blue and carmine. Lavender blue: violet blue, mixed with grey. Sky blue: a light blue with a slight tint of green.

"5. *Greens*. Verdigris green: a bright green of a bluish cast. Sea green: a very light green, a mixture of verdigris green and grey. Beryl green: the preceding, but of a yellowish cast. Emerald green: pure green. Grass green: pure green, with a tint of yellow. Apple green: a light green, formed of verdigris green and white. Leek green: a very dark green with a cast of brown. Blackish green: the darkest green with a mixture of leek green and black. Pistachio green: grass green, yellow and a little brown. Olive green: a pale yellowish green, with a tint of brown. Asparagus green: the lightest of all greens, yellowish, mixed with a little brown and grey.

"6. *Yellows*. Sulphur yellow: a light greenish yellow. Brass yellow: the preceding, with a little less green and metallic lustre. Lemon yellow: pure yellow. Gold yellow: the preceding, with a metallic lustre. Honey yellow: a deep yellow, with a little reddish brown. Wax yellow: the preceding, but deeper. Pyritaceous yellow: a pale yellow, with grey. Straw yellow: a pale yellow, a mixture of sulphur yellow and reddish grey. Wine yellow: a pale yellow, with a tint of red. Ochre yellow: darker than the preceding, a mixture of lemon yellow with a little brown. Isabella yellow: a pale brownish yellow, a mixture of pale orange with reddish brown. Orange yellow: a bright reddish yellow, formed of lemon yellow and red.

"7. *Reds*. Aurora red: a bright yellow red, a mixture of scarlet and lemon yellow. Hyacinth red: a high red, like the preceding, but with a shade of brown. Brick red: lighter than the preceding, a mixture of aurora red and a little brown. Scarlet red: a bright and high red, with scarce a tint of yellow. Copper red: a light yellowish red, with the metallic lustre. Blood red: a deep red, a mixture of crimson and scarlet. Carmine red: pure red, verging towards a cast of blue. Cochineal red: a deep red, a mixture of carmine, with a little blue and a very little grey. Crimson red: a deep red, with a tint of blue. Flesh red: a very pale red, of the crimson kind. Rose red: a pale red, of the cochineal kind. Peach blossom red: a very pale whitish red, of the crimson kind. Mordoré, a dark dirty crimson red: a mixture of crimson and a little brown. Brownish red: a mixture of blood red and brown.

"8. *Browns*. Reddish brown: a deep brown, inclining to red. Clove brown: a deep brown, with a tint of carmine. Yellowish brown: a light brown, verging towards ochre yellow. Umber brown: a light brown, a mixture of yellowish brown and grey.

Hair brown: intermediate between yellow brown and clove brown, with a tint of grey. Tombac brown: a yellowish brown of a metallic lustre, formed of gold, yellow, and reddish brown. Liver brown: a dark brown, blackish brown, with a tint of green. Blackish brown: the darkest brown. Colours, in respect of intensity, are either dark, deep, light, or pale. When a colour cannot be referred to any of the preceding, but is a mixture of two, this is expressed by saying, that the prevailing one verges towards the other, if it has only a small tint of it; passes into it, if it has a greater.

"V. By the scratch or streak, is meant the mark left when a mineral is scratched by any hard body, as the point of a knife. It is either similar, of the same colour with the mineral, or dissimilar, of a different colour.

"VI. Lustre is the gloss or brightness, which appears on the external surface of a mineral, or on its internal surface when fresh broken. The first is called external, the second internal lustre. Lustre is either common, that which most minerals possess; silky, like that of silk or mother-of-pearl; waxy, like that of wax; greasy, like that of grease; or metallic, like that of metals. As to the degree, the greatest is called splendent; the next shining; the third dullish; and when only a few scattered particles shine, the lustre is called dull. These degrees are noted by the figures, 4, 3, 2, 1, and no lustre by 0.

"VII. I have used Mr. Kirwan's figures to denote the comparative hardness of all kinds of mineral bodies. Thus, 3 is used to denote the hardness of chalk. 4. A superior hardness, but yet what yields to the nail. 5. What will not yield to the nail, but easily, and without grittiness, to the knife. 6. That which yields more difficultly to the knife. 7. That which scarcely yields to the knife. 8. That which cannot be scraped by a knife, but does not give fire with steel. 9. That which gives a few feeble sparks with steel. 10. That which gives plentiful lively sparks." Kirwan's Mineralogy, i. 38.

"VIII. With respect to ductility and brittleness, minerals are either malleable, sectile, capable of being cut without breaking, but not malleable; flexible, capable of being bent, and when bent retaining their shape; elastic, capable of being bent, but recovering their former shape. Minerals destitute of these properties are brittle. Brittle minerals, with respect to the ease with which they may be broken are either very tough, tough, fragile, or very fragile.

"IX. By fracture is meant the fresh surface which a mineral displays, when broken. It is either flat, without any general elevation or depression; or conchoidal, having wide extended roundish hollows and gentle risings. When these are not very evident, the fracture is called flat conchoidal, when they are small, it is called small conchoidal, and when of great extent, great conchoidal. The fracture may also be even, free from all asperities; uneven, having many small, sharp, abrupt, irregular elevations and inequalities; and from the size of these, this fracture is denominated coarse, small, or fine; splintery, having small, thin, detached, sharp-edged splinters, according to the size of which, this fracture is denominated coarse, or fine; or rugged having many very minute sharp hooks, more sensible to the hand than the eye.

"X. By texture is meant the internal structure or disposition of the matter of which a mineral is composed, which may be discovered by breaking it. The texture is either compact, without any distinguishable parts, or the appearance of being composed of smaller parts; earthy, composed of very minute almost imperceptible rough parts; granular, composed of small shapeless grains; globuliform, composed of small spherical bodies; fibrous, composed of fibres, which may be long, short, straight, crooked, parallel, divergent, stellated, fasciculated, or decussated; radiated, consisting of long, narrow, flattish lamellae; or lamellar, or foliated, consisting of smooth continued plates covering each other: these plates may be either straight, crooked, or undulating.

"XI. The structure or compound texture, is the manner in which the parts that form the texture are disposed. It is either slaty, in straight layers like slate; testaceous, in incurvated layers; concentric, in concentric layers; or columnar, in columns. The texture and structure may at first view appear the same; but they are very different. Thus common slate has often the slaty structure

structure and earthy texture. The texture of pit-coal is compact, but its structure is often slaty.

"XII. By fragments is meant the shape of the pieces into which a mineral breaks, when struck with a hammer. They are either cubic, rhomboidal, wedge-shaped, splintery, thin, long, and pointed; tabular, thin and broad, and sharp at the corners, as common slate; or indeterminate, without any particular resemblance to any other body. The edges of indeterminate fragments are either very sharp, sharp, sharpish, or blunt.

"XIII. By the feel of minerals is meant the sensation which their surfaces communicate when handled. The feel of some minerals is greasy; of others dry, &c.

"XIV. Some minerals when struck give a clear sound; as common slate: others a dull sound. The smell, taste, specific gravity, and magnetism, of minerals, require no explanation. With respect to electricity, some minerals become electric when heated, others when rubbed; others cannot be rendered electric. The electricity of some is positive, of others negative." See ELECTRICITY.

OF A SYSTEMATIC ARRANGEMENT OF MINERALS.

"Minerals," says Dr. Thomson, "may be arranged two ways, according to their external characters, and according to their chemical composition. The first of these methods has been called artificial classification; the second a natural one. The first is indispensable for the student of nature; the second is no less indispensable for the proficient, who means to turn his knowledge to account. Without the first, it is impossible to discover the names of minerals; and without the second we must remain ignorant of their uses. Almost every system of mineralogy hitherto published, at least since the appearance of Werner's external characters, has attempted to combine these two arrangements, and to obtain at the same time the advantages peculiar to each. But no attempt of this kind has hitherto succeeded. Whether this be owing to any thing impossible in the undertaking, or to the present imperfect state of mineralogy, I do not take upon me to determine. But surely the want of success, which has hitherto attended all attempts to combine the two arrangements, ought to suggest the propriety of separating them. By adhering strictly to one language, the trouble of studying two different systems would be entirely prevented. They would throw mutual light upon each other: the artificial system would enable the student to discover the names of minerals; the natural would enable him to arrange them, and to study their properties and uses. The happy arrangement of Cronstedt, together with the subsequent improvements of Bergman, Werner, Kirwan, Haüy, and other celebrated mineralogists, has brought the natural system to a considerable degree of perfection. But an artificial system is still a desideratum; for, excepting Linnæus, whose success was precluded by the state of the science, no one has hitherto attempted it. Avicenna, a writer of the eleventh century, divided minerals into four classes; stones, salts, inflammable bodies, and metals. This division has been in some measure followed by all succeeding writers. Linnæus, indeed, the first of the moderns, who published a system of mineralogy, being guided by the external characters alone, divided minerals into three classes, *petræ*, *minera*, *fossilia*: but Avicenna's classes appear among his orders. The same remark may be made, with respect to the systems of Wallerius, Wolsterdorf, Cartheuser, and Justi, which appeared in succession after the first publication of Linnæus's *Systema Naturæ*, in 1736. At last, in 1758, the system of Cronstedt appeared. He reinstated the classes of Avicenna in their place; and his system was adopted by Bergman, Kirwan, Werner, and the most celebrated mineralogists who have written since. We shall here present the reader with the arrangement adopted in the system of Werner, as given by professor Jameson in his *System of Mineralogy*. And here minerals are disposed under four classes: the earthy, the saline, the inflammable, and the metallic, which are thus distinguished:

1. The earthy minerals compose the greater part of the crust of the earth, and generally form a covering to the rest. They are not remarkable for being heavy, brittle, or light-coloured. They are little disposed to crystallize, are unflammable in a low temperature, insipid, and without much smell.

2. The saline minerals are commonly moderately heavy, soft, sapid, and possess some degree of transparency.

3. The inflammable class of minerals is light, brittle, mostly opaque, of a yellow, brown, or black colour, seldom crystallize, and never feel cold.

4. Metallic minerals are characterized by being heavy, generally opaque, tough, malleable, cold, not easily inflamed, and by exhibiting a great variety of colours, of a peculiar lustre. Under each of these classes are various genera, species, sub-species, and kinds, which will be noticed in order. Sometimes, as in the vegetable kingdom, we find a strict affinity between different species of minerals, and in that case they are said to belong to the same family; but in mineralogy, one class does not always blend with another in a chemical point of view, or furnish that beautiful gradation and almost imperceptible union which is to be traced in the other kingdoms of nature.

The classes, genera, species, &c. according to Werner's arrangement, are as follows: viz.

CLASS I.

EARTHY FOSSILS.

1. DIAMOND GENUS. One species. Diamond.
2. ZIRCON GENUS. Three species. 1. Zircon. 2. Hyacinth. 3. Cinnamon-stone.
3. FLINT GENUS. Fifty-seven species. Chrysolite family. 1. Chrysoberyl. 2. Chrysolite. 3. Olivine. 4. Coccolite. 5. Augite. 6. Pistazite. 7. Vesuvian.—Garnet family. 8. Leucite. 9. Melanite. 10. Garnet. 11. Staurolite, or Grenatite. 12. Pyrope.—Ruby family. 13. Spinelite. 14. Sapphire. 15. Emery. 16. Corundum. 17. Diamond-spar. 18. Ceylanite. 19. Topaz.—Schorl family. 20. Eulclase. 21. Emerald. 22. Beryl. 23. Schorl. 24. Axinite, or Thumerstone.—Quartz family. 25. Quartz. 26. Iron-flint. 27. Hornstone. 28. Flinty-slate. 29. Flint. 30. Chalcedony. 31. Hyalite. 32. Opal. 33. Menilite. 34. Jasper. 35. Heliotrope. 36. Chrysoprase. 37. Plasma. 38. Cat's-eye.—Pitchstone family. 39. Obsidian. 40. Pitchstone. 41. Pearllite. 42. Pumice.—Zeolite family. 43. Prehnite. 44. Zeolite. 45. Culizite. 46. Cross-stone, or Cruzite. 47. Lomonite. 48. Schmelzstein. 49. Natrolite. 50. Azurite. 51. Azure-stone.—Felspar family. 52. Andalusite. 53. Felspar. 54. Scapolite. 55. Arctizite, or Wernerite. 56. Spodumene. 57. Fischaugenstein.
4. CLAY GENUS. Thirty species.—Clay family. 1. Pure clay. 2. Porcelain earth. 3. Common clay. 4. Claystone. 5. Adhesive slate. 6. Polishing, or polier slate. 7. Tripoli. 8. Floastone. 9. Alum-stone. 10. Alum-slate. 11. Bituminous shale. 12. Drawing-slate. 13. Whet-slate. 14. Clay-slate.—Mica family. 15. Lepidolite. 16. Mica. 17. Pinite. 18. Pot-stone. 19. Chlorite.—Trap family. 20. Hornblende. 21. Basalt. 22. Wacke. 23. Clinkstone. 24. Iron-clay. 25. Lava.—Lithomarge family. 26. Green earth. 27. Lithomarge. 28. Rock-soap. 29. Umber. 30. Yellow earth.
5. TALC GENUS. Fifteen species.—Soapstone family. 1. Native magnesia, or talc-earth. 2. Bole. 3. Meerschau. 4. Fuller's earth. 5. Steatite. 6. Bildstein.—Talc family. 7. Nephrite. 8. Serpentine. 9. Schillerstone. 10. Talc. 11. Asbest.—Actynolite family. 12. Kyanite. 13. Actynolite. 14. Tremolite. 15. Sahlite.
6. CALC GENUS. Twenty-two species. Carbonates. 1. Rock-milk. 2. Chalk. 3. Limestone. 4. Chert-tuff. 5. Schum-earth, or foam-earth. 6. Slate-spar. 7. Brown-spar. 8. Schaal-stone. 9. Dolomite. 10. Rhomb-spar. 11. Stinkstone. 12. Marl. 13. Bituminous marl-slate. 14. Arragon.—Phosphates. 15. Appatite. 16. Asparagus-stone. 17. Phosphorite.—Fluates. 18. Fluor.—Sulphates. 19. Gips. 20. Selenite. 21. Anhydrite. 22. Cube-spar.
7. BARYTE GENUS. Two species. 1. Witherite. 2. Heavy spar.
8. STRONTIAN GENUS. Two species. 1. Strontian. 2. Celestine.
9. HALLITE GENUS. Two species. 1. Boracite. 2. Cryolite.

CLASS II.

FOSSIL SALTS.

1. CARBONATES. One species. Natural soda, or natron.
2. NITRATES. One species. Natural nitre.
3. MURIATES. Two species. 1. Natural rock-salt. 2. Natural sal-ammoniac.
4. SULPHATES. Five species. 1. Natural vitriol. 2. Hair-salt. 3. Rock-butter. 4. Natural Epsom-salt. 5. Natural Glauber-salts.

CLASS III.

INFLAMMABLE FOSSILS.

1. SULPHUR GENUS. One species. Natural sulphur.
2. BITUMINOUS GENUS. Four species. 1. Mineral, or fossil-oil. 2. Mineral pitch. 3. Brown coal. 4. Black coal.
3. GRAPHITE GENUS. Three species. 1. Glance coal. 2. Graphite. 3. Mineral charcoal.
4. RESIN GENUS. Two species. 1. Amber. 2. Honey-stone.

CLASS IV.

METALLIC FOSSILS.

1. PLATINA GENUS. One species. Native platina.
2. GOLD GENUS. One species. Native gold.
3. MERCURY GENUS. Five species. 1. Native mercury. 2. Natural amalgam. 3. Mercurial horn-ore. 4. Mercurial liver-ore. 5. Cinnabar.
4. SILVER GENUS. Ten species. 1. Native silver. 2. Antimonial silver. 3. Arsenical silver. 4. Corneous silver-ore, or horn-ore. 5. Silver-black. 6. Silver-glance. 7. Brittle silver-glance. 8. Red silver-ore. 9. White silver-ore. 10. Black silver-ore.
5. COPPER GENUS. Eighteen species. 1. Native copper. 2. Copper-glance. 3. Variegated copper-ore. 4. Copper-pyrites. 5. White copper-ore. 6. Pahl, or grey copper-ore. 7. Copper-black. 8. Red copper-ore. 9. Tile-ore. 10. Copper-azure. 11. Malachite. 12. Copper-green. 13. Ironshot copper-green. 14. Copper-emerald. 15. Copper-mica. 16. Lenticular ore. 17. Oliven-ore. 18. Muriate of copper, or copper-muriate.
6. IRON GENUS. Sixteen species. 1. Native iron. 2. Iron-pyrites. 3. Magnetic pyrites. 4. Magnetic ironstone. 5. Iron-glance. 6. Red ironstone. 7. Brown ironstone. 8. Sparry ironstone. 9. Black ironstone. 10. Clay-ironstone. 11. Bog iron-ore. 12. Blue iron-earth. 13. Pitchy iron-ore. 14. Gadolinite. 15. Green iron-earth. 16. Cube-ore.
7. LEAD GENUS. Ten species. 1. Lead-glance. 2. Blue lead-ore. 3. Brown lead-ore. 4. Black lead-ore. 5. White lead-ore. 6. Green lead-ore. 7. Red lead-ore. 8. Yellow lead-ore. 9. Lead-vitriol. 10. Lead-earth.
8. TIN GENUS. Three species. 1. Tin-pyrites. 2. Tinstone. 3. Cornish tin-ore.
9. BISMUTH GENUS. Three species. 1. Native bismuth. 2. Bismuth-glance. 3. Bismuth-ochre.
10. ZINC GENUS. Two species. 1. Blende. 2. Calamine.
11. ANTIMONY GENUS. Six species. 1. Native antimony. 2. Grey antimony-ore. 3. Black antimony-ore. 4. Red antimony-ore. 5. White antimony-ore. 6. Antimony-ochre.
12. COBALT GENUS. Seven species. 1. White cobalt-ore. 2. Grey cobalt-ore. 3. Cobalt-glance. 4. Black cobalt-ochre. 5. Brown cobalt-ochre. 6. Yellow cobalt-ochre. 7. Red cobalt-ochre.
13. NICKEL GENUS. Two species. 1. Copper-nickel. 2. Nickel-ochre.
14. MANGANESE GENUS. Three species. 1. Grey manganese-ore. 2. Black manganese-ore. 3. Red manganese-ore.
15. MOLYBDENA GENUS. One species. Molybdena.
16. ARSENIC GENUS. Four species. 1. Native arsenic. 2. Arsenic-pyrites. 3. Orpiment. 4. Arsenic-bloom.
17. SCHEEL GENUS. Two species. 1. Tungsten. 2. Wolfram.

18. MENACHINE GENUS. Five species. 1. Menachan. 2. Octahedrite. 3. Rutile. 4. Nigrine. 5. Iserine.
19. URAN GENUS. Three species. 1. Pitch-ore. 2. Uran-mica. 3. Uran-ochre.

20. SYLVAN GENUS. Four species. 1. Native sylvan. 2. Graphic-ore. 3. Yellow sylvan-ore. 4. Black sylvan-ore.
21. CHROME GENUS. Two species. 1. Acicular ore. 2. Chrome-ochre.

METHOD OF ANALYSING MINERALS.

"The progress," says Dr. Thomson, "which the art of analysing minerals has made within these last twenty years is truly astonishing. To separate five or six substances intimately combined, to exhibit each of them separately, to ascertain the precise quantity of each, and even to detect the presence and weight of substances, which do not approach one five hundredth part of the compound, would, at no very remote period, have been considered as a hopeless, if not an impossible, task; yet this can now be done with tolerable accuracy. The first person who undertook the analysis of minerals was Margraff of Berlin. His attempts were indeed rude, but their importance was soon perceived by Bergman and Scheele, whose industry and address brought the art to a considerable degree of perfection. But their methods, though they had very considerable merits, were often tedious and uncertain, and could not in all cases be applied with confidence. These defects were perceived by Mr. Klaproth of Berlin, who applied himself to the analysis of minerals with a persevering industry, which nothing could fatigue, and an ingenuity and accuracy, which nothing could perplex. He corrected what was wrong, and supplied what was wanting; invented new processes, discovered new instruments; and to his labours, more than to those of any other chemist, the degree of perfection to which the analysis of minerals has attained, is to be ascribed. Many improvements, however, were introduced by other chemists, especially by M. Vauquelin, whose analyses, in point of accuracy and ingenuity, rival those of Klaproth himself. Before a mineral is submitted to analysis, it ought to be reduced to an impalpable powder. This is by no means an easy task, when the stone is extremely hard. It ought to be raised to a bright red or white heat in a crucible, and then instantly thrown into cold water. This sudden transition makes it crack and break into pieces. If these pieces are not small enough, the operation may be repeated on each, till they are reduced to the proper size. These fragments are then to be beaten to small pieces in a polished steel-mortar; the cavity of which should be cylindrical, and the steel-pestle should fit it exactly, to prevent any of the stone from escaping during the act of pounding. As soon as the stone is reduced to pretty small pieces, it ought to be put into a mortar of rock-crystal, or flint, and reduced to a coarse powder. This mortar should be about four inches in diameter, and rather more than an inch in depth. The pestle should be formed of the same stone with the mortar. Klaproth's mortar is of flint. When the stone has been reduced to a coarse powder, a certain quantity, weighed exactly, 100 grains for instance, ought to be reduced to as fine a powder as possible. This is best done by pounding small quantities of it at once, not exceeding ten grains. The powder is as fine as possible, when it feels soft, adheres together, and, as it were, forms a cake under the paste. It ought then to be weighed exactly. It will almost always be found heavier after being pounded than it was before; owing to a certain quantity of the substance of the mortar being rubbed off during the grinding, and mixed with it. This additional weight must be carefully noted; and, after the analysis, a portion corresponding to it must be subtracted. It is necessary to have a crucible of pure silver, or, what is far preferable, of platina, capable of holding rather more than seven cubic inches of water, with a cover of the same metal; and a spatula of the same about four inches long. The dishes in which the solutions, evaporations, &c. are performed, ought to be of glass or porcelain. Those of porcelain are cheaper, because they are not so apt to break. Those which Vauquelin uses are of porcelain; they are sections of spheres, and are glazed both within and without, except that part of the bottom, which is immediately exposed to the fire. The only substances which enter into the composition of the simple stones, as far as analysis has discovered, are the earths, silica, alumina, zirconia, glucina, lime, and magnesia; and the oxides of iron, manganese, nickel

nickel, chromium, and copper. Seldom more than four or five of these substances are found combined together in the same stone. Let one hundred or two hundred grains of the stone to be analysed, previously reduced to a fine powder, be mixed with three times its weight of pure potass and a little water, and exposed in the silver or platinum-crucible to a strong heat. The heat should at first be applied slowly, and the matter should be constantly stirred, to prevent the potass from swelling and throwing any part out of the crucible. When the whole water is evaporated, the mixture should be kept for half an hour or three quarters in a strong red heat. If the matter in the crucible melt completely, and appear as liquid as water, we may be certain that the stone consists chiefly of silica; if it remain opaque, and of the consistence of paste, the other earths are most abundant; if it remain in the form of a powder, alumina is the prevalent earth. If the matter be of a dark or brownish red colour, it contains oxide of iron; if it be grass-green, manganese is present; if yellowish green, chromium. When the crucible has been taken from the fire, and wiped on the outside, it is to be placed in a capsule of porcelain, and filled with water. This water is to be renewed from time to time, till all the matter is detached from the crucible. The water dissolves a part of the combination of the alkali with the silica and alumina of the stone; and if a sufficient quantity were used, it would dissolve the whole of that combination. Muriatic acid is now to be poured in till the whole of the matter is dissolved. At first a flaky precipitate appears, because the acid combines with the alkali which kept it in solution. Then an effervescence takes place, owing to the decomposition of some carbonate of potass, formed during the fusion. At the same time the flaky precipitate is redissolved; as is also that part of the matter, which, not having been dissolved in the water, had remained at the bottom of the dish in the form of a powder. This powder, if it consist only of silica and alumina, dissolves without effervescence but if it contain lime, effervescence takes place. If this solution be colourless, we may conclude, that it contains no metallic oxide, or only a very small portion; if its colour be purplish red, it contains manganese; orange red indicates the presence of iron; and golden yellow that of chromium. This solution is to be poured into a capsule of porcelain, covered with paper and evaporated to dryness in a sand-bath. When the evaporation is drawing to its completion, the liquor assumes the form of jelly. It must then be stirred constantly with a glass or porcelain rod, to facilitate the disengagement of the acid and water, and to prevent one part of the matter from being too much and the other not sufficiently dried. Without this precaution the silica and alumina would not be completely separated from each other. When the matter is reduced almost to a dry powder, a large quantity of pure water is to be poured on it; and after exposure to a slight heat, the whole is to be poured on a filter. The powder which remains on the filter is to be washed repeatedly, till the water with which it has been washed ceases to precipitate silver from its solutions. This powder is the whole of the silica which the stone we are analysing contained. It must first be dried between folds of blotting paper; then heated red hot in a platinum or silver crucible, and weighed while yet warm. It ought to be a fine powder, of a white colour, not adhering to the fingers, and entirely soluble in acids. If it be coloured, it is contaminated with some metallic oxide; and shews that the evaporation to dryness has been performed at too high a temperature. To separate this oxide the silica must be boiled with an acid, and then washed and dried as before. The acid solution must be added to the water which passed through the filter, and which we shall denominate A. The watery solution A is to be evaporated till its quantity does not exceed 30 cubic inches, or nearly an English pint. A solution of carbonates of potass is then to be poured into it, till no more matter precipitates. It ought to be boiled a few minutes to enable all the precipitate to fall to the bottom. When the whole of the precipitate has collected at the bottom, the supernatant liquid is to be decanted off; and water being substituted in its place, the precipitate and water are to be thrown upon a filter. When the water has run off, the filter, with the precipitation upon it, is to be placed between folds of blotting paper. When the precipitate has acquired some consistence, it is to be carefully collected by an ivory-knife, mixed with a solution of pure potass, and boiled in a porcelain-capsule. If any alumina or glucina be present, they will be dissolved in the potass; while the other substances remain untouched in the form of a powder,

which we shall call B. Into the solution of potass as much acid must be poured as will not only saturate the potass, but completely redissolve any precipitate which may have at first appeared. Carbonate of ammonia is now to be added in such quantity, that the liquid shall taste of it. By this addition the whole of the alumina will be precipitated in white flecks, and the glucina will remain dissolved, provided the quantity of carbonate of ammonia used be not too small. The liquid is now to be filtered, and the alumina, which will remain on the filter, is to be washed, dried, heated red hot, and then weighed. To see if it be really alumina, dissolve it in sulphuric acid, and add a sufficient quantity of sulphate or acetate of potass; if it be alumina, the whole of it will be converted into crystals of alum. Let the liquid, which has passed through the filter, be boiled for some time; and the glucina, if it contain any, will be precipitated in a light powder, which may be dried and weighed. When pure, it is a fine, soft, very light tasteless powder, which does not concretize when heated, as alumina does. The residuum B may contain lime, magnesia, and one or more metallic oxides. Let it be dissolved in weak sulphuric acid, and the solution evaporated to dryness. Pour a small quantity of water on it. The water will dissolve the sulphate of magnesia and the metallic sulphate; but the sulphate of lime will remain undissolved. Let it be heated red-hot in a crucible and weighed. The lime amounts to 0.42 of the weight. Let the solution, containing the remaining sulphates, be diluted with a large quantity of water; let a small excess of acid be added; and then let a saturated carbonate of potass be poured in. The oxides of chromium, iron, and nickel, will be precipitated, and the magnesia and oxide of manganese will remain dissolved. The precipitate we shall call C. Into the solution let a solution of hydrosulphuret of potass be poured, and the manganese will be precipitated in the state of a hydrosulphuret. Let it be calcined in contact with air, and weighed. The magnesia may then be precipitated by pure potass, washed, exposed to a red heat, and then weighed. Let the residuum C be boiled repeatedly with nitric acid, then mixed with pure potass; after being heated, let the liquor be decanted off. Let the precipitate, which consists of the oxides of iron and nickel, be washed with pure water; and let this water be added to the solution of the nitric acid and potass. That solution contains the chromium converted into an acid. Add to this solution an excess of muriatic acid, and evaporate till the liquid assumes a green colour; then add a pure alkali. The chromium precipitates in the state of an oxide, and may be dried and weighed. Let the precipitate, consisting of the oxides of iron and nickel, be dissolved in muriatic acid; and an excess of ammonia: the oxide of iron precipitates. Let it be mashed, dried, and weighed. Evaporate the solution, and the oxide of nickel will also precipitate. Its weight may be ascertained in the same manner with the other ingredients. The weights of all the ingredients are now to be added together, and their sum total compared with the weight of the matter analysed. If the two are equal, or if they differ only by 0.03 or 0.04 parts, we may conclude that the analysis has been properly performed; but if the loss of weight be considerable, something or other has been lost. The analysis must therefore be repeated with all possible care. If there is still the same loss of weight, we may conclude, that the stone contains some substance, which has either evaporated by heat, or is soluble in water. A fresh portion of the stone must therefore be broken into small pieces, and exposed in a porcelain-crucible to a strong heat. If it contain water, or any other volatile substance, they will come over into the receiver; and their nature and weight may be ascertained. If nothing comes over, or if what comes over is not equal to the weight wanting, we may conclude, that the stone contains some ingredient which is soluble in water. To discover whether it contains potass, let the stone, reduced to an impalpable powder, be boiled five or six times in succession, with very strong sulphuric acid, applying a pretty strong heat towards the end of the operation, to expel the excess of acid; but taking care, that it be not strong enough to decompose the salts which have been formed. Water is now to be poured on, and the residuum, which does not dissolve, is to be washed with water till it becomes tasteless. The watery solution is to be filtered and evaporated to dryness, in order to drive off any excess of acid, which may be present. The salts are to be again dissolved in water, and the solution, after being boiled for a few moments, is to be filtered and evaporated to a consistence proper for crystallizing. If the stone contains

contains a sufficient quantity of alumina, and if potass be present, crystals of alum will be formed; and the quantity of potass may be discovered by weighing them, it being nearly one-tenth of their weight. If the stone does not contain alumina, or not in sufficient quantity, a solution of pure alumina in sulphuric acid must be added. Sometimes the alum, even when potass is present, does not appear for several days or even weeks; and sometimes, when a great quantity of alumina is present, if the solution has been too much concentrated by evaporation, the sulphate of alumina prevents the alum from crystallizing at all. Care, therefore, must be taken to prevent this last source of error. The alum obtained may be dissolved in water, and barytic water poured into it as long as any precipitate forms. The liquor is to be filtered and evaporated to dryness. The residuum will consist of potass, and a little carbonate of potass. The potass may be dissolved in a little water. This solution, evaporated to dryness, gives us the potass pure; which may be examined and weighed. If no crystals of alum can be obtained, we must look for some other substance than potass. The stone may contain soda. The presence of this alkali may be discovered by decomposing the solution in sulphuric acid, already described, by means of ammonia. The liquid which remains is to be evaporated to dryness, and the residuum is to be calcined in a crucible: the sulphate of ammonia will thus be volatilized, and the soda will remain. It may be redissolved in water, crystallized, and examined. If sulphuric acid does not attack the stone, as is often the case, it must be decomposed by fusion with soda, in the manner formerly directed with potass. The matter, after fusion, is to be diluted with water, and then saturated with sulphuric acid. The solution is to be evaporated to dryness, the residuum again dissolved in water, and evaporated. Sulphate of soda will crystallize first; and, by a second evaporation, if the stone contains potass and alumina, crystals of alum will be deposited. The presence of potass may be discovered, by mixing with a somewhat concentrated solution of muriate of platinum the salt obtained, either by decomposing the stone immediately by an acid, or by saturating with an acid the matter obtained by fusing the stone with soda. If any potass be present, a very red precipitate will be formed. This precipitate is a triple salt, composed of potass, muriatic acid, and oxide of platinum. Ammonia, indeed, produces the same precipitate, but has not hitherto been discovered in stones. In this manner may earthy substances be analysed. As to saline stones, their analysis must vary according to the acid which they contain. But almost all of them may be decomposed by one or other of two methods: viz.

“I. Analysis of Carbonate of Strontian. Klaproth analysed this mineral, by dissolving 100 parts of it in diluted muriatic acid: during the solution 30 parts of carbonic acid escaped. The solution crystallized in needles, and when dissolved in alcohol, burnt with a purple flame. Therefore it contained strontian. He dissolved a grain of sulphate of potass in 6 oz. of water, and let fall into it 3 drops of the muriatic solution. No precipitate appeared till next day. Therefore the solution contained no barytes; for if it had, a precipitate would have appeared immediately. He then decomposed the muriatic acid solution, by mixing it with carbonate of potass. Carbonate of strontian precipitated. By the application of a strong heat the carbonic acid was driven off. The whole of the earth which remained was dissolved in water. It crystallized; and, when dried, weighed 69½.

“II. Analysis of Sulphate of Strontian. Vauquelin analysed an impure specimen of this mineral as follows: On 200 parts of the mineral, diluted nitric acid was poured. A violent effervescence took place, and part of the mineral was dissolved. The undissolved portion, after being heated red hot, weighed 167. Therefore 33 parts were dissolved. The nitric solution was evaporated to dryness: a reddish substance remained, which indicated the presence of oxide of iron. The substance was redissolved in water, and some ammonia mixed with it; a reddish precipitate appeared, which, when dried, weighed 1, and was oxide of iron. The remainder of the solution was precipitated by carbonate of potass. The precipitate weighed, when dried, 20, and possessed the properties of carbonate of lime. Therefore 200 parts of this mineral contain twenty of carbonate of lime, one of oxide of iron, and the remainder of the 33 parts he concluded to be water. The 167 parts, which were insoluble in nitric acid, were mixed with 500 parts of carbonate of potass, and 7000 parts of water, and

boiled for a considerable time. The solution was then filtered, and the residuum washed and dried. The liquid scarcely effervesced with acids: but with barytes it produced a copious precipitate totally indissoluble in muriatic acid. Therefore it contained sulphuric acid. The undissolved residuum, when dried, weighed 129 parts. It dissolved completely in muriatic acid. The solution crystallized in needles; when dissolved in alcohol it burnt with a purple flame; and in short had all the properties of muriate of strontian. Therefore these 129 parts were carbonate of strontian. Now 100 parts of this carbonate contain 30 of carbonic acid; therefore 129 contain 38·7. Therefore the mineral must contain, in 200 parts, 90·3 of strontian. Now the insoluble residuum of 167 was pure sulphate of strontian; and we have seen, that it contained 90·3 of strontian. Therefore the sulphuric acid must amount to 76·7 parts.

“Coal is composed of charcoal, bitumen, and some portion of earth. The earths may be detected by burning completely a portion of the coal to be analysed. The ashes, which remain after incineration, consist of the earthy part. Their nature may be ascertained by the rules laid down above. For the method of ascertaining the proportion of charcoal and bitumen in coal, we are indebted to Mr. Kirwan. When nitre is heated red hot, and charcoal is thrown on it, a violent detonation takes place; and if the quantity of charcoal be sufficient, the nitre is completely decomposed. Now it requires a certain quantity of pure charcoal to decompose a given weight of nitre. From the experiments of Lavoisier, it follows, that when the detonation is performed in close vessels under water, 13·21 parts of charcoal are capable of decomposing 100 parts of nitre. But when the detonation is performed in an open crucible, a smaller portion of charcoal is necessary, because part of the nitre is decomposed by the action of the surrounding air. Scheele found, that, under these circumstances, ten parts of plumbago were sufficient to decompose 96 parts of nitre; and Mr. Kirwan found, that nearly the same quantity of charcoal was sufficient for producing the same effect. Macquer observed, that no volatile oily matter will detonate with nitre, unless it be reduced to a charcoal; and that then its effect upon charcoal is precisely proportional to the charcoal which it contains. Mr. Kirwan, upon trying the experiment with vegetable pitch and maltha, found that these substances did not detonate with nitre, but merely burn upon its surface with a white or yellow flame; and that after they were consumed, nearly the same quantity of charcoal was necessary to decompose the nitre, which would have been required if no bitumen had been used at all. Now coals are chiefly composed of charcoal and bitumen. It occurred therefore to Mr. Kirwan, that the quantity of charcoal, which any coal contains, may be ascertained by detonating it with nitre. For, since the bitumen of the coal has no effect in decomposing nitre, it is evident, that the detonation and decomposition must be owing to the charcoal of the coal; and that, therefore, the quantity of coal, necessary to decompose a given portion of nitre, will indicate the quantity of carbon which it contains; and the proportion of charcoal and earth, which any coal contains, being ascertained, its bituminous part may be easily had from calculation. The crucible, which he used in his experiments, was large; it was placed in a wind-furnace at a distance from the flue, and the heat in every experiment was as equal as possible. The moment the nitre was red hot, the coal, previously reduced to small pieces of the size of a pin's head, was projected in portions of one or two grains at a time, till the nitre would no longer detonate; and every experiment was repeated several times to ensure accuracy. He found that 480 grains of nitre required fifty grains of Kilkenny-coal to decompose it by this method. Therefore ten grains would have decomposed 96 of nitre; precisely the quantity of charcoal which would have produced the same effect. Therefore Kilkenny-coal is composed almost entirely of charcoal. The diversity of metallic ores is so great, that no general method of analysis can be obtained; we shall give a few examples from Dr. Thomson serving for the principal metals. The presence of gold may easily be detected, by treating the mineral supposed to contain it, with nitro-muriatic acid, and dropping muriate of tin into the solution. If the solution contains any gold, a purple precipitate immediately appears.

“NATIVE GOLD ought to be dissolved in nitro-muriatic acid: the silver, if any be present, falls to the bottom in the state of muriate, and may be separated by filtration, and weighed. Pour sulphate

sulphate of iron into the solution, and the gold is precipitated in the metallic state. The copper, if any be present, may be precipitated by a plate of iron. The presence of iron may be ascertained, by dropping tincture of nut-galls into a portion of the solution. The analysis of the ores of silver has been always considered as very important, on account of the great value of the metal.

"NATIVE SILVER is to be dissolved in nitric acid. The gold, if the ore contains any, remains in the state of a black powder, and may be dried and weighed. The silver may be precipitated by common salt: 100 parts of the precipitate, dried, denote about 75 parts of silver. The presence of copper may be ascertained by the green colour of the solution, and by the blue colour it assumes on adding ammonia. The copper may be precipitated by a plate of iron, or by the rules laid down hereafter. When the ore contains arsenic, its proportion may be estimated by weighing before and after fusion; for the arsenic is dissipated by heat, or the ore may be dissolved in nitric acid, which acidifies the arsenic. After the separation of the silver, the arsenic acid may be precipitated by nitrate of lead; 100 parts of the dry precipitate indicating about 22 of the arsenic.

"ALLOY OF SILVER AND ANTIMONY is to be treated with nitric acid, which dissolves the silver, and oxidates the antimony. The silver is estimated as above. The oxide of antimony may be reduced by fusion with four times its weight of black flux and a little soap.

"SULPHURET OF SILVER is to be treated with diluted nitric acid, which dissolves the silver, leaving the greater part of the sulphur untouched. The residuum is to be dried, and then the sulphur burnt off. The loss of weight gives the sulphur. The residuum is the gangue of the ore, which may be analysed by the rules laid down in the last chapter. The silver is to be precipitated by common salt; and the other metals, if any be present, may be ascertained as above. Part of the sulphur is always acidified. The acid thus formed may be precipitated by nitrate of barytes; 100 parts of the dried precipitate indicating about 14.5 of sulphur.

"MURIATE OF SILVER was analysed by Klaproth as follows: 100 parts were mixed with thrice their weight of pure carbonate of potass, and melted together in a glass-retort. The mass was dissolved in water, and the solution filtered. A residuum remained, which was dissolved in nitric acid, with the exception of a red powder; which, treated with nitro-muriatic acid, was dissolved, except a little muriate of silver, which, when reduced, yielded 0.5 of pure silver. Ammonia precipitated from the nitro-muriatic solution 2.5 parts oxide of iron. The nitric solution was precipitated by common salt; the muriate of silver, thus obtained, yielded, when reduced, 67.25 of pure silver. The original aqueous solution of the alkaline mass was saturated with acetic acid, on which it deposited 1.75 parts of alumina. The solution was evaporated to dryness, and the dry mass treated with alcohol, which dissolved the acetate of potass. The residuum, amounting to 58.75 parts, was dissolved in water; and being treated with muriate of barytes, fifteen parts of sulphate of barytes precipitated, indicating the presence of about 0.5 of sulphuric acid, and 0.75 sulphate of potass. The remaining 58 parts were muriate of potass, indicating about 12 parts muriatic acid.

"NATIVE COPPER sometimes contains gold, silver, or iron. It may be dissolved in nitric acid; the gold remains in the state of a blackish, or rather violet-coloured, powder; the silver may be separated by a polished plate of copper; (or precipitated from a portion of the solution by common salt); the iron may be separated by boiling the solution to dryness, and treating the residuum with water. By this process, the nitrate of iron is decomposed; the oxide of iron remains, while the water dissolves the nitrate of cop-

per. This salt may be decomposed by boiling it with potass: the precipitate dried in a red heat, is black oxide of copper: 100 parts of it denote 80 of metallic copper.

"SULPHATE OF COPPER may be dissolved in diluted nitric acid. Part of the sulphur remains unaltered, and may be estimated by weighing it, and burning it off. Part is acidified, and may be precipitated by nitrate of barytes; 100 parts of the dried precipitate indicating 14.5 of sulphur. By evaporation to dryness, and solution in water, the iron is separated; and the copper may be estimated as above; or muriatic acid may be used instead of nitric: but in that case it is much more difficult to obtain a complete solution.

ARSENATE OF COPPER was thus analysed by Mr. Chevenix. The ore was dissolved in diluted nitric acid, nitrate of lead poured in. The solution was evaporated till a precipitate began to appear, and then mixed with alcohol. Arseniate of lead precipitated: 100 parts of this salt indicate 33 of arsenic acid. The copper was separated from the nitric acid by boiling it with potass.

"PYRITES, OR SULPHURETED IRON, may be treated repeatedly with boiling nitric acid, till the sulphur is acidified. Muriatic acid is then to be added, and the digestion continued till the whole be dissolved. Muriate of barytes is then to be added, to precipitate the sulphuric acid; 100 of the dried precipitate indicates 14.5 of sulphur. If the solution contains only iron, it may be precipitated by carbonate of soda, calcined to redness and weighed. But if earths or manganese be present, we must proceed by the rules laid down above for those substances.

"THE SULPHURET OF TIN was thus analysed by Klaproth: 120 parts of the ore was digested with nitro-muriatic acid; 43 parts remained undissolved. Of these, 30 burnt away with a blue flame, and were sulphur; of the remaining 13, eight dissolved in nitro-muriatic acid. The undissolved five were heated with wax, and yielded a grain of iron attracted by the magnet. The rest was a mixture of alumina and silica. The nitro-muriatic solution was completely precipitated by potass, and the precipitate redissolved in muriatic acid. A cylinder of tin precipitated 44 parts of copper from this solution, and lost itself 89 parts of its weight. A cylinder of zinc precipitated 130 parts of tin; so that deducting the 89 parts of tin dissolved during the precipitation of the copper, 41 remained for the tin contained in the ore.

"SULPHURET OF LEAD usually contains a little silver, and sometimes also antimony and zinc. It may be treated with diluted nitric acid, which leaves only the sulphur undissolved, the weight of which is to be taken, and its purity determined by combustion. If antimony be present, it will either remain in the state of a white oxide, or, if dissolved, will be precipitated by diluting the solution with water. Muriatic acid is to be added, and the solution evaporated till it is reduced to a small portion. Muriate of lead and of silver precipitate. The first of these may be dissolved in boiling water; the second remains insoluble. Westrum separated the muriate of silver, by digesting the precipitate with ammonia. The liquid, from which the muriates are separated may contain iron, zinc, and copper. The iron may be precipitated by ammonia added in excess; the copper by a plate of zinc: the zinc by carbonate of soda, reduced to the metallic state and weighed, subtracting what had been separated from the plate of zinc.

"CARBONATE OF LEAD may be dissolved in nitric acid, collecting and estimating the carbonic acid. By boiling the solution, the iron and antimony (if present) will be separated, and may be estimated by solution in muriatic acid; precipitating the antimony by water, and the iron by ammonia. From the nitric solution the lead may be precipitated by sulphuric acid, and the earth may be examined by the rules laid down above."

MINERVA, ATHENA, or PALLAS, in Pagan worship, the goddess of sciences and of wisdom, who sprung completely armed from Jupiter's brain; and on the day of her nativity it rained gold at Rhodes. She disputed with Neptune the honour of giving a name to the capital of Cecropia, when they agreed that whosoever of them should produce what was most useful to mankind, should have that advantage. Neptune, with a stroke of his trident,

formed a horse; and Minerva caused an olive to spring from the ground, which was judged by the unanimous voice of the gods to be the most useful, from its being the symbol of peace; whereupon she gave her name Athenæ to the city, and became its tutelard goddess. Minerva is usually represented by the poets, painters, and sculptors, completely armed, with a composed but agreeable countenance, bearing a golden breast-plate, a spear in her right-hand,

band, and her *egis* or shield in the left, on which is represented Medusa's head encircled with snakes, and her helmet usually entwined with olives. Minerva had several temples both in Greece and Italy. The usual victim offered her was a white heifer, never yoked. The animals sacred to her were the cock, the owl, and the basilisk.

MINERVÆ ARX, MINERVÆ CASTRUM, MINERVIVM, or TEMPLUM MINERVÆ, a citadel, temple, and town, on the Ionian sea, beyond Hydrus; now called Castro, a town of Otranto in Naples. Lon. 19. 25. E. Lat. 46. 8. N.

MINERVÆ PROMONTORIUM, in ancient geography, the seat of the Sirens, a promontory of Italy, in the Sinus Paestanus, now called Capo della Minerva, on the W. coast of Naples, over against the island Capri.

MINERVALIA, in Roman antiquity, festivals celebrated in honour of Minerva; in March the scholars had a vacation, and usually made a present to their masters, called from this festival *Minerval*.

MINGALLA, one of the Western Islands of Scotland, nine miles S. of Barra.

MINGAN ISLANDS, a cluster of islands on the S. coast of Labrador, so named from the largest one.

MINGO, an Indian town, on the W. bank of the Ohio, 40 miles S. W. of Pittsburg.

MINGOES, a nation of N. American Indians, who inhabit the banks of the S. branch of the Sciota.

MINGRELIA, a part of Western Georgia, in Asia, anciently called Colchis; bounded on the E. by Iberia, or Georgia properly so called; on the W. by the Euxine Sea; on the S. by Armenia, and part of Pontus; and on the N. by Mount Caucasus. It is watered by many rivers; particularly the Corex, the Hippus, the Cyaneus, the Charistus, the Phasis, where the Argonauts landed, the Absarus, the Cissa, and the Ophis, all running into the Euxine Sea. The whole kingdom of Colchis was in ancient times very pleasant and fruitful, as it is still where duly cultivated; abounded in all the necessities of life; and was enriched with many mines of gold, which gave occasion to the fable of the Golden Fleece and the Argonautic expedition so much celebrated by the ancients.

MINHO, a great river in Spain, which taking its rise in Galicia, divides that province from Portugal, and falls into the Atlantic at Caminha.

MINIATO, Str. an episcopal town of Etruria, on the Arno, 20 miles S. W. of Florence. Lon. 10. 45. E. Lat. 43. 40. N.

MINIATURE PAINTING, a delicate kind of painting, in which the subjects are represented on a very small scale. The effect is usually produced by little points or dots done on vellum, ivory, or paper, with water-colours. The word comes from the French *mignature*, from *mignon*, fine, or pretty, on account of its smallness and delicacy; and it may be ultimately derived from *μικρος*, small, or *minimus*, least. Miniature is distinguished from other kinds of painting by the smallness and delicacy of its figures; on which account it requires to be viewed very closely. As many persons wish to amuse themselves with painting in miniature, who know little or nothing of the principles of drawing or painting, various methods have been invented, such as copying by squares, on oiled paper, &c. Perhaps one of the best mechanical inventions to assist such persons is the mathematical compass called a **PENTAGRAPH**, which see. This instrument may be made of ten pieces of wood or brass in form of rulers, half a quarter of an inch thick, six inches broad, and about a foot long. See Plate CXVIII. fig. 2. The little board A is of fir, covered with linen, as the piece to be copied, and the paper or vellum are to be fixed upon it. On this the compass must be fixed with a pin, by the end of the first foot B, deep enough to keep it close, but not so deep as to hinder it from turning easily. To reduce a figure, place the original on the side of the foot C, and the vellum or paper on the side of the foot B; removing the vellum, or drawing it nearer, as it is wished to reduce or enlarge. A crayon or black-lead-pencil must be put in the foot under which the vellum lies, and a pin blunted in that over the original, with which the traces are to be copied. See **DRAWING**, and **PAINTING**. For a long time miniature-painting was employed upon vellum, paper, &c. but in the present improved state of the art, ivory is more used than any of these materials. The chief colours made use of in miniature-painting are: Carmine. Venice and Florence-lake. Rose-pink. Vermillion.

Red lead. Brown red. Red orpiment. Ultramarine. Verditer. Indigo. Gall-stone. Yellow ochre. Dutch-pink. Gamboge. Naples-yellow. Pale masticot. Deep yellow masticot. Ivory-black. Lamp-black. True indian-ink. Bistre, or wood-soot. Raw umber. Burnt umber. Sap-green. Verdigrise. Flake-white.

MINIM, in music, a note equal to two crotchets, or half a semibreve. See **MUSIC**.

MINIMS, a religious order in the church of Rome, founded by St. Francis de Paula, towards the end of the 15th century. Their habit is a coarse black woollen stuff, with a woollen girdle, of the same colours, tied in five knots.

MINIMUM, in the higher geometry, the least quantity attainable in a given case.

MINION, [*mignon*, Fr.] a favourite; a darling; a low dependant; one who pleases rather than benefits. A word of contempt, or of slight and familiar kindness.

MINION, a piece of cannon, at present but little used in the field.

MINISTER, a person who preaches, performs religious worship in public, administers the sacraments, &c.

MINISTER, FOREIGN, a person sent into a foreign country, to manage the affairs of his province, or of the state to which he belongs. Of these there are two kinds: those of the first rank are ambassadors and envoys extraordinary, who represent the persons of their sovereigns: the ministers of the second rank are the ordinary residents.

MINISTER OF STATE. See **PRIVY COUNCIL**.

MINITOBA, a lake of Canada, 100 miles long, and from 10 to 15 broad. Lon. 100. 20. W. Lat. 50. 40. N.

MINIUM, or **RED LEAD**, an oxide of lead of a vivid red colour, which it acquires by a slow calcination and reverberation. The minium in commerce is chiefly brought from Holland, where large quantities of it are manufactured. The method in which minium is made in large quantities with us is this: They first burn lead in a furnace into a kind of litharge, by continually stirring it while melted with an iron-rake; this they afterwards grind with two pairs of stones, which deliver it from one to another, the first pair grinding it coarser, the second finer; these are worked by means of a mill which moves six pairs of them at once. When thus reduced to a fine powder, it is washed, and then put into a furnace, and is burnt with a reverberatory fire for two or three days, all the while they continue stirring it with a large iron-rake, hung on a swivel or iron-hook; and toward the end of the time they watch its being of the right colour. When this is doing, the fire must not be carried beyond a certain degree, lest the matter clot and run together. See **LEAD**.

MINNOW, a species of **CYPRINUS**, which see.

MINONG, an island of Canada, in Lake Superior, 30 miles long and 10 broad. Lon. 89. 0. W. Lat. 48. 0. N.

MINOR, [Lat.] in law, denotes a person under age; or who, by the laws of the country, is not arrived at the power of administering his own affairs, or the possession of his estate. Among us, a person is a minor till the age of 21; before which time his acts are invalid. See **AGE**, **INFANT**, and **MAJOR**. It is a maxim in the common law, that in the King there is no minority, and therefore he hath no legal guardian; and his royal grants and assents to acts of parliaments are good, though he has not, in his natural capacity, attained the legal age of 21. It is also provided by the custom and law of parliament, that no one shall sit or vote in either house, unless he be 21 years of age. This is expressly declared by stat. 7 and 8 William III. cap. 25, with regard to the house of commons.

MINOR, in logic, is the second proposition of a formal or regular syllogism, called also the assumption. See **LOGIC**.

MINOR, in music, is applied to certain concords, which differ from, or are lower than, others of the same denomination by a less semitone or four commas. Thus we say, a third minor or less third, or a sixth major and minor. Concords that admit of major and minor, *i. e.* greater and less, are said to be imperfect concords. See **MAJOR**.

MINORS, FRIARS MINOR, or **MINORITES**, appellations which the Franciscans assume. See **FRANCISCANS**. There is also an order of Regular Minors at Naples, which was established in 1588, and confirmed by Sixtus V.

MINORBINO, a town and bishop's see of Naples, in Bari, 26 miles N. of Cirenza. Lon. 16. 19. E. Lat. 41. 8. N.

MINORCA,

MINORCA, an island of the Mediterranean, situated between 39° and 40° N. Lat. and near 4° of Lon. E. It is about 33 miles long, and from 8 to 12 broad. The form is very irregular; and the coasts are much indented by the sea, which forms a great number of little creeks and inlets, some of which might be very advantageous. This island is one of those called by the ancient Romans *Baleares*, which arose from the dexterity of the inhabitants in using the sling. The soil is light, thin, and very stony, with a great deal of sea-salt, and in some places, of calcareous nitre, intermixed. In most places there is so little earth, that the island appears to be but one huge irregular rock covered here and there with mould, and an infinite variety of stones. Notwithstanding this, however, it is not only extremely proper for vineyards, but produces more wheat and barley than could at first sight be imagined.

MINOS I. in fabulous history, king of Crete, son of Jupiter and Europa. He flourished about B. C. 1432. He gave laws to his subjects, which remained in force in the age of the philosopher Plato, about 1000 years after his death. His justice and moderation procured him the titles of the favourite of the gods, the confidant of Jupiter, and the wise legislator in every city of Greece: and, according to the poets, he was rewarded for his equity after death with the office of supreme judge in the infernal regions. In this character he is represented sitting in the shades, and holding a sceptre in his hand. The dead plead their causes before him; and the impartial judge shakes the fatal urn, which is filled with the destinies of mankind. He married Ithone, by whom he had Lycastes, the father of Minos II.

MINOS II. the grand-son of Minos I. and king of Crete, married Pasiphae, the daughter of Apollo and Perseus, by whom he had many children. He increased his dominions by the conquest of the neighbouring islands; but shewed himself cruel in the war against the Athenians, who had put to death his son Androgeus. He took Megara by the treachery of Scylla; and obliged the vanquished to send annually to Crete seven chosen boys and seven virgins to be devoured by the Minotaur. This bloody tribute was abolished when Theseus destroyed the monster. When Dædalus, whose industry and invention had fabricated the labyrinth, and whose imprudence, in assisting Pasiphae in the gratification of her unnatural desires, had offended Minos, fled with artificial wings from the place of his confinement, and arrived safe in Sicily, Minos pursued him, and resolved to punish his infidelity. Cocalus, king of Sicily, who had hospitably received Dædalus, entertained his royal guest with dissimbled friendship; and to preserve an artist whose ingenuity and abilities he so well knew, he put Minos to death, about 35 years before the Trojan war. He was father of Androgeus, Glaucus, Deucalion, Phædra, and Ariadne. Many authors have confounded the two Minoses; but Homer, Ptolemy, and Diodorus, prove plainly that they were two different persons.

MINOTAUR, in fabulous history, the fruit of Pasiphae's amour with a bull. Minos having refused to sacrifice a white bull to Neptune, which he had received from the god for that purpose, Neptune, in revenge, made Pasiphae the wife of Minos enamoured of this fine bull. Dædalus prostituted his talents subservient to the queen's unnatural desires; and by his means, Pasiphae's horrible passions were gratified, and the Minotaur came into the world. Minos confined in the labyrinth this monster, where he devoured the young men and maidens annually exacted from the Athenians. Theseus delivered his country from this barbarous tribute, when it had fallen to his lot to be devoured; and by means of Ariadne, the daughter of Minos, destroyed the monster, and escaped from the windings of the labyrinth. The fable of the Minotaur has been thus explained:—Pasiphae was enamoured of one of her husband's courtiers called *Taurus*, or *Tauros*, (which in Greek as well as Latin signifies a bull;) and Dædalus favoured the passion of the queen, by allowing his house to become the retreat of the two lovers. Pasiphae brought forth twins, one of whom greatly resembled Minos and the other Taurus; whence originated the name, and the fable, of the Minotaur.

MINSK, or **MINSKI**, a palatinate of Russian Lithuania, containing fertile plains and extensive forests. Bee-husbandry is much cultivated, and great quantities of honey exported.

MINSKI, the capital of the above palatinate, 55 miles S. E. of Wilna. Lon. 26. 30. E. Lat. 53. 45. N.

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MINSTREL, [from the French *menestrier*,] in ancient customs, certain persons who combined the character of poet and musician, and whose profession it was to wander about the countries they inhabited, singing panegyrical songs and verses on their occasional benefactors, accompanying them with some musical instrument. They united the powers of melody, poem, and dance. The Saxons, as well as the ancient Danes, had been accustomed to hold men of this profession in the highest reverence. Their skill was considered as something divine, their persons were deemed sacred, their attendance was solicited by kings, and they were every-where loaded with honours and rewards. In short, poets and their art were held among them in that rude admiration, which is shewn by an ignorant people to such as excel them in intellectual accomplishments. When the Saxons were converted to Christianity, in proportion as letters prevailed among them, this rude admiration began to abate, and poetry was no longer a peculiar profession. The poet and the minstrel became two persons. Poetry was cultivated by men of letters indiscriminately, and many of the most popular rhymes were composed amidst the leisure and retirement of monasteries. But the minstrels continued a distinct order of men, and got their livelihood by singing verses to the harp at the houses of the great. There they were still hospitably and respectfully received, and retained many of the honours shewn to their predecessors, the Bards and Scalds. However towards the end of the 16th century, this class of men had lost all credit, and were sunk so low in the public opinion, that in the 39th of Elizabeth a statute was passed by which "minstrels, wandering abroad," were included among "rogues, vagabonds, and sturdy beggars," and were adjudged to be punished as such. This act seems to have put an end to the profession.

MINT, in botany. See **MENTHA**.

MINT, [*minetian*, to coin, Sax.] the place where money is coined. There were anciently mints in almost every county in England; but the only mint at present in the British dominions is that in the tower of London. The officers of the mint are, 1. The warden, who is the chief; he oversees the other officers, and receives the bullion. 2. The master-worker who receives bullion from the warden, causes it to be melted, delivers it to the moneyers, and, when it is coined, receives it again. 3. The comptroller, who is the overseer of all the inferior officers, and sees that all the money is made to the just assize. 4. The assay-master, who weighs the gold and silver, and sees that it is according to the standard. 5. The two auditors who take the accounts. 6. The surveyor of the melting; who, after the assay-master has made trial of the bullion, sees that it is cast out and not altered after it is delivered to the melter. 7. The engraver; who engraves the stamps and dyes for the coinage of the money. 8. The clerk of the irons; who sees that the irons are clean and fit to work with. 9. The melter who melts the bullion before it be coined. 10. The provost of the mint; who provides for and oversees all the moneyers. 11. The blanchers, who anneal and cleanse the money. 12. The moneyers: some of whom forge the money, some share it, some round and mill it, and some stamp and coin it. 13. The porters who keep the gate.

MINT, a pretended place of privilege, in Southwark, near the King's Bench, abolished by statute. If any persons, within the limits of the mint, shall obstruct any officer in the serving of any writ or process, &c. or assault any person therein, so as he receive any bodily hurt, the offender shall be guilty of felony, and be transported to the plantations, &c. Stat. 9. Geo. I.

MINTON, an island on the W. coast of Sumatra. Lon. 97. 8. E. Lat. 20. 55. S.

MINUARTIA, in botany, a genus of the triandria trigynia class and order. Natural order, Caryophylli. Calyx five-leaved; corolla none; capsule one-celled, three-valved. There are three species, all annual plants, natives of Spain.

MINUET, a graceful dance, consisting of a coupée, a high step, and a balance: it begins with a beat, and its motion is triple. The invention of it is generally ascribed to the French, and particularly to the inhabitants of Poictou. The word is by Menage and Furetiere derived from the French *menue* or *menu*, small, and literally signifies a small pace.

MINUTE, [from *minutus*, small,] in geometry, the sixtieth part of a degree of a circle. Minutes are denoted by a dash thus

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('); a second, or sixtieth part of a minute, thus ("'); and the third by three ("''), &c.

MINUTE OF TIME, the sixtieth part of an hour.

MINUTE, in architecture, usually denotes the 60th, sometimes the 30th, part of a module. See **ARCHITECTURE**.

MINUTE is also used for a memoir, or short sketch of a thing taken in writing.

MINUTE-GLASS, a glass of which the sand measures a minute.

MINYÆ, the ancient inhabitants of Orchomenos in Bœotia, so named from Minyas king of the country.

MINYAS, in fabulous history, a king of Bœotia, the son of Neptune by Tritogenia, daughter of Æolus. He had six sons, of whom the most famous were Orchomenos and Athamas; and three daughters.

MINYIDES, the three daughters of Minyas, called Alcithoe, Leucippe, and Leuconoe, who were changed into bats. Ovid. Met. iv. Fab. 12.

MIOLANS, a town of France, in the department of the Lower Alps; 9 miles W. of Barcelonetta. Lon. 6. 20. E. Lat. 45. 35. N.

MIOS, a large lake of Norway, in Hedemarke, Aggerhuus; 50 miles long from N. to S. from 12 to 18 broad, and 80 in circumference. The south end of this lake is 30 miles N. E. of Christiania.

MIQUELON, a small desert island S. W. of Cape May in Newfoundland. Lon. 56. 5. W. Lat. 46. 56. N.

MIRABILIS, **MARVEL OF PERU**; a genus of the monogynia order, and pentandria class of plants. Corolla funnel-shaped above; calyx inferior; nectarium globular, containing the germs. There are four species.

M. JALAPPA, the **COMMON MARVEL OF PERU**, has a large, thick, fleshy root; an upright, thick, jointed stalk, dividing and branching numerous, widely, and erectly, a yard or more high, garnished with oblong, broad, opposite leaves; and all the branches and shoots terminated by numerous flowers in clusters, of different colours in the varieties.

MIRACLE, [*miraculum*, Lat.] an effect contrary to the established constitution and course of things, or a sensible deviation from the known laws of nature. That the universe is governed by stated general rules, or that there is an order of causes and effects established in every part of the visible system of nature, is a fact which cannot be controverted. If the Supreme Being be the only real agent in the universe, we have the evidence of experience, that, in the particular system to which we belong, he acts by stated rules. If he employs inferior agents to conduct the various motions from which the phenomena result, we have the same evidence that he has subjected those agents to certain fixed laws, commonly called the laws of nature. On either hypothesis, effects which are produced by the regular operation of these laws, or which are conformable to the established course of events, are properly called natural; and every deviation from this constitution of the natural system, and the correspondent course of events in it, is called a miracle. If this definition be just, no event can be deemed miraculous merely because it is strange, or even to us unaccountable; since it may be nothing more than a regular effect of some unknown law of nature. In this country earthquakes are rare; and for monstrous births perhaps no particular and satisfactory account can be given: yet an earthquake is as regular an effect of the established laws of nature as any of those with which we are most intimately acquainted; and under circumstances in which there would always be the same kind of production, the monster is nature's genuine issue. It is therefore necessary, before we can pronounce any effect to be a true miracle, that the circumstances under which it is produced be known, and that the common course of nature be in some degree understood; for in all those cases in which we are totally ignorant of nature, it is impossible to determine what is, or what is not, a deviation from its course. Miracles, therefore, are not, as some have represented them, appeals to our ignorance. They suppose some antecedent knowledge of the course of nature, without which no proper judgement can be formed concerning them; though with it their reality may be so apparent as to prevent all possibility of a dispute. Thus, were a physician to cure a blind man of a cataract, by anointing his eyes with a chemical preparation which we had never before seen, and to the nature and effects of which we are absolute

strangers, the cure would undoubtedly be wonderful; but we could not pronounce it miraculous, because, for any thing known to us, it might be the natural effect of the operation of the unguent on the eye. But were he to recover his patient merely by commanding him to see, or by anointing his eyes with clay and spittle, we should with the utmost confidence pronounce the cure to be a miracle; because we know perfectly that neither the human voice nor human saliva have, by the established constitution of things, any such power over the diseases of the eye. No one is now ignorant, that persons apparently dead are often restored to their families and friends, by being treated in the manner recommended by the Humane Society. To the vulgar, and sometimes even to men of science, these effects appear very wonderful; but as they are known to be produced by physical agency, they can never be considered as miraculous deviations from the laws of nature. On the other hand, no one could doubt of his having witnessed a real miracle who had seen a person that had been four days dead come alive out of his grave at the call of another, or who had even beheld a person exhibiting all the symptoms of death instantly resuscitated merely by being commanded to live. Thus it is easy, in all cases in which the course of nature is understood, to determine whether any particular event be really a miracle; while in circumstances where we know nothing of nature and its course, even a true miracle could not be admitted as such, or carry any conviction to the mind of a philosopher. If miracles be effects contrary to the established constitution of things, we are certain that they will never be performed on trivial occasions. The constitution of things was established by the Creator and Governor of the universe, and is undoubtedly the offspring of infinite wisdom pursuing a plan for the best of purposes. From this plan no deviation can be made but by God himself, or by some powerful being acting with his permission. The plans of infinite wisdom must be absolutely perfect. From this consideration, some have concluded, that no miracle was ever wrought, or can rationally be expected; but mature reflection must satisfy us that all such conclusions are hasty. Man is unquestionably the principal creature in this world, and apparently the only one in it, who is capable of being made acquainted with the relation in which he stands to his Creator. We cannot, therefore, doubt, but that such of the laws of nature as extend not their operation beyond the limits of this earth were established chiefly, if not solely, for the good of mankind: and if, in any particular circumstances, that good can be more effectually promoted by an occasional deviation from those laws, such a deviation may be reasonably expected. Were man, in the exercise of his mental and corporeal powers, subjected to the laws of physical necessity, the circumstances supposed would indeed never occur, and of course no miracle could be admitted. But such is not the nature of man. For the reality of the Gospel-miracles we have evidence as convincing to the reflecting mind, as those had who were contemporary with Christ and his apostles, and were actual witnesses to their mighty works.

MIRAGOANE, a town of Hispaniola, on the S. side of Leogane, 69 miles W. by S. of Port au Prince.

MIRANDA DE CORVO, a town of Portugal, in the province of Beira, 15 miles S. of Coimbra.

MIRANDA DE DUERO, a strong town of Portugal, and capital of Tra-los-Montes. Lon. 5. 40. W. Lat. 41. 30. N.

MIRANDA DE EBRO, a town of Spain, in Old Castile. Lon. 3. 10. W. Lat. 42. 52. N.

MIRANDE, a town of France, in the department of Gers, and late province of Gascony; 15 miles S. W. of Auch. Lon. 0. 21. E. Lat. 42. 53. N.

MIRANDOLA, a late principality of Italy, between the late duchies of Mantua and Modena, nearly surrounded by the latter. It is now included in the department of Panaro.

MIRANDOLA, a town of Italy in the department of Panaro, and district of Modena; 14 miles N. E. of Modena, and 20 S. E. of Mantua. Lon. 11. 5. E. Lat. 44. 52. N.

MIREBEAU, a town of France, in the department of Vienne, 16 miles N. W. of Poitiers. Lon. 0. 19. E. Lat. 46. 46. N.

MIRECOURT, a town of France, in the department of the Vosges, and late province of Lorraine; 30 miles S. E. of Toul. Lon. 6. 14. E. Lat. 48. 15. N.

MIRE-CROW, or **PEWIT**. See **LARUS**.

MIREPOIN, a town of France, in the department of Arriege, 15 miles

15 miles N. of Foix, and 40 S. E. of Toulouse. Lon. 1. 56. E. Lat. 48. 7. N.

MIRROR, [*miroir*, Fr. *mirar*, Spanish, to look,] any polished body, that forms the images of objects, by reflection of the rays of light. See **OPTICS**, and **REFLECTION**. Mirrors are either plain, convex, or concave. The first reflect the rays of light in a direction exactly similar to that in which they fall upon them, and therefore represent bodies of their natural magnitude. The convex ones make the rays diverge much more than before reflection, and therefore greatly diminish the images of those objects which they shew: while the concave ones, by collecting the rays into a focus, not only magnify the objects they shew, but will burn very fiercely when exposed to the rays of the sun: and hence they are commonly known by the name of burning mirrors. See **BURNING GLASS**.

MIRRORS, METHODS OF BLOWING, CASTING, GRINDING, AND POLISHING GLASS FOR. See **GLASS-MAKING**.

MISADVENTURE, in common language, signifies any unlucky accident which takes place without being foreseen.

MISADVENTURE, in law, has an especial signification for the killing a man partly by negligence, and partly by chance. See **HOMICIDE**.

MISANTHROPY, [from *μισος*, hatred, and *ανθρωπος*, a man,] hatred of mankind.

MISCELLANÆE, in botany, the name of the fifty-fourth order in Linnæus's "Fragments of a Natural Method," consisting of plants, which not being connected together by numerous relations, in their habit and structure, as the natural families, are assembled into one head, under the general title of miscellaneous plants. See **BOTANY**.

MISCELLANY, LITERARY. See **MAGAZINE**.

MISCHKIN, a town of Russia, in Jaroslaw, 60 miles W. of Jaroslaw. Lon. 40. 22. E. Lat. 58. 42. N.

MISCHNA, or **MISNA**, [from *משנה*, *iteravit*, i. e. he repeated,] the first part of the Jewish Talmud. The Mischna contains the text; and the Gemara, which is the second part of the Talmud, contains the commentaries. See **GEMARA**. The Mischna consists of various traditions of the Jews, and of explanations of several passages of Scripture: these traditions, serving as an explanation of the written law, and supplement to it, are said to have been delivered to Moses during his abode on the Mount; which he afterwards communicated to Aaron, Eleazar, and Joshua.

MISDEMEANOR, in law, signifies a crime; but the law distinguishes between crimes of a higher and a lower nature; the latter being denominated misdemeanors, the former felonies, &c. Blackstone, in his Commentaries, (vol. iv. 5.) thus distinguishes them, "A crime, or misdemeanour, is an act committed or omitted, in violation of a public law, either forbidding or commanding it."

MISE, in law, is used in various senses: sometimes for costs or expences; in which sense it is commonly used in entering of judgements in actions personal. It is also used for the issue to be tried on the grand assize; in which case, joining of the mise upon the mere right, is putting in issue, between the tenant and demandant, Who has the best or clearest right?

Mise also signifies a tax or tallage, &c. An honorary gift, or customary present from the people of Wales to every new king or prince of Wales, anciently given in cattle, wine, and corn, but now in money, being 5000*l.* or more, is denominated a mise: so was the usual tribute of 3000 merks paid by the inhabitants of the county palatine of Chester at the change of every owner of the said earldoms, for enjoying their liberties.

MISENUM, or **MISENUS**, in ancient geography, a promontory, port, and town, of Italy, in Campania, S. W. of Baia, in the Sinus Puteolanus, on the N. side.

MISERICORDIA, in law, an arbitrary fine imposed on any person for an offence: this is called misericordia, because the amercement ought to be but small, and less than that required by magna charta. If a person be outrageously amerced in a court that is not of record, the writ called *moderata misericordia* lies for moderating the amercement according to the nature of the fault.

MISFEASANCE, in law, a trespass.

MISFORTUNE, or **CHANCE**, in law, is a deficiency of the will in committing an unlawful act; or by chance, and not by de-

sign. In such case, the will does not co-operate with the deed; which therefore wants one main ingredient of a crime. See **CRIME**. For this, when it affects the life of another, See **HOMICIDE**.

MISITRA, a town of European Turkey, the capital of the Morea, renowned in the ancient history of Greece, under its original names of **LACEDÆMON** and **SPARTA**. See these articles. Lon. 22. 30. E. Lat. 37. 11. N.

MISLETOE, in botany, and antiquity. See **DRUIDS**, and **VISCUM**.

MISNA, a river of European Turkey, in Bosnia; which rises near Krosseva, and runs into the Bosna, eight miles S. E. of Serajo.

MISNOMER, [Fr.] in law, a misnaming or mistaking a person's name. The Christian name of a person should always be perfect; but the law is not so strict in regard to surnames, a small mistake in which will be dispensed with to make good a contract, and support the act of the party. See **PLEA**, to **INDICTMENT**.

MISO, a substance resembling salt butter and used as a substitute for it by the Japanese, prepared from a plant called *Daidso*, a species of *dolichos*. See **DOLICHOS**. To make it they take a measure of mame, or the beans produced by the plant; after boiling them for a considerable time in water, and to a proper degree of softness, they beat or bray them into a softish pulse; incorporating with the mass a large quantity of salt, four measures in summer, and three in winter. The less salt that is added, the substance is more palatable; but what it gains in point of taste, it loses in durability. They then add to this mixture a certain proportion of rice, called *koos*: and having formed the whole into a compost, remove it into a wooden vessel which had lately contained their common ale, named *sacki*. In two months it is fit for use. The *koos* gives it a grateful taste; and the preparing of it, like the palenta of the Germans, requires the skilful hand of an experienced master. For this reason there are people who make it their sole business to prepare the *koos*, and who sell it ready made for making *miso*; a substance which cannot fail to be greatly valued in those countries where butter from the milk of animals is unknown.

MISPICKEL, a name given by mineralogists to a native alloy of iron and arsenic. This alloy may be made by fusion; it is white and brittle, and may be crystallized. Iron is capable of combining with more than its own weight of arsenic.

MISPRISIONS, [from the old French *mespris*, a neglect or contempt,] are, in the English law, generally understood to be all such high offences as are less than capital, but nearly bordering thereon; and a misprision is contained in every treason and felony whatsoever; and if the king please, the offender may be proceeded against for the misprision only. Upon this principle, while the jurisdiction of the star-chamber subsisted, it was held that the king might remit a prosecution for treason, and cause the delinquent to be censured in that court, merely for a high misdemeanour: as happened in the case of Roger earl of Rutland, in 43 Eliz. who was concerned in the earl of Essex's rebellion. Misprisions are generally divided into two sorts: viz. negative, which consist in the concealment of something which ought to be revealed; and positive, which consist in the commission of something which ought not to be done.

MISPRISIONS, NEGATIVE, are either misprision of treason or of felony.

MISPRISION OF FELONY, is the concealment of a felony which a man knows, but never assented to; for, if he assented, this makes him either principal or accessory. And the punishment of this, in a public officer, by stat. Westm. 1. 3. Edw. 1. c. 9, is imprisonment for a year and a day; in a common person, imprisonment for a less discretionary time; and, in both, fine and ransom at the king's pleasure: which pleasure of the king must be observed, once for all, not to signify any extrajudicial will of the sovereign, but such as is declared by his representatives, the judges in the courts of justice; *voluntas regis in curia, non in camera*.

MISPRISION OF TREASON, consists in the bare knowledge and concealment of treason, without any degree of assent thereto: for any assent makes the party a principal traitor; as indeed the concealment, which was construed aiding and abetting, did at the common law; in like manner as the knowledge of a plot against the state, and not revealing it, was a capital crime at Florence, and other

other states of Italy. But it is enacted by stat. 1 & 2 Ph. Mar. c. 10, that a bare concealment of treason shall be only held a misprison. This concealment becomes criminal, if the party apprised of the treason does not, as soon as conveniently may be, reveal it to some judge of assize or justice of the peace. But if there be any probable circumstances of assent, as if one goes to a treasonable meeting, knowing before hand that a conspiracy is intended against the king; or, being in such company once by accident, and having heard such treasonable conspiracy, meets the same company again, and hears more of it but conceals it; this is an implied assent in law, and makes the concealer guilty of actual high treason.

MISPRISONS, POSITIVE, are generally denominated contempt of high misdemeanours; of which the principal is the mal-administration of such high officers as are in public trust and employment. This is usually punished by the method of parliamentary impeachment; wherein such penalties short of death, are inflicted, as to the wisdom of the house of peers shall seem proper; consisting usually of banishment, imprisonment, fines, or perpetual disability. Hither also may be preferred the offence of embezzling the public money, called among the Romans *peculatus*; which the Julian law punished with death in a magistrate, and with deportation, or banishment, in a private person. In the English law, it is not capital, but subjects the committer of it to a discretionary fine and imprisonment. Other misprisions are, in general, such contempts of the executive magistrate as demonstrate themselves by some arrogant and undutiful behaviour towards the king and government: for a detail of which see Blackstone's Comment. iv. 12.

MISSAL, [*missale*, Lat. *missel*, Fr.] the mass-book. It contains the several masses to be said on particular days. It is derived from the Latin *missa*, which, in the ancient Christian church, signified every part of divine service.

MISSINABE, a lake of North America, in Canada. Lon. 84° 2' 42" W. Lat. 48° 29' 42" N.

MISSIO, in Roman antiquity, was a full discharge given to a soldier after twenty years service, and differed from the exauctoratio, which was a discharge from duty after seventeen years service. Every soldier had a right to claim his *missio* at the end of twenty years.

MISSION, [*missio*, Lat.] in theology, denotes a commission to preach the gospel. Jesus Christ gave his disciples their mission in these words, Go and teach all nations, &c. The Romanists reproach the Protestants that their ministers have no mission, as not being authorised in the exercise of their ministry, either by an uninterrupted succession from the apostles, or by miracles, or by any extraordinary proof of a vocation. Many among us deny any other mission necessary for their ministry than the talents requisite to discharge it.

MISSION, is also used for an establishment of people zealous for the glory of God and the salvation of souls; who go and preach the gospel in remote countries, and among infidels.

MISSIONARIES, persons sent by any Christian church, to propagate the gospel in particular places, or among certain classes of men as pagans, infidels, &c. Christians of various denominations have of late exerted themselves in propagating the gospel both at home and abroad, and their labours have been crowned with success not only in Ireland, France, America, the West and East Indies, and other places.

MISSISSIPPI, or the RIVER OF St. LEWIS, a river of North America, one of the largest in the world. Its sources are unknown; having never been explored; but its length is reckoned upwards of 3000 miles. This noble river, with its eastern branches, waters five-eighths of the United States, and separates them from Louisiana and the Indian territories. The rivers and streams which fall into it from the W. and E. are very numerous. The largest are, the Missouri from the W. and the Illinois, Ohio, and Tennessee, from the E. It is navigable up to St. Anthony's Falls, and a great way above them. Its banks abound with salt-springs. Like the Nile, it has periodical inundations, by the melting of snow in the north; so that in May it overflows the country on each side, from 60 to 90 miles, and the inundation continues till near the end of July. Its mouths, which fall into the Gulf of Florida, are situated between Lon. 89° and 90° W. and between Lat. 29° and 30° N.

MISSISSAQUE, a river of Canada, which runs into Lake Huron. Lon. 83. 40. W. Lat. 46. 0. N.

MISSIVE, [*missive*, Fr.] something sent to another, as missive letters; meaning letters sent from one to another upon business, in contra-distinction to letters of gallantry, points of learning, dispatches, &c.

MISSOURI, a large river of North America, in Louisiana, which is navigable for at least 1300 miles up, but its length and source are not known. It runs into the Mississippi from the W. in Lat. 39° N.

MISSOURIS, a nation of North American Indians, who inhabit the banks of the above river, and have about 1500 warriors.

MISSUS, in the Circensian games, were the matches in horse or chariot races.

MIST, or FOG. See FOG, and METEOROLOGY.

MISTAKE, any wrong action committed, not through an evil design, but through an error of judgement.

MISTAKE, in law. See IGNORANCE.

MISTAKE BAY, a large bay of North America, on the W. side of the entrance into Davis's Straits, and N. of Hudson's Straits.

MISTISSINNY, a large lake of Canada; extending from Lon. 73. 40. to 75. 15. W. and from Lat. 50. 18. to 51. 0. N.

MISTLETOE, [*mystellus*, Sax. *mistel*, birdlime, and *tan*, a twig.] a plant. See DRUIDS, and VISCUM.

MISTRETTA, a town of Sicily, 50 miles E. S. E. of Palermo.

MISUSER, in law, an abuse of any liberty or benefit; as "He shall make fine for his misuser." Old. Nat. Br. 149. By misuser a charter of a corporation may be forfeited; so also an office, &c.

MISY, in natural history, is a species of the chalcantha. a fossil very common in Turkey and found in the mines of Crennitz in Hungary.

MITCHELLA, in botany, a genus of the monogynia order, and tetrandria class of plants; natural order, Aggregate. Corollas one-petaled, superior, two on the same germ; stigmas four; berry blind, four-seeded. There is only one species, viz. *M. repens*, creeping mitchella, which is a native of Carolina, Maryland, and Virginia.

MITCHIGAMIAS, a native of North American Indians, who, with the Piorias, inhabit the country on the W. bank of the Illinois.

MITE, in Jewish antiquity, a small piece of money mentioned in Luke xii. 59, and xxi. 2. In the Greek it is *χολδραίνος*, i. e. quadrans, or a quarter of the Roman denarius; so that the mite was worth about seven farthings of our money.

MITE, in zoology. See ACARUS.

MITELLA, BASTARD AMERICAN SANICLE; a genus of the digynia order, and decandria class of plants; natural order, Succulentæ. Calyx five-cleft; corolla five-petaled, inserted into the calyx; petals pinnatifid; capsule one-celled, two-valved; valves equal. There are two species, viz. *M. diphylla*, two-leaved mitella; and *M. nuda*, naked mitella, natives of North America, and the northern parts of Asia.

MITHRA, or MITHRAS, a god of Persia and Chaldaea, supposed to be the sun.

MITHRAS, FEASTS OF, in antiquity, feasts celebrated among the Romans in honour of Mithras.

MITHRIDATE is a composition, in form of an electuary, supposed to serve either as a remedy or a preservative against poisons. It takes its name from the inventor, Mithridates VII. king of Pontus.

MITHRIDATE MUSTARD. See THLASPI.

MITHRIDATEA, in botany, a genus of the monandria monogynia class and order; natural order, Scabridæ. Calyx common, four-cleft, enlarged, fleshy, containing the seeds; corolla none; fruit globular, depressed; seeds solitary, arilled. There is only one species, viz. *M. quadrifida*, a milky tree, with sub-opposite, entire, evergreen leaves, a native of Madagascar.

MITIOMBA, a kingdom of Africa, in Sierra Leona, on the banks of the Sierra Leona.

MITRA, in Roman antiquity, a cap or covering for the head, worn by the ladies, and sometimes by the men.

MITRE, [*mitra*, Lat.] a sacerdotal cap pointed and cleft at top, worn by bishops and certain abbots on solemn occasions. The high-priest among the Jews wore a mitre, as did also the inferior priests.

MITRE,

MITRE, in architecture, is an angle that is just 45 degrees, or half a right one. If the angle be a quarter of a right angle, they call it a half-mitre. To describe such angles, they have an instrument called the mitre-square; with this they strike mitre-lines on their quarters or battens; and for dispatch they have a mitre-box, as they call it, which is made of two pieces of wood, each about an inch thick, one nailed upright on the edge of the other; the upper piece hath the mitre-lines struck upon it on both sides, and a kerf to direct the saw in cutting the mitre-joints readily, by only applying the piece into this box.

MITRE is used by the writers of the Irish history for a sort of base money, which was very common there about 1270.

MITTAU, or **MITTAW**, the capital of Courland. Lon. 23° 42' 45" E. from Greenwich. Lat. 56° 39' 10" N.

MITTIMUS, [Lat.] in law, hath two significations: 1. A writ for removing or transferring of records from one court to another. 2. A precept, or command in writing, under the hand and seal of a justice of the peace, directed to the gaoler of some prison, for the receiving and safe keeping of an offender charged with any crime, until he be delivered by a due course of law.

MITYLENÆ, **MITYLENE**, or **MYTELENE**, in ancient geography, a powerful and affluent city, capital of the island of Lesbos.

MIXT-LINED FIGURE, is one consisting of straight and crooked lines.

MIXT NUMBER, is one that is part integer, or a whole number, and part of it a fraction; as $4\frac{1}{2}$, $10\frac{1}{3}$, &c.

MIXT RATIO, or **PROPORTION**, is when the sum of the antecedent and consequent is compared with the difference between antecedent and consequent, as if $a : b :: c : d$. Then

$$\begin{array}{r} 7 \quad 1 \quad 28 : 4 \\ a + b : a - b :: c + d : c - d \end{array}$$

MIXT, or **MIXT BODY**, in chemistry, that which is compounded of different elements or principles.

MIXT ACTION, in law, is an action partly real, and partly personal, which lies both for the thing detained, and against the person of the detainer. See **ACTION**.

MIXTURE, [mixtura, Lat.] a compound of several different bodies in the same mass, consisting in the simple apposition of parts of different bodies to each other. Thus, when powders of different kinds are rubbed together, the mixture is only simple, and each of the powders retains its particular characters. It differs from combination in not having that intimate union of the particles mixed which in combination is caused by affinity. See **CHEMISTRY**.

MIXTURE, in pharmacy, a medicine which differs from a julep in this respect, that it receives into its composition not only salts, extracts, and other substances dissoluble in water; but also earths, powders, and such substances as cannot be dissolved.

MIZRAIM, or **MISRAIM**, the second son of Ham, and grandson of Noah; supposed to have been the same with Menes, the first king of Egypt.

MIZRAIM, or **MISRAIM**, is used in scripture to denote the Higher and Lower Egypt, which see. It sometimes occurs singular, *Mazor*: 2 Kings xix. Isaiah xix. Micah vii.

MIZEN, [mezen, Dutch.] a mast in the stern or back part of a ship: in some large ships there are two such masts, that standing next the mainmast is called the main mizen: and the other near the poop the bonaventure mizen. See **MAST**, and **SHIP-BUILDING**.

MNASIUM, in botany, a genus of the hexandria monogynia class and order; natural order, *Ensata*. Calyx one-leaved, three-parted; corolla one-petaled, three-parted, with a short tube; anthers four-cornered, terminated by an ovate leaflet; germ three-lobed; stigmas three, spiral. There is but one species, viz. *M. paludosum*, a perennial plant of Guiana.

MNEMOSYNE, in the mythology, the daughter of *Cælus* and *Terra*. She married *Jupiter*, by whom she had the Nine Muses. *Mnemosyne* signifies "memory;" and therefore the poets rightly called *Memory* the mother of the Muses, because it is to that mental endowment that mankind are indebted for their progress in science.

MNIARUM, in botany, a genus of the monandria digynia class and order. Calyx four-parted, superior; corolla none; seed one. There is but one species, viz. *M. biflorum*, resembling *mirapartia*. It is a native of New Zealand and Terra del Fuego.

MNIUM, in botany, a genus of the cryptogamia musci class and order; natural order, *Mosses*. Capsule with a lid; calyptra smooth; bristle from a terminating tubercle: male flowers headed, or discoid. There are twenty species.

M. HYGROMETRICUM grows in woods, heaths, garden-walks, walls, old trees, decayed wood, and where coals or cinders have been laid. It is stemless, hath tips inversely egg-shaped, nodding, and bright yellow. If the fruit-stalk is moistened at the base with a little water or steam, the head makes three or four revolutions: if the head is moistened, it turns back again.

MOAB, in ancient geography, a country of Arabia Petraea; so called from Moab the son of Lot, to whose posterity this country was allotted by Divine appointment, Deut. ii. 9. It was originally occupied by the *Emims*, a race of giants extirpated by the *Moabites*, ib. 10. Moab anciently lay to the S. of Ammon, before *Sihon* the Amorite stripped both nations of a part of their territory, afterwards occupied by the *Israelites*, Numb. xxii; and then Moab was bounded by the *Arnon* on the N. the *Asphaltites* on the W. the brook *Zared* and the mountains *Abarim* on the E.

MOAT, or **DITCH**, [motu, a mount, low Lat.] in fortification, a deep trench dug round the rampart of a fortified place, to prevent surprizes. The brink of the moat, next the rampart, is called the scarp: and the opposite one, the counterscarp. A dry moat round a large place, with a strong garrison, is preferable to one full of water; because the passage may be disputed inch by inch, and the besiegers, when lodged in it, are continually exposed to the bombs, granades, and other fire-works, which are thrown incessantly from the rampart into their works. In the middle of dry moats, there is sometimes another small one, called *cunette*: which is generally dug so deep till they find water to fill it. The deepest and broadest moats are accounted the best; but a deep one is preferable to a broad one: the ordinary breadth is about 20 fathoms, and the depth about 16. To drain a moat that is full of water, they dig a trench deeper than the level of the water, to let it run off; and then throw hurdles upon the mud and slime, covering them with earth or bundles of rushes, to make a firm passage. See **FORTIFICATION**.

MOATAZALITES, or **SEPARATISTS**, a religious sect among the *Turks*, who deny all forms and qualities in the *Divine Being*; or who divest God of his attributes.

MOBILE, a large navigable river of N. America, which falls into the *Gulph of Mexico* at *Mobile Point*.

MOBILE, a city of W. Florida, on the W. bank of the above river, 30 miles W. N. W. of *Pensacola*.

MOBILE, an island of W. Florida, formed by the divided stream of the *Mobile*, 26 miles long and 5 broad. Lon. 87. 55. W. Lat. 31. 0. N.

MOBILE, [Lat.] moveable; any thing susceptible of motion, or that is disposed to be moved either by itself, or by some other prior mobile or mover.

MOBILE PRIMUM, in the ancient astronomy, was a ninth heaven or sphere, imagined above those of the planets and fixed stars. This was supposed to be the first mover, and to carry all the lower spheres round along with it; by its rapidity communicating to them a motion whereby they revolved in 24 hours.

MOCAUMPOUR, a territory of India, and its capital N. of *Bengal*. The city lies 120 miles N. of *Patna*. Lon. 85. 37. E. Lat. 27. 35. N.

MOCIO, **MOCO**, or **MOKHA**, a kingdom of Arabia Felix, extending along the most southern coast. That part which lies next the *Red Sea* is a dry barren desert, in some places 10 or 12 leagues over; but bounded by mountains, which, being well watered, enjoy an almost perpetual spring; and yield coffee, corn, grapes, myrrh, frankincense, cassia, balm, gum, mangos, dates, pomegranates, &c. The weather is so hot and sultry in summer, especially when the S. wind blows, that it would be insupportable, if it were not mitigated by the cool breezes that blow from the mountains on the N. or the *Red* and *Arabic Seas* on the W. and E. The heat in winter is equal to that of our warmest summers: and it is very seldom that either clouds or rain are seen.

Mocha, **Moco**, or **Moka**, a town and port on the *Red Sea*, capital of the above kingdom; by some supposed to be the *Musa* or *Muza* of *Ptolemy*. Lon. 44. 0. E. Lat. 13. 16. N.

MOCKING-BIRD. See **TURDUS**.

MODBURG, a town of *Devonshire*, 14 miles E. of *Plymouth*.

MODE, [*modus*, Lat.] in grammar. See GRAMMAR.

MODE, in metaphysics, seems properly to denote the manner of a thing's existence: but Locke, whose language in that science is generally adopted, uses the word in a sense somewhat different from its ordinary signification. "Such complex ideas, which, however compounded, contain not in them the supposition of subsisting by themselves, but are considered as dependencies on, or affections of, substances," he calls modes. See METAPHYSICS.

MODE, in music, a regular disposition of the air and accompaniments relative to certain principal sounds upon which a piece of music is performed, and which are called the essential sounds of the mode. There is this difference between the mode and the tone, that the latter only determines the principal sound, and indicates the place which is most proper to be occupied by that system, which ought to constitute the bass of the air; whereas the former regulates the thirds, and modifies the whole scale agreeably to its fundamental sounds. Our modes are not, like those of the ancients, characterised by any sentiment which they tend to excite, but result from our system of harmony alone. The sounds essential to the mode are three, and form together one perfect chord. 1. The tonic or key, which is the fundamental note both of the tone and of the mode. 2. The dominant, which is a fifth from the tonic. 3. The mediant, which properly constitutes the mode, and which is a third from the same tonic. As this third may be of two kinds, there are of consequence two different modes. When the mediant forms a greater third with the tonic, the mode is major; when the third is lesser, it is minor. The major mode is immediately generated by the resonance of sounding bodies, which exhibit the third major of the fundamental sound: but the minor mode is not the product of nature: it is only found by analogy and inversion. See MUSIC.

MODEL, [*modulus*, Lat.] in a general sense, an original pattern, proposed for any one to copy or imitate. This word is particularly used, in building, for an artificial pattern made in wood, stone, plaster, or other matter, with all its parts and proportions, for the better conducting and executing some great work, and to give an idea of the effect it will have in large. In all great buildings, it is much the surest way to make a model in relief, and not to trust to a bare design or draught. There are also models for the building of ships, and for extraordinary stair-cases, &c. They also use models in painting and sculpture: whence, in the academies, they give the term model to a naked man, disposed in several postures, to afford an opportunity to the scholars to design him in various views and attitudes. Models in imitation of any natural or artificial substance, are most frequently made by means of moulds composed of plaster of Paris. Of all the models which have been undertaken by human industry, perhaps the most remarkable is that constructed by Gen. Pflüger, to represent the mountainous parts of Switzerland. It is composed of 142 compartments, of different sizes and forms, respectively numbered, and so artfully put together, that they can be separated and replaced with the greatest ease. The model itself is 20½ feet long and 12 broad, and formed on a scale which represents two English miles and a quarter by an English foot; comprehending part of the cantons of Zug, Zurich, Schweiz, Unterwalden, Lucerne, Berne, and a small part of the mountains of Glarus; in all, an extent of country of 18½ leagues in length and 12 in breadth. The highest point of the model, from the level of the centre, which is the lake of Lucerne, is about 10 inches; and as the most elevated mountain represented therein rises 1475 toises or 9440 feet above the lake of Lucerne, at a gross calculation, the height of an inch in the model is about 900 feet. The whole is painted of different colours, in such a manner as to represent objects as they exist in nature; and so exactly is this done, that not only the woods of oak, beech, pine, and other trees, are distinguished, but even the strata of the several rocks are marked, each being shaped upon the spot, and formed of granite, gravel, or such other substances as compose the natural mountain. So minute also is the accuracy of the plan, that it comprises not only all the mountains, lakes, rivers, towns, villages, and forests, but every cottage, bridge, torrent, road, and even every path, is distinctly marked. The principal material, employed in the construction of this extraordinary model, is a mixture of charcoal, lime, clay, a little pitch, with a thin coat of wax; and it is so hard that it may be trod upon without any damage. It was begun in 1766, when the general was

about 59 years of age, and it employed him till August 1785; during all which long space of time his task was not only most laborious but even dangerous. He raised the plans with his own hands on the spot, took the elevation of mountains, and laid them down in their several proportions. In the prosecution of this laborious employment he was twice arrested as a spy; and in the popular cantons was frequently forced to work by moon-light, in order to avoid the jealousy of the peasants, who imagined that their liberty would be endangered should a plan of their country be taken with such minute exactness. Being often obliged to remain on the tops of some of the Alps, where no provisions could be procured, he took along with him a few milk-goats, who supplied him with nourishment. When any part was finished, he sent for the people residing near the spot, and desired them to examine each mountain with accuracy, whether it corresponded, as far as the smallness of the scale would admit, with its natural appearance; and then, by frequently retouching, corrected the deficiencies. Even after the model was finished, he continued his Alpine expeditions with the same ardour as ever, and with a degree of vigour that would fatigue a much younger person. All his elevations were taken from the level of the lake of Lucerne; which, according to M. Saussure, is 1408 feet above the level of the Mediterranean.

MODENA, or the MODENESE, a duchy of Italy, now forming the greater part of the department of Panaro.

MODENA, a city of Italy, capital of the dept. of Panaro, as well as of the district and late duchy of Modena. It was anciently named Mutina. It lies 23 miles N. W. of Bologna, and 30 S. of Mantua. Lon. 11. 18. E. Lat. 44. 34. N.

MODERATA MISERICORDIA, in law, a writ that lies where one is amerced in a court-baron, or other court, not being of record, for any fault or transgression beyond the quality and quantity of that offence; and is directed to the lord of the court or his steward, commanding them to take a moderate amercement of the party.

MODERATION, in ethics, is a virtue consisting in the proper government of our appetites, passions, and pursuits, with respect to honours, riches, and pleasures; and this sense is synonymous with temperance: it is also often used to denote candour.

MODERATOR, in ecclesiastical polity, is the title given the president of the annual assembly of the church of Scotland; it is also applied to the presidents of presbyteries and synods.

MODERN AUTHORS, according to Naude, are all those who have written since Boethius. The modern philosophy commences with Galileo; the modern astronomy with Copernicus.

MODI, an island of Turkey, in the Mediterranean. Lon. 23. 44. E. Lat. 37. 27. N.

MODILLIONS, [*modiolus*, Lat.] in architecture, are ornaments in the cornice of the Ionic, Corinthian, and Composite, columns. They consist of little inverted consoles or brackets, like an S, under the soffit or bottom of the cornice. See ARCHITECTURE.

MODIUS, a Roman dry measure for all sorts of grain, containing 32 hemina, or 16 sextarii, or one-third of the amphora, amounting to an English peck.

MODON, a town of Turkey, on the S. W. coast of the Morea, 20 miles W. of Coron. Lon. 21. 35. E. Lat. 36. 58. N.

MODULATION, in music, is susceptible of several different significations. It frequently means no more than an air, or a number of musical sounds properly connected and arranged. Thus it answers to what Mr. Malcolm understands by the word *tune*, when he does not expressly treat concerning the tuning of instruments. Thus likewise it expresses the French word *chant*; for which reason, in music, the one word is often expressed by the other. But the precise and technical acception to which it ought to be confined, is the art of composing melody or harmony agreeably to the laws prescribed by any particular key, that of changing the key, or of regularly and legitimately passing from one key to another. Modulation (says M. Rousseau) is properly the manner of ascertaining and managing the modes; but at this time the word most frequently signifies the art of conducting the harmony and the air successively through several modes, in a manner agreeable to the ear and conformed to rules. If the different modes be produced by harmony, thence likewise must spring the laws of modulation. These are simple in conception, but difficult in practice. To modulate properly in the same tone, it is necessary.

1. To run through all the sounds of it in an agreeable air, frequently repeating the sounds most essential to it, and dwelling upon these with a most remarkable emphasis; that is to say, that the chord containing the sensible notes, and that of the tonic, should frequently be heard in it, but under different appearances, and obtained by different procedures, to prevent monotony. 2. That repose or cadences should only be established upon these two chords: the greatest liberty, however, which ought to be taken with the rule is, that a cadence or repose may be established on the chord of the subdominant. 3. In short, that none of the sounds of the mode ought ever to be altered; for without quitting it we cannot introduce a sharp or a flat which does not belong to it, nor abstract any one which in reality does belong to it. But passing from one mode to another, we must consult analogy, we must consider the relations which a key bears to the other notes in the series, and to the number of sounds common to both the modes, that from whence we pass, and that into which we enter. If we pass from a mode major, whether we consider the fifth from the key as having the most simple relation with it except that of the octave, or whether we consider it as the first sound which enters into the harmonics of the same key, we shall always find, that this fifth, which is the dominant of the mode, is the chord upon which we may establish the modulation most analogous to that of the principal key. This dominant, which constituted one of the harmonics of the first key, makes also one of its own peculiar key, of which it is the fundamental sound. There is then a connection between these two chords. Besides, that same dominant carrying, as well as the tonic, a perfect chord major upon the principle of resonance, these two chords are only different one from the other by the dissonance, which passing from the key to the dominant is the 6th superadded, and when reascending from the dominant to the key is the 7th. Now these two chords, thus distinguished by the dissonance which is suitable to each, by the sounds which compose them when ranged in order, form precisely the octave, or the diatonic scale, which we call a gammut, which determines the mode. This series of the key, altered only by a sharp, tortms the scale belonging to the mode of the dominant; which shews how striking the analogy is between these two tones, and gives the easiest opportunity of passing from one to another by means of one single alteration alone. See Music.

MODULE, [*modulus*, Lat.] in architecture, a certain measure, or bigness, taken at pleasure, for regulating the proportions of columns, and the symmetry or disposition of the whole building. Architects generally choose the semidiameter of the bottom of the column for their module, and this they subdivide into parts or minutes.

MODUS DECIMANDI, in law, is where money, land, or other valuable consideration, has been given, time out of mind, to the minister or parson of any certain place in the room of tithes. A clergyman may sue in a spiritual court for a modus decimandi; yet if the modus is denied there, or a custom is to be tried, the trial thereof belongs to the courts of common law. When lands are converted to other uses, as in the case of hay-ground turned into tillage, the modus may be discharged, and the tithes paid again in kind.

MOERLINGIA, **MOUNTAIN CHICKWEED**; in botany, a genus of the digynia order, and octandria class of plants; natural order, Caryophyllæ. Calyx four-leaved; petals four, short, undivided; fruit a subglobose capsule, with one cell, in which are contained numerous roundish seeds. There is but one species. *M. mucosa*, a native of Europe.

MOEN, or **MONA**, an island of Denmark, in the Baltic, near the S.E. end of Zealand; containing one town named Stoege, and several villages.

MOENIUS, **CARUS**, a celebrated Roman consul, who conquered the ancient Latins, B. C. 338. He was the first who hung up the prows, &c. of the galleys he had taken at the naval engagement of Actium, upon the place where the tribunes harangued the people; from whence it was called the rostra.

MERIS, a celebrated artificial lake of Egypt, said to have been 220 miles in circumference, intended as a reservoir for the waters of the Nile during its extraordinary overflows. There were two pyramids in it, one-half of which lay under water. Herodot. lib. ii. c. 12.

MÆSIA, or **MYSLA**, in ancient geography, a country of Eu-

rope, extending from the confluence of the Savus and the Danube to the shores of the Euxine. It was divided into Upper and Lower Mæsia.

1. **MÆSIA, LOWER**, was on the borders of the Euxine, and comprehended that tract of country which received the name of Pontus from its vicinity to the sea.

2. **MÆSIA, UPPER**, lay beyond the other in the inland country. **MOFFAT**, a town of Scotland, near the Annan, famous for its sulphureous well, which has been in just estimation for near 160 years as a remedy in all cutaneous and scrophulous complaints; and for its chalybeate spring, discovered about 65 years ago. It lies 21 miles N.N.E. of Dumfries, and 50 S.W. of Edinburgh.

MOFFAT-WATERS, are those sulphureous springs which issue from a rock, in the vicinity of the above town. The smell of this water corresponds with that of Harrogate; its taste is saline and sulphureous, divested of all bitterness.—It is chiefly employed in cutaneous and scrophulous cases; but has been found very beneficial, when applied externally, to irritable and ill-conditioned ulcers. The Moffat-waters have lately been of considerable service to persons afflicted with calculous and biliary complaints; in cases of indigestion; and for invigorating the alimentary canal, where general weakness and inactivity prevail. The dose varies according to the constitution of the patient; but, as this water may be safely drunk at almost every season, it ought to be taken liberally, in such quantities, and at such intervals, as the person affected can conveniently bear. From one to three bottles should be taken every morning; a quantity which produces scarcely any other sensible effects, excepting an increased flow of urine.

MOGODORE, or **MOGADORE**, a town of Morocco. Lon. 9. 55. W. Lat. 31. 38. N.

MOGULS, a celebrated nation of Asia, whose conquests formerly were the most rapid and extensive of any people recorded in history. The Moguls deduce their origin from Japhet, or, as they call him, Japhis, the son of Noah. His son Turk, they say, was the first king, or khan, of those nations now known by the separate names of Turks, Tartars, and Moguls; and the Tartars, especially, assert that their proper designation is Turks. To this prince is attributed many of those inventions, which barbarous nations commonly ascribe to their first sovereigns.

MOHACS, a town of Hungary, on the Danube, 36 miles N.W. of Bacs, and 56 W. of Zegedin.

MOHAIR, [*molere*, *moire*, Fr.] in commerce, the hair of a kind of goat frequent about Angria in Turkey; the inhabitants of which city are all employed in the manufacture of camblets made of this hair. Some gave the name mohair to the camblets or stuffs made of this hair.

MOHAMMED, the impostor, was born in the reign of Anush-irwan the Just, emperor of Persia, A. D. 571. He came into the world under some disadvantages. His father Abdallah was a younger son of Abdalmotaleb; and dying very young, left his widow and infant-son in very mean circumstances, his whole substance consisting but of five camels and one Ethiopian female slave. Abdalmotaleb was therefore obliged to take care of his grandchild, which he not only did during his life, but at his death en-joined his eldest son Abu Taleb, who was full brother to Abdallah, to provide for him afterwards. This he very affectionately did, and instructed him in the business of a merchant, for which purpose he took him to Syria when he was only 13. He afterwards recommended him to Khadijah, a rich widow, for her factor; in whose service he behaved so well, that she married and raised him to an equality with the richest in Mecca. After this advantageous match he formed the scheme of establishing a new religion, or, as he expressed it, of replanting the only true and ancient one professed by Adam, Noah, Abraham, Moses, Jesus, and all the prophets; by destroying the gross idolatry into which the generality of his countrymen had fallen, and weeding out the corruptions and superstitions which the latter Jews and Christians had, as he pretended, introduced into their religion; and reducing it to its original purity, which consisted chiefly in the worship of one God. But before he made any attempt abroad, he resolved to begin with the conversion of his own household. Having therefore retired with his family, as he had done several times before, to a cave in mount Hara, he there opened the secret of his mission to his wife; and acquainted her, that the angel Gabriel had appeared to him, and told him that he was appointed the apostle of God: he also

repeated to her a passage which he pretended had been revealed to him by the angel, with those other circumstances of this first appearance, which are related by the Mohammedan writers. Khadijah received the news with great joy; swearing by him in whose hands her soul was, that she trusted he would be the prophet of his nation; and immediately communicated what she had heard to her cousin Warakah Ebn Nawfal, who, being a Christian, could write in the Hebrew character, and was tolerably well versed in the scriptures; and he as readily came into her opinion, assuring her that the same angel who had formerly appeared unto Moses was now sent to Mohammed. After this he applied to the most wealthy and powerful of his relatives, most of whom he won over to his party. He now began to use his influence and art of persuasion on others, so that in three years his disciples were considerably numerous. On these he imposed the most marvellous tales, but well adapted to deceive ignorant and superstitious minds. He pretended to have passed into the highest heavens in one night, on the back of a beautiful ass called Al Borak, and accompanied by the angel Gabriel. There he had an interview with Adam, Abraham, Moses, David, and Jesus Christ, who acknowledged his superiority, which was confirmed to him by the Deity himself. This romance staggered even some of his best friends, and a powerful confederacy being formed against him, he was forced to quit Mecca, and to seek a refuge in Medina. This retreat occasioned the foundation of his empire, and of his religion. The Mohammedans adopt it as their chronological standard, calling it the Hegira, that is the Flight or Persecution, being the first day of our July, A. D. 622. Hitherto Mohammed had propagated his religion by fair means; so that the whose success of his enterprise, before his flight to Medina, must be attributed to persuasion only, and not to compulsion. And he was so far from allowing his followers to use force, that he exhorted them to bear patiently those injuries which were offered them on account of their faith; and, when persecuted himself, chose rather to quit the place of his birth and retire to Medina, than to make any resistance. But this great passiveness and moderation seem entirely owing to his want of power, and the great superiority of his opposers for the first 12 years of his mission; for no sooner was he enabled, by the assistance of those of Medina, to make head against his enemies, than he gave out, that God had allowed him and his followers to defend themselves against the infidels; and at length, as his forces increased, he pretended to have the Divine leave to attack them, to destroy idolatry, and set up the true faith by the sword. It is certainly one of the most convincing proofs that Mohammedanism was no other than a human invention, that it owed its progress and establishment almost entirely to the sword; and that it is one of the strongest demonstrations of the divine original of Christianity, that it prevailed against all the opposition, and power of the Pagan world by the mere force of its own truth, after having stood the assaults of all manner of persecution for 300 years together. Mohammed, being settled at Medina, began to send out small parties to make reprisals on the Koreish; the first consisting of only nine men, who plundered a caravan belonging to that tribe, and took two prisoners. But what established his reputation, and laid the foundation of all his succeeding greatness, was the gaining of the battle of Bedr, fought in the 2d year of the Hegira. Some reckon no less than 27 expeditions wherein Mohammed was personally present, in nine of which he gave battle, besides several others, in which he was not present. His forces he maintained partly by the contributions of his followers, which he called zacet or alms, and the paying of which he very artfully made an article of his religion; and partly by ordering one-fifth of the plunder to be brought into the public treasury for that purpose. In a few years, by the success of his arms, (though he was sometimes defeated,) he considerably raised his credit and power. In the sixth year of the Hegira he set out with 1400 men to visit the temple of Mecca, not with any intent of committing hostilities, but in a peaceable manner. However, when he came to Hodeibiya, which is partly within and partly without the sacred territory, the Koreish sent to let him know that they would not permit him to enter Mecca; whereupon he resolved to attack the city; but the people of Mecca sending Arwa Ebn Masud, prince of the tribe of Thakif, as their ambassador, to desire peace, a truce was concluded for ten years, by which any person was allowed to enter into league either with Mohammed, or with the Koreish, as he thought fit. He af-

terwards violated this treaty, and stormed the place with fire and sword. Having made himself master of Arabia, he extended his conquests into Syria, where he took several cities, and laid some of the princes under tribute. The 8th year of the Hegira was a very fortunate year to Mohammed. In the beginning of it, Khaled Ebn al Walid and Amru Ebn al As, both excellent soldiers, the first of whom afterwards conquered Syria and other countries, and the latter Egypt, became proselytes to Mohammedanism. And soon after the prophet sent 3000 men against the Grecian forces, to revenge the death of one of his ambassadors. The Grecians being vastly superior in number (for, including the auxiliary Arabs, they had an army of 100,000 men), the Mohammedans were repulsed in the first attack, and lost successively three of their generals, viz. Zeid Ebn Haretha Mohammed's freed man, Jaafar the son of Abu Taleb, and Abdallah Ebn Rawaha: but Khaled Ebn al Walid succeeding to the command, overthrew the Greeks with a great slaughter, and brought away abundance of rich spoil; on occasion of which action Mohammed gave him the title of Seif min soyuf Allah, "one of the swords of God." The next year, being the ninth of the Hegira, the Mohammedans call the year of embassies: for the Arabs were satisfied that it was not in their power to oppose Mohammed; and therefore began to come in to him in great numbers, and to send embassies to make their submissions to him, both to Mecca, while he staid there, and also to Medina, whither he returned this year. Thus was Mohammedanism established, even in Mohammed's lifetime, throughout the greatest part of Arabia. And thus the Arabs found themselves in a condition of making those conquests which extended the Mohammedan faith over so great a part of the world. This famous impostor died in the ninth year of the Hegira, aged 62. His grand work, the Koran, contains a great deal of practical morality, drawn from the scriptures, but blended with extravagant tales, and blasphemous doctrines. See ALKORAN.

MOHAMMED II. surnamed the Great, the 7th king, and 1st emperor, of the Turks, was born at Adrianople, March 24, 1430; and succeeded his father Amurath II. in 1451. He took Constantinople in 1453, and thereby drove many learned Greeks into the West, which was a great cause of the restoration of learning in Europe, as the Greek literature was then introduced here. He was one of the greatest men upon record, considered merely as a conqueror; for he conquered two empires, 12 kingdoms, and 200 considerable cities. He was very ambitious of the title of Great, which both Turks and Christians have given him. And he was the first of the Ottoman emperors whom the Western nations dignified with the title of Grand Seigneur, or Great Turk, which posterity has preserved to his descendants. Italy had suffered greater calamities, but had never felt a terror equal to that which this sultan's victories imprinted. The inhabitants seemed already condemned to wear the turban; and Pope Sixtus IV. dreading the fate of Constantinople, thought of escaping into Provence, and transferring the holy see to Avignon. Hence, the news of Mohammed's death, which happened the 3d May 1481, was received at Rome with the greatest demonstrations of joy. Mohammed appears to have been the first sultan who was a lover of arts and sciences; and even cultivated polite letters. He often read the history of Augustus, and the other Casars; and he perused those of Alexander, Constantine, and Theodosius, with more than ordinary pleasure, because these had reigned in the same country with himself. He was fond of painting, music, sculpture, and agriculture. He was much addicted to astrology; and used to encourage his troops by giving out, that the influence of the heavenly bodies promised him the empire of the world. Contrary to the genius of his country, he delighted so much in foreign languages, that he not only spoke the Arabic, but also the Persian, Greek, and French, or corrupted Italian. Landin, a knight of Rhodes, collected several of his letters, written in Syriac, Greek, and Turkish, and translated them into Latin. Where the originals are unknown, but the translation has been published at Lyons 1520, in 4to; at Basil 1554, in 12mo; in a collection by Oporinus, at Marburg 1604, in 8vo; and at Leipsic, in 1690, 12mo. Prof. Melchior Junius, published at Montbeliard, 1595, a collection of letters, in which there are three written by Mohammed II. to Scanderberg. These letters have nothing of Turkish ferocity in them: they are written in as civil terms, and as obliging a manner, as the most polite prince in Christendom could have written.

MOHAMMEDANISM, the system of religion broached by Mohammed, and still adhered to by his followers. See **MOHAMMED**, and **ALCORAN**. Mohammedanism is professed by the Turks, Persians, and several nations among the Africans, and many in the East Indies. The Mohammedans divide their religion into two general parts, faith and practice: of which the first is divided into six distinct branches: Belief in God, in his angels, his scriptures, his prophets, in the resurrection and final judgement, and in God's absolute decrees. The points relating to practice are, prayer, with washings, &c. alms, fasting, pilgrimage to Mecca, and circumcision.

MOHAMMEDANISM ARTICLES OF FAITH IN. 1. The Mohammedans, at least those who are reckoned orthodox, profess to believe in and worship the true God, the God of the Jews and Christians. 2. The existence and purity of angels are required to be believed in the Koran; and he is reckoned an infidel who denies there are such beings, or hates any of them, or asserts any distinction of sexes among them. They believe them to have pure and subtle bodies, created of fire; that they neither eat nor drink, nor propagate their species; that they have various forms and offices, some adoring God in different postures, others singing praises to him, or interceding for mankind. They hold, that some of them are employed in writing down the actions of men; others in carrying the throne of God, and other services. The four angels, whom they look on as more eminently in God's favour, are, Gabriel, to whom they give several titles, particularly those of the holy spirit, and the angel of revelations, supposing him to be honoured by God with a greater confidence than any other, and to be employed in writing down the divine decrees; Michael, the friend and protector of the Jews; Azrael, the angel of death, who separates men's souls from their bodies; and Israfil, whose office it will be to sound the trumpet at the resurrection. They also believe, that two guardian angels attend on every man, to observe and write down his actions, being changed every day, and therefore called al Moakkibat, or "the angels who continually succeed one another." The devil, whom Mohammed names Eblis, from his despair, was once one of those angels who are nearest to God's presence, called Azazel; and fell, for refusing to pay homage to Adam at the command of God. Besides angels and devils, the Mohammedans believe in an intermediate order of creatures, which they call jin or genii, created also of fire, but of a grosser fabric than angels, as they eat and drink, and propagate their species, and are subject to death. Some of these are supposed to be good and others bad, and capable of salvation or damnation, as men are; whence Mohammed pretended to be sent for the conversion of genii as well as men. 3. As to the scriptures, the Koran, teaches, that God, in divers ages of the world, gave revelations of his will in writing to several prophets, the whole and every one of which it is absolutely necessary for a good Moslem to believe. The number of these sacred books were, according to them, 104; of which 10 were given to Adam, 50 to Seth, 30 to Edris or Enoch, 10 to Abraham; and the other four, being the Pentateuch, the Psalms, the Gospel, and the Koran, were successively delivered to Moses, David, Jesus, and Mohammed; which last being the seal of the prophets, those revelations are now closed, and no more are to be expected. All these divine books, except the four last, they agree to be now entirely lost, and their contents unknown; though the Sabians have several books which they attribute to the antediluvian prophets. And of those four, the Pentateuch, Psalms, and Gospel, they say, have undergone so many alterations and corruptions, that, though there may possibly be some part of the true word of God therein, yet no credit is to be given to the present copies in the hands of the Jews and Christians. The Mohammedans have also a gospel in Arabic, attributed to St. Barnabas. Of this gospel the Moriscoes in Africa have a translation in Spanish. It appears to be no original forgery of the Mohammedans; though they have, no doubt, altered it since, e. g. instead of the Paraclete, or Comforter, they have in this apocryphal gospel inserted the word Pericyte, i. e. the famous or illustrious; by which they pretend their prophet was foretold by name, that being the signification of Mohammed in Arabic; and this they say to justify that passage of the Koran, where Jesus Christ is formally asserted to have foretold his coming, under his other name of Ahmed, which is derived from the same root as Mohammed, and of the same import. From these, or

some other forgeries of the same stamp, the Mohammedans quote several passages, of which there are not the least vestiges in the New Testament. The number of the prophets, from time to time sent by God into the world, amounts to no less than 224,000, according to one Mohammedan tradition; or to 124,000, according to another: among whom 313 were apostles, sent with special commissions to reclaim mankind from infidelity and superstition; and six of them brought new laws or dispensations, which successively abrogated the preceding: these were Adam, Noah, Abraham, Moses, Jesus, and Mohammed. All the prophets in general, the Mohammedans believe to have been free from great sins, and professors of the same religion, viz. Islam, notwithstanding the different laws and institutions which they observed. 4. They believe in a general resurrection and a future judgement. When a corpse is laid in the grave, they say he is received by an angel, who gives him notice of the coming of the two examiners; who are two black livid angels, of a terrible appearance, named Monker and Nakir. These order the dead person to sit upright, and examine him concerning his faith, as to the unity of God, and the mission of Mohammed: if he answer rightly, they suffer the body to rest in peace, and it is refreshed by the air of paradise; but, if not, they beat him on the temples, with iron-maces, till he roars out for anguish so loud, that he is heard by all from east to west, except men and genii. They then press the earth on the corpse, which is gnawed and stung till the resurrection by 99 dragons, with seven heads each; or, as others say, their sins become venomous beasts, the grievous ones stinging like dragons, the smaller like scorpions, and the others like serpents: circumstances which some understand in a figurative sense. As to the soul they hold, that, when it is separated from the body by the angel of death, who performs his office with ease and gentleness towards the good, and with violence towards the wicked, it enters into that which they call al berzakh, or the interval between death and the resurrection. If the departed person was a believer, they say two angels meet it, who convey it to heaven, that its place there may be assigned, according to its merit and degree. For they distinguish the souls of the faithful into three classes: viz. 1st, prophets, whose souls are admitted into paradise immediately; 2d, martyrs, whose spirits, according to a tradition of Mohammed, rest in the crops of green birds, which eat of the fruits and drink of the rivers of paradise; and 3d, other believers, concerning the state of whose souls before the resurrection there are various opinions. The time of the resurrection the Mohammedans allow to be a perfect secret to all but God alone; the angel Gabriel himself acknowledging his ignorance in this point, when Mohammed asked him about it. However, they say, the approach of that day may be known from certain signs which are to precede it. 5. When those who have risen shall have waited the limited time, the Mohammedans believe God will at length appear to judge them; Mohammed undertaking the office of intercessor, after it shall have been declined by Adam, Noah, Abraham, and Jesus, who shall beg deliverance only for their own souls. They say, that on this solemn occasion God will come in the clouds, surrounded by angels, and will produce the books wherein the actions of every person are recorded by their guardian angels, and will command the prophets to bear witness against those to whom they have been respectively sent. Then every one will be examined concerning all his words and actions uttered and done by him in this life; not as if God needed any information in these respects, but to oblige the person to make public confession and acknowledgment of God's justice. The particulars, of which they shall give an account, as Mohammed himself enumerated them, are, of their time, how they spent it; of their wealth, by what means they acquired it, and how they employed it; of their bodies, wherein they exercised them; of their knowledge and learning, what use they made of them. 6. The trials being over, these who are to be admitted into paradise will take the right-hand way, and those who are destined to hell-fire will take the left; but both must first pass the bridge called in Arabic al Sirat, which they say is laid over the midst of hell, and describe to be finer than a hair, and sharper than the edge of a sword; so that it seems very difficult to conceive how any one shall be able to stand upon it: for which reason, the Motazalites reject it as a fable; though the orthodox think it a sufficient proof of the truth of this article, that it was seriously affirmed by him who never asserted

a falsehood, meaning their prophet: who, to add to the difficulty of the passage, has likewise declared, that this bridge is beset on each side with briars and hooked thorns; which will however be no impediment to the good; for they shall pass with wonderful ease and swiftness, like lightning, or the wind, Mohammed and his Moslems leading the way; whereas the wicked, what with the slipperiness and extreme narrowness of the path, the intangling of the thorns, and the extinction of the light which directed the former to paradise, will soon miss their footing, and fall down headlong into hell, which is gaping beneath them. As to the punishment of the wicked, the Mohammedans are taught, that hell is divided into seven stories or apartments, one below another, designed for the reception of as many distinct classes of the damned. The first, which they call Jehennam, they say, will be the reception of those who acknowledged one God, that is, the wicked Mohammedans; who, after having been there punished according to their demerits, will at length be released. The 2d, named Ladha, they assign to the Jews; the 3d, named al Hotama, to the Christians; the 4th named al Sair, to the Sabians; the 5th, named Sakar, to the Magians; the 6th, named al Jahim, to the idolaters; and the 7th, which is the lowest and worst of all, and is called al Hawyat, to the hypocrites, or those who outwardly professed some religion, but in their hearts were of none. The condition of these unhappy wretches, as the same prophet teaches, cannot be properly called either life or death; and their misery will be greatly increased by their despair of being ever delivered from that place, since, according to that frequent expression in the Koran, they must remain therein for ever. But the infidels alone will be liable to eternal damnation; for the Moslems, or those who have embraced the true religion, and have been guilty of heinous sins, will be delivered thence after they shall have expiated their crimes by their sufferings. The righteous having surmounted the difficulties, and passed the sharp bridge abovementioned, before they enter paradise, will be refreshed by drinking at the pond of their prophet, who describes it to be an exact square of a month's journey in compass; its water, which is supplied by two pipes from al Cawthar, one of the rivers of paradise, being whiter than milk or silver, and more odoriferous than musk, with as many cups set around it as there are stars in the firmament; of which water whoever drinks will thirst no more for ever. This is the first taste which the blessed will have of their future and now near-approaching felicity. The Koran speaks of the rivers of paradise as a principal ornament thereof: some of these, they say, flow with water, some with milk, some with wine, and others with honey; all taking their rise from the root of the tree Tuba. But all these glories will be eclipsed by the resplendent and ravishing girls of paradise, called, from their large black eyes, Hur al oym, or Houries, the enjoyment of whose company will be a principal felicity of the faithful. These, they say, are created, not of clay, as mortal women are, but of pure musk; being free from all natural impurities, defects, and inconveniences, incident to the sex; of the strictest modesty, and secluded from public view in pavilions of hollow pearls, so large, that one of them will be no less than four parasangs (or, 60 miles) long, and as many broad. The name which the Mohammedans usually give to this happy mansion, is al Jannat, or the garden; and sometimes they call it Junnat al Ferdaws, the garden of paradise; Jannat Ader, the garden of Eden, Jannat al Mawa, the garden of abode; Jannat al Naim, the garden of pleasure; and the like. 7. The Mohammedans believe in God's absolute decree and predestination both of good and evil. The orthodox doctrine is, that whatever hath or shall come to pass in this world, whether good or evil, proceedeth entirely from the divine will, and is irrevocably fixed and recorded from all eternity in the preserved table: God having pre-determined not only the adverse and prosperous fortune of every person in this world, in the most minute particulars, but also his faith or infidelity, his obedience or disobedience, and consequently his everlasting happiness or misery after death; which fate or predestination it is not possible by any foresight or wisdom to avoid. Of this doctrine Mohammed made great use for the advancement of his designs; encouraging his followers to fight without fear, and even desperately, for the propagation of their faith, by representing to them, that all their caution could not avert their inevitable destiny, or prolong their lives for a moment; and deterring them from disobeying or rejecting him as an impostor, by setting before them the dangers

they might thereby incur of being, by the just judgement of God, abandoned to seduction, hardness of heart, and a reprobate mind, as a punishment for their obstinacy.

MOHAMMEDANS, RELIGIOUS PRACTICES ENJOINED BY THE.

1. The first point is prayer, under which are comprehended those legal washings which are necessary preparations thereto. Of these purifications there are two degrees, one called ghost, being a total immersion or bathing of the body in water; and the other called wodu, which is the washing of their faces, hands, and feet, after a certain manner. The first is required in some particular cases only. The latter is the ordinary ablution in common cases, and before prayer, and must necessarily be used by every person before he can enter upon that duty. Circumcision, though it be not so much as once mentioned in the Koran, is yet held by the Mohammedans to be an ancient divine institution, confirmed by the religion of Islam, and, though not so absolutely necessary but that it may be dispensed with in some cases, yet highly proper and expedient. The Arabs used this rite for many ages before Mohammed, having learned it from Ishmael their ancestor. Prayer was by Mohammed thought so necessary a duty, that he used to call it the pillar of religion, and the key of paradise. He, therefore, obliged his followers to pray five times every 24 hours, at certain stated times; viz. 1. In the morning before sun-rise: 2. When noon is past, and the sun begins to decline from the meridian: 3. In the afternoon, before sun-set: 4. In the evening, after sun-set, and before day be shut in; and 5. After the day is shut in, and before the first watch of the night. At these times, of which public notice is given by the Mueddhins, or Criers, from the steeples of their mosques (for they use no bells), every conscientious Moslem prepares himself for prayer, which he performs either in the mosque, or any other place, provided it be clean, after a prescribed form, and with a certain number of praises or ejaculations (which the more scrupulous count by a string of beads), and using certain postures of worship; all which have been particularly set down and described, and must not be abridged, unless on a journey, or preparing for battle, &c. It is also requisite that they turn their faces, while they pray, towards the temple of Mecca; the quarter where the same is situated, being, for that reason, pointed out within the mosques by a nich, which they call al Mehrab; and without, by the situation of the doors opening into the galleries of the steeples: there are also tables calculated for the ready finding out their Keblah, or part towards which they ought to pray, in places where they have no other direction. 2. Alms are of two sorts, legal and voluntary. The legal alms are of indispensable obligation, being commanded by the law, which directs and determines both the portion which is to be given, and of what things it ought to be given; but the voluntary alms are left to every one's liberty, to give more or less, as he shall see fit. The former kind are called *zadat*, either because they increase a man's store by drawing down a blessing thereon, or because they purify the remaining part of one's substance from pollution, and the soul from the filth of avarice. The latter *sadakat*, because they are a proof of a man's sincerity in the worship of God. 3. Fasting is a duty of so great moment, that Mohammed used to say it was the gate of religion, and that the odour of the mouth of him who fasteth is more grateful to God than that of musk; and Ghazali reckons fasting one-fourth part of the faith. According to the Mohammedan divines, there are three degrees of fasting: 1. The restraining the belly and other parts of the body from satisfying their lusts: 2. The restraining the ears, eyes, tongue, hands, feet, and other members, from sin; and, 3. The fasting of the heart from worldly cares, and restraining the thoughts from every thing besides God. The Mohammedans are obliged by the Koran, to fast the whole month of Ramadan, from the new moon till the next new moon. The reason given why the month Ramadan was pitched on for this purpose is, that on that month the Koran was sent down from heaven. Some pretend, that Abraham, Moses, and Jesus, received their respective revelations in the same month. 4. The pilgrimage to Mecca is so necessary a point of practice, that, according to a tradition of Mohammed, he who dies without performing it may as well die a Jew or a Christian; and it is expressly commanded in the Koran. The temple of Mecca stands in the midst of the city, and is honoured with the title of *Masjad al elharam*, i. e. the sacred or inviolable temple. What is principally revered in this place, and gives sanctity to the whole, is a square stone-building, called the *Caaba*. To this temple every

every Mohammedan, who has health and means sufficient, ought, once at least in his life, to go on pilgrimage; nor are women excused from the performance of this duty. The pilgrims meet at different places near Mecca, according to the different parts from whence they come, during the months of Shawal and Dhulkaada; being obliged to be there by the beginning of Dhulhaya; which month is peculiarly set apart for the celebration of this solemnity. At these places the pilgrims properly commence such; when the men put on the Ibrah or sacred habit, which consists of two woollen wrappers, one wrapped about their middle, and the other thrown over their shoulders, having their heads bare, and a kind of slippers which cover neither the heel nor the instep, and so enter the sacred territory in their way to Mecca. While they have this habit on, they must neither hunt nor fowl, (though they are allowed to fish); which precept is so punctually observed, that they will not kill even a louse or a flea on their bodies: there are some noxious animals, however, which they have permission to kill during the pilgrimage, as kites, ravens, scorpions, mice, and dogs given to bite. During the pilgrimage, it behoves a man to have a constant guard over his words and actions; to avoid all quarrelling, all converse with women, and all obscene discourse; and to apply his whole attention to the good work he has engaged in. The pilgrims, being arrived at Mecca, immediately visit the temple; and then enter on the performance of the several ceremonies which their religion demands. The rapid success, which attended the propagation of this wretched system, was owing to causes that are plain and evident, and must remove, or rather prevent, our surprize, when they are attentively considered. The terror of Mohammed's arms, and the repeated victories which were gained by him and his successors, were, no doubt, the irresistible arguments that persuaded such multitudes to embrace his religion and submit to his dominion. Besides, his law was most artfully and marvellously adapted to the corrupt nature of man; and, more particularly, to the manners and opinions of the eastern nations, and the vices to which they were naturally addicted: for the articles of faith which it proposed were few in number, and extremely simple; and the duties it required were neither many nor difficult, nor such as were incompatible with the empire of appetites and passions. It is to be observed farther, that the gross ignorance, under which the Arabians, Syrians, Persians, and the greatest part of the eastern nations, laboured at this time, rendered many an easy prey to the artifice and eloquence of this bold adventurer. To these causes of the progress of Mohammedanism, we may add the bitter dissensions and cruel animosities that reigned among the Christian sects, particularly the Greeks, Nestorians, Eutychians, and Monophysites; dissensions that filled a great part of the East with carnage, assassinations, and such detestable enormities, as rendered the very name of Christianity odious to many. We might add, that the Monophysites and Nestorians, full of resentment against the Greeks, from whom they had suffered the most injurious treatment, assisted the Arabians in the conquest of several provinces, into which, of consequence, the religion of Mohammed was afterwards introduced. Other causes of the sudden progress of that religion will naturally occur to such as consider attentively its spirit and genius, and the state of the world at that time.

MOHATZ, a town of Lower Hungary, in Baraniwar, at the confluence of the Danube and the Corasse, 17 miles N. W. of Esseck.

MOHAWK, a town and river of New York.

MOHAWK COUNTRY, a part of N. America, formerly inhabited by one of the Six Nations of the Iroquois, situated between New York and Lake Ontario.

MOHAWKS, a nation of N. American Indians, who are acknowledged by the other tribes of the Six Nations to be "the true old head of the confederacy." They were formerly very powerful.

MOHICCONS; 1. a tribe of N. American Indians who inhabit, on a branch of the Susquehanna. 2. Another tribe in the N. Western territory near Sandusky, between the Sciota and Muskingum.

MOHILA, **MOHILLA**, or **MOELIA**, one of the Comorra islands in the Indian sea, between the N. end of Madagascar and Africa.

MOHILEF, or **MOHILOF**, a government of Russia formed

out of part of Lithuania, in 1772; when Catherine II. compelled the Poles to cede to her all that part of Lithuania which borders on Russia, comprehending one-third of the country. This she erected in the two governments or provinces of Mohilef and Polotzk.

MOHILOF, a large and strong city of Poland, in the above provinces and palatinate of Miezlau. Lon. 30. 14. E. Lat. 53. 52. N.

MOINEAU, in fortification, a flat bastion, raised before a courtin when it is too long, and the bastions of the angles too remote, to defend one another.

MOIRA, or **MOYRA**, a town of Ireland, in the county of Down, Ulster, 69 miles from Dublin; noted for its linen-manufacture.

MOISI, a river of Canada, running into the St. Lawrence, in Lon. 65. 40. W. Lat. 50. 15. N.

MOISAC, a town of France, in the department of Lot, on the Tarn, 13 miles N. W. of Montauban. Lon. 1. 17. E. Lat. 44. 6. N.

MOISTURE, a term sometimes used to denote animal-fluids, the juices of plants, or dampness of the air or other bodies. See **FLUID**, **JUICE**, **HUMIDITY**, &c.

MOIVRE, **ABRAHAM**, F. R. S. an eminent mathematician, born at Vitri in Champagne, A. D. 1667. His father was a surgeon. At the revocation of the edict of Nantes, he determined to fly into England rather than abandon the Protestant religion. Before he left France, he had begun to study mathematics; and having perfected himself in that science in London, he resolved to teach it. Newton's Principia shewed him how little progress he had made in a science of which he thought himself master. From this work he acquired a knowledge of the geometry of infinites with as great facility as he had learned the elementary geometry. His success in these studies procured him a seat in the Royal Society of London, and in the Academy of Sciences at Paris. His merit was so much esteemed, that he was thought capable of deciding in the famous dispute between Leibnitz and Newton, concerning the differential calculus. He published a Treatise on Chances in 1738, and another on Annuities in 1752; both extremely accurate. The Philosophical Transactions contain many interesting memoirs of his composition; some on the method of fluxions; others on the lunula of Hippocrates; others on physical astronomy, in which he resolved many important problems; and others, on the analysis of the games of chance. Towards the close of his life he lost his sight and hearing, and the demand for sleep became so great that he required 20 hours of it in a day. He died at London, in 1754, aged 87. He was intimately acquainted with the best authors of antiquity; and was often consulted about difficult passages in their works. He detested all indecent witticisms against religion.

MOKDASI, a title among the oriental Christians, similar to that of Hadsji, among the Turks, given to those pilgrims who have not only performed the journey to Jerusalem, but kept the passover in it, and assisted at all the ceremonies of the holy weeks.

MOLA DI GAETA, an ancient town of Naples in Lavora, where Cicero resided and was murdered.

MOLA SALSA, **SALT CAKE**, in antiquity, was barley parched, and afterwards ground to meal or flour, then mixed with salt and frankincense, with the addition of a little water. Thus prepared, it was sprinkled between the horns of the victim before it was killed in sacrifice. This act was called immolatio, and was common to the Greeks and Romans; with this difference, that the mola of the Romans was of wheat. The Greeks called it *αλη* or *αλογυλη*.

MOLARES, or **DENTES MOLARES**. See **ANATOMY**.

MOLASSES. See **MOLASSES**.

MOLDAVA, a river of European Turkey, which rises near Hungary, passes Niemez, and runs into the Siret, in Moldavia.

MOLDAVIA, a province of Turkey in Europe, bounded on the N. E. by the Niester, which divides it from Poland; on the E. by Bessarabia; on the S. by the Danube, which parts it from Bulgaria; and on the W. by Walachia and Transylvania. It is 240 miles long and 150 broad. The climate is good, and the soil fruitful, producing corn, wine, rich pastures, a good breed of horses, oxen, sheep, game, fish, fowl, honey, wax, and all European fruits. Its principal rivers are the Danube, Daister, Pruth, Bardalach,

Bardalach, and Geret. The inhabitants are Christians of the Greek church, and Jassy is the capital.

MOLE, in architecture, a massive work formed of large stones laid in the sea by means of coffer-dams, extended either in a right line or an arch of a circle, before a port, which it serves to close; to defend the vessels in it from the impetuosity of the waves, and to prevent the passage of ships without leave.

MOLE is sometimes also used to signify the harbour itself.

MOLE, MOLES, among the Romans, was used for a kind of mausoleum, built in manner of a round tower on a square base, insulate, encompassed with columns, and covered with a dome.

MOLE, in zoology. See **TALPA**. Moles in the fields may be destroyed by taking a head or two of garlic, onion, or leek, and putting it into their holes; on which they will run out as if frightened, and you may kill them with a spear or dog. Or pounded helbore, white or black, with wheat-flour, the white of an egg, milk, and sweet wine, or metheglin, may be made into a paste, and pellets as big as a small nut may be put into their holes: the moles will eat this with pleasure, and will be killed by it.

MOLE-CRICKET. See **GRYLUS**.

MOLECULA, or MOLECULE, a small part of any thing: a little cake or lump; a small spot on the skin.

MOLINA, a celebrated Jesuit, founder of the sect of the Molinists. He taught that the operations of divine grace were entirely consistent with the freedom of human will; and introduced a new hypothesis to remove the difficulties attending the doctrines of predestination and liberty, and to reconcile the jarring opinions of Augustines, Thomists, Semi-Pelagians, and other polemical divines. He affirmed, that the decree of predestination to eternal glory was founded upon a previous knowledge and consideration of the merits of the elect; that the grace, from whose operation these merits are derived, is not efficacious by its own intrinsic power only, but also by the consent of our own will, and because it is administered in those circumstances, in which the Deity, by that branch of his knowledge which is called *scientia media*, foresees that it will be efficacious. The kind of prescience, denominated in the schools *scientia media*, is that foreknowledge of future contingents that arises from an acquaintance with the nature and faculties of rational beings, of the circumstances in which they shall be placed, of the objects that shall be presented to them, and of the influence which their circumstances and objects must have on their actions.

MOLINISTS, in ecclesiastical history, a sect in the Romish church, who follow the doctrine and sentiments of Molina, relating to sufficient and efficacious grace. See **MOLINA**.

MOLISE, a province or county of Naples, bounded on the N. by Abruzzo Citra. It is fertile in corn, wine, saffron, silk, &c. Campo Basso is the capital.

MOLISE, a town in the above county 48 miles N. N. E. of Naples, and 95 E. S. E. of Rome.

MOLL, HERMAN, a celebrated English geographer, who published very accurate maps, which are still esteemed. He died in 1732.

MOLLUGO, AFRICAN CHICKWEED; a genus of the trigynia order, and triandria class of plants; natural order, Carophyllæ. Calyx five-leaved; no corolla; capsule trilocular, three-valved. Six species are enumerated, annual plants, and natives of warm climates.

MOLLUSCA, in natural history, the name of the second order of the Linnæan class, Vermes. They are naked; furnished with tentacula, or arms; for the most part inhabitants of the sea.

Actinia	Pedicellaria
Ascidia	Salpa
Clava	Terris
Dagysia	Pterotrachea
Doris	Limax
Laplysia	Tethys
Holothuria	Terebella
Clio	Scyllæa
Lernæa	Sepia
Lobaria	Triton
Onchidium	Amphitrite
Aphrodita	Nereis
Nais	Spio
Asterias	Medusa

Echinus

Lucernaria

Physophora

MOLMUTIN LAWS, in ancient British history, the laws of Dunwallo Molmutius, the 16th king of the Britons. They are said to have been in use till the Norman conquest.

MOLO, a philosopher of Rhodes, called also Apollonius. Some are of opinion that Apollonius and Molo were different persons, both natives of Alabanda, and disciples of Meneceles. They both visited Rhodes, and there opened a school; but Molo came some time after Apollonius. Molo had Cicero and J. Cæsar among his pupils.

MOLOCH, or MOLECH, [מלך, Heb. *i. e.* King,] a false god of the Ammonites, who dedicated their children to him, by making them "pass through the fire," as the scriptures express it. There are various opinions concerning this method of consecration. Some think, the children leaped over a fire sacred to Moloch; others, that they passed between two fires; but the most probable opinion is, that they were really burnt in the fire, as sacrifices to this god. For, although it was usual among the pagans to lustrate or purify with fire, yet it is expressly said, that the inhabitants of Scpharvaim burnt their children in the fire to Anamelech and Adramelech; deities similar to Moloch of the Ammonites. Moses, in several places, forbids the Israelites to dedicate their children to this god as the Ammonites did, and threatens utter extirpation to such as were guilty of this abominable idolatry. The Hebrews were however much addicted to this barbarous superstition. Amos, and after him St. Stephen, reproaches them with having carried along with them into the wilderness the tabernacle of their god Moloch. It was chiefly in the valley of Tophet and Hinnom, E. of Jerusalem, that the Israelites paid their idolatrous worship to this false god.

MOLLOSSES, or MOLASSES, [*melazzo*, Italian,] treacle; the spume or scum of the juice of the sugar-cane; the gross fluid matter which remains after refining sugar, and which no boiling will bring to a consistence more solid than that of syrup; hence also called syrup of sugar. Molosses are much used in Holland for the preparation of tobacco, and also among poor people instead of sugar. There is a kind of brandy or spirit made of molosses: but by some held exceedingly unwholesome.

MOLLOSSES, ARTIFICIAL. There has been found a method of making molosses from apples without the addition of sugar. The apple that succeeds best in this operation is a summer sweetening of a middle size, pleasant to the taste, and so full of juice that seven bushels will yield a barrel of cyder. The method of making it is this: the apples are to be ground and pressed; then the juice is to be boiled in a large copper, till three quarters of it be evaporated; this will be done with a moderate fire in about six hours, with the quantity of juice above mentioned; by this time it will be of the consistence and taste as well as of the colour of molosses. These new molosses serve all the purposes of the common kind, and are of great use in preserving cyder. Two quarts of it, put into a barrel of a racked cyder, will preserve it, and give it an agreeable colour. The invention of this kind was owing to Mr. Chandles of Woodstock in New England, who living at a distance from the sea, and where the common molosses were very dear and scarce, provided this for the supply of his own family, and soon made it the practice among the people of the neighbourhood. It is to be observed, that this sort of apple, the sweetening, is of great use in making cyder, one of the very best kinds we know being made of it. The people in New England also feed their hogs with the fallings of their orchards of these apples; in consequence of which their pork is the finest in the world.

MOLOSSIA, or MOLOSSIS, a territory of Epirus so named from king Molossus, son of Pyrrhus and Andromache. This country had the bay of Ambracia on the S. and the country of the Perrhæbeans on the E.

MOLOSSUS, in the Greek and Latin poetry, a foot consisting of three long syllables. As *aūdīrī, cāntābānt, vīrtū'ē.n.* It takes its name either from a dance in use among the Molossi, or from the temple of Jupiter Molossus, where odes were sung, in which this foot had a great share.

MOLSHEIM, a town of France, in the department of the Lower Rhine, 10 miles W. S. W. of Strasburgh. Lon. 7. 35. E. Lat. 48. 33. N.

MOLTEN GREASE. See **FARRIERY**.

MOLTING,

MOLTING, the change of feathers, hair, or horns, in birds and beasts.

MOLUCCA ISLANDS, lie in the East Indian Sea under the line. There are six principal islands; viz. Amboyna, Ternate, Tydor, Machian, Motyr, and Bachian. The largest is hardly thirty miles in circumference. They produce neither corn, rice, nor cattle, except goats; but have oranges, lemons, and other fruits; and are most remarkable for spices, especially cloves.

MOLUCCELLA, or **MOLUCILLA**, **MOLUCCA BAUM**; in botany, a genus of the gymnospermia order, and didymia class of plants; natural order, Verticillata. Calyx campanulate, gradually widening, larger than the corolla, spinous. It has three species.

MOLWITZ, a town of Silesia, in the province of Grotzka. Lon. 16. 45. E. Lat. 50. 26. N.

MOLYBDATES, in chemistry, salts formed from the molybdic acid and the earths, alkalies, &c. They are mostly colourless, and soluble in water; they have a metallic taste. The prussiate of potash throws down from several of them a light brown coloured precipitate.

MOLYBDENUM, [*μολυβδαίνα*, from *μολυβδος*, lead,] a term applied by the ancients to several oxides of lead, but afterwards used to denote light friable soft greasy substances having a dark colour, and leaving a stain on the fingers. Scheele first examined these minerals with attention. He found that two very different substances had been confounded together. To one of these, which is composed of carbon and iron, he appropriated the word plumbago; the other he called molybdena. Molybdena is composed of scaly particles adhering slightly to each other. Its colour is bluish, very much resembling that of lead, but its fracture is a whitish-grey. Hitherto it has only been procured in small grains, agglutinated together in brittle masses. Its specific gravity is 7.4. It is almost infusible in our fires. When exposed to heat in an open vessel, it gradually combines with oxygen, and is converted into a white oxide, which is volatilized in small brilliant needle-form crystals. This oxide, having the properties of an acid, is known by the name of molybdic acid. From the experiments of Mr. Hatchet, it follows that molybdenum is capable of combining with four different proportions of oxygen, and of forming four oxides; namely, 1. The black; 2. The blue; 3. The green, to which Mr. Hatchet has given the name of molybdous acid; and, 4. The yellow or white, or the molybdic acid. It combines readily with sulphur, and in that state it is called molybdena, the sulphuret of molybdenum. This may be formed by distilling together one part of molybdic acid and five parts of sulphur. It will also combine with phosphorus. Muriatic acid has but little effect on the metal; but it dissolves the oxide. Molybdenum will unite with many of the metals, forming with them alloys.

MOLYBDENA, or **SULPHURET OF MOLYBDENUM**, occurs massive, disseminated, and rarely crystallized. Its colour is like that of fresh cut metallic lead. It occurs in granular distinct concretions; it is opaque, stains the fingers, leaves shining traces when drawn over paper; it is very soft and easily divisible in the direction of its laminae. Specific gravity 4.5 to 4.7. It is infusible before the blow-pipe, but exhales a sulphureous odour; at a very high heat, it melts, gives out white fumes, and burns with a blue flame; it consists of 45 parts of molybdic acid, and 55 of sulphur. It is found in Norway, Sweden, Saxony, and in Mont-Blanc in Switzerland.

MOLYBDIC, **MOLYBDOS ACID**. See **MOLYBDENUM**.

MOLYNEUX, DR. WILLIAM, an excellent mathematician and astronomer, born at Dublin in 1656. When he left the university of that city, he carried with him a testimonial expressing in the strongest terms the highest opinion of his genius, and the probity of his manners. In 1675, he entered in the Middle Temple, where he spent three years in the study of the law; but the bent of his genius lay strongly toward mathematics and philosophy; and even at the university he fell into the methods of Lord Bacon. Returning to Ireland in June 1678, he married Lucy the daughter of Sir William Domville, attorney-general. Being master of an easy fortune, he continued to prosecute natural and experimental philosophy, particularly astronomy; and about 1681 he commenced a literary correspondence with Flamsteed the king's astronomer, which he kept up for several years. In 1683, he formed a design of erecting a philosophical society at Dublin, in imita-

tion of the Royal Society at London; and, by the countenance of Sir William Petty, who accepted the office of president, they began a weekly meeting that year, when he was appointed their first secretary. In April 1689, he published his *Sciothericum Telescopium*, containing a description of the structure and use of a telescopic dial invented by him. He spent two years with his family at Chester, where he wrote his *Dioptries*, dedicated to the Royal Society. Here he lost his lady, who died soon after she had brought him a son. As soon as tranquillity was settled in Ireland, he returned home; and, upon the convening of a new parliament in 1692, was chosen one of the representatives for Dublin. In 1695, he was elected for the university, whom he represented to the end of his life: and that learned body conferred on him the degree of LL. D. He was likewise nominated a commissioner for the forfeited estates, with a salary of 500*l.* a year; but declined it as an invidious office. In 1698, he published, "The Case of Ireland stated, in Relation to its being bound by Acts of Parliament made in England." Among those with whom he maintained correspondence and friendship, Mr. Locke was in a particular manner dear to him, as appears from their letters. In 1698, which was the last year of his life, he went to England, to visit that great man; and soon after his return to Ireland was seized with a fit of the stone, of which he died. He published also several pieces in the *Philosophical Transactions*.

MOMBAZA, or **MONBAZA**, a town of Africa, in an island of the same name, with a castle and a fort: seated on the E. coast, opposite to the above country, 70 miles S. of Melinda. Lon. 43. 0. W. Lat. 44. 0. N.

MOMENT, [*momentum*, Lat.] in the doctrine of time, ought not to be considered as any part of time, but only as the termination or limit thereof.

MOMENT, in the doctrine of infinites, denotes the same with infinitesimal. See **INFINITESIMAL**.

MOMENTUM, in mechanics, signifies the same with impetus, or the quantity of motion in a moving body; which is always equal to the quantity of matter multiplied in the velocity; or, which is the same thing, it may be considered as a rectangle under the quantity of matter and velocity. See **MECHANICS**.

MOMORDICA, **MALE BALSAM APPLE**; a genus of the syngenesia order, and monœcia class of plants; natural order, Cucurbitaceæ. Male calyx five-cleft; corolla five-parted; filaments three. Female calyx three-cleft; corolla five-parted; fruit an apple parting asunder with a spring. Eight species are known.

M. BALSAMINA, the **MALE BALSAM-APPLE**, is a native of Asia, and has a trailing stalk like the melon, with smooth leaves, cut into several segments, and spread open like a hand. The fruit is oval, ending in acute points, having several deep angles, with sharp tubercles placed on their edges. It changes to a red or purplish colour when ripe, opening with an elasticity, and throwing out its seeds. This species is famous in Syria for curing wounds. The natives cut open the unripe fruit, and infuse it in sweet oil, which they expose to the sun for some days, until it becomes red; and then present it for use. Dropped on cotton, and applied to a fresh wound, the Syrians reckon this oil the best vulnerary next to balsam of Mecca. It often cures large wounds in three days. The leaves and stems are used for arbours or bowers.

M. ELATERIUM, **WILD OR SPURTING CUCUMBER**, has a large fleshy root, somewhat like briony, whence come forth every spring several thick, rough, trailing stalks, dividing into many branches, and extending every way two or three feet. From the property which the plant has of throwing out its seeds, with a violent force, upon being touched, it has sometimes been called *noli me tangere*.

MOMOTUS, a genus of birds of the order pica. Bill strong, slightly curved, serrate at the edges; nostrils feathered; tongue feathered; tail wedged; feet formed for walking. There is but one species, the *Brasiliensis*, that inhabits Brasil; size of a black-bird; eighteen inches long; lives solitarily in unfrequented forests; feeds on insects and raw flesh. Its voice is harsh, weak, and tremulous.

MOMUS, in the mythology, the god of raillery, or the jester of the celestial assembly, who ridiculed both gods and men. Being chosen by Vulcan, Neptune, and Minerva, to give his judgement concerning their works, he blamed them all: Neptune for not making his bull with horns before his eyes, in order that

he might give a surer blow; Minerva for building a house that could not be removed in case of bad neighbours; and Vulcan, for making a man without a window in his breast, that his treacheries might be seen. For his free reflections upon the gods, Momus was driven from heaven. He is generally represented raising a mask from his face, and holding a small figure in his hand.

MONA, in ancient geography, an island in the sea, between Britain and Ireland; called Monaëda, by Ptolemy; Monapia, or Monabia, by Pliny: supposed to be the Isle of Man.

MONA, another island, between Britain and Ireland, mentioned by Tacitus, more to the S. now called Anglesey. See ANGLESEY.

MONA, an island of the Baltic Sea, S. W. of the island of Zealand, subject to Denmark. Lon. 12. 30. E. Lat. 55. 20. N.

MONACHISM. See MONASTERY, and MONK.

MONACO, a late principality of Italy, on the coast of the Mediterranean, between Nice and Genoa, five Italian miles in circuit, and now included in the department of the Maritime Alps.

MONACO, a town in the department of Maritime Alps, in the above territory. Lon. 7. 33. E. Lat. 43. 48. N.

MONAD, or MONADE, [*μοναδα*], an indivisible thing. See LEIBNITZIAN PHILOSOPHY.

MONADELPHIA, [from *μονα*, alone, and *αδελφια*, a brotherhood,] a single brotherhood: the 16th class in Linnæus's sexual system. See BOTANY.

MONAGHAN, a county of Ireland, situated in the province of Ulster, bounded on the E. by Armagh. It is a boggy and mountainous tract, but in some places is well improved.

MONAGHAN, the capital of the above county, is 62 miles N. N. W. from Dublin. Lon. 6. 49. W. Lat. 54. 16. N.

MONANDRIA, [from *μονα*, alone, and *ανδρ*, a man,] the first class in Linnæus's sexual system. See BOTANY.

MONARCH, [*μοναρχος*], a governor invested with absolute authority. See EMPEROR, KING, &c.

MONARCHY, [*μοναρχια*], a large state governed by one; or a state where the supreme power is lodged in the hands of a single person. Of the three forms of government, viz. democracy, aristocracy, and monarchy, the last is the most powerful, all the sinews of government being knit together, and united in the hand of the prince; but then there is imminent danger of his employing that strength to oppressive purposes. As a democracy is the best calculated to direct the end of a law, and an aristocracy to invent the means by which that end shall be obtained, a monarchy is most fit for carrying these means into execution. Of monarchies some are absolute and despotic, where the will of the monarch is uncontrollable; others are limited, where the prince's authority is restrained by laws, and part of the supreme power lodged in other hands, as in Britain. See GOVERNMENT. Some monarchies again are hereditary, where the succession devolves immediately from father to son; and others are elective, where, on the death of the monarch, his successor is appointed by election, as in Poland, before its dismemberment by those pretended friends of social order Frederic, William II. of Prussia, and Catharine II. of Russia.

MONARCHY, UNIVERSAL. The most ancient monarchy was that of the Assyrians, which is said to have been founded soon after the deluge; though Archbishop Ussher differs from most other chronologists by placing the foundation of this kingdom upwards of 1000 years after this event. Historians usually reckon four grand monarchies the Assyrian, Persian, Grecian, and Roman. Belus is placed at the head of the series of Assyrian kings who reigned at Babylon, and is by profane authors esteemed the founder of it, and by some the same whom the scriptures call Nimrod. The principal Assyrian kings after Belus were Ninus, who built Nineveh, and removed the seat of empire to it; Semiramis, who, disguising her sex, took possession of the kingdom instead of her son, and was killed and succeeded by her son Ninyas; and Sardanapalus, the last of the Assyrian monarchs. After his death the Assyrian empire was split into three separate kingdoms, viz. the Median, Assyrian, and Babylonian. Cyrus founded the second grand monarchy called the Persian, which stood upwards of 200 years, from Cyrus, from A. M. 3468, to Darius Codomannus, who was conquered by Alexander A. M. 3674. The first monarch was Cyrus. 2. Cambyzes, the son of Cyrus. 3. Smerdis. 4. Darius, the son of Hystaspes, who reigned B. C. 521. 5. Xerxes, who reigned B. C. 485. 6. Ar-

taxerxes Longimanus, who reigned B. C. 464. 7. Xerxes II. 8. Ochus, or Darius Notbus, B. C. 424. 9. Artaxerxes Mnemon, B. C. 405. 10. Artaxerxes Ochus, B. C. 359. 11. Arsēs, B. C. 338. 12. Darius Codomannus, B. C. 336, who was defeated by Alexander the Great, and deprived of his kingdom, and life, B. C. 331, and the dominion of Persia translated to the Greeks. The third grand monarchy was the Grecian. As Alexander, when he died, did not declare who should succeed him, there started up as many kings as there were commanders. At first they governed the provinces that were divided among them under the title of viceroys; but when the family of Alexander the Great was extinct, they took upon them the name of kings. Hence, in process of time, the whole empire of Alexander produced four distinct kingdoms, viz. 1. The Macedonian. 2. The Asiatic. 3. The Syrian. 4. The Egyptian, which was formed by the Greeks in Egypt, and flourished near 240 years. The fourth grand monarchy was the Roman, whose regal state lasted only 244 years, from the building of the city until the royal power was abrogated. The kings of Rome, were Romulus, its founder; Numa Pompilius; Tullus Hostilius; Ancus Martius; Tarquin I. Servius Tullus; and Tarquin II. who was banished, and with whom terminated the regal power. But it was not under its kings, that Rome became the fourth grand monarchy. It was long after the regal power was abolished, when the Roman republic in its different forms of government under consuls, dictators, tribunes, decemvirs, emperors, and popes, became and constituted one very great, increasing, and at last universal empire, or rather tyranny over all the rest of the known world, such as has never since been equalled by the government of any other nation. The strong resemblance of these four universal empires to the prophetic description of them given by Daniel, under the similitude of four great beasts, (an emphatical scriptural expression for the various tyrannies that have prevailed among mankind) and this vision being seen too by the prophet at a time, when only the first of them had begun to exercise its tyranny over the world, must satisfy every Christian, as well as every man who is willing to lay aside prejudice, of the divine inspiration of that prophet. See Dan. ch. ii. vii. and viii. Prideaux's Connection; Selden, De quatuor monarchiis, &c.)

MONARDA, INDIAN HOREHOUND, OSWEGO TEA, or AMERICAN FIELD-BASIL; in botany, a genus of the monogylia order, and diandria class of plants; natural order, Verticillatæ. Corolla unequal, upper lip linear, involving the filaments; seeds four. Seven species are enumerated.

MONAS, in natural history, a genus of insects of the vermes infusoria class and order. Worm invisible to the naked eye, most simple, pellucid, resembling a point. There are five species, some of them the most minute animalcules, almost eluding the powers of the best microscopes.

MONASTER, a town of Tunis. Lon. 11. 6. E. Lat. 35. 50. N.

MONASTEREVAN, a town of Ireland, in Kildare, Leinster, 36 miles from Dublin.

MONASTERY, [*monasterium*, Lat.] a convent, or house built for the reception and entertainment of monks, mendicant friars, or nuns, whether it be an abbey, priory, &c. Monasteries are governed by different rules, according to the different regulations prescribed by their founders. The first regular and perfect monasteries were founded by St. Pachomius, in Egypt: but St. Basil is generally considered as the great father and patriarch of the eastern monks; since in the fourth century he prescribed rules for the government of the monasteries, to which the anachorites and cenobites, and the other ancient fathers of the deserts, submitted: in like manner St. Benedict was stiled the patriarch of the western monks; he appeared in Italy towards the latter end of the fifth century, and published his rule, which was universally received throughout the west. St. Augustine being sent into England by St. Gregory the pope, in the year 596, to convert the English, he at the same time introduced the monastic state into this kingdom, which made such progress here, that within the space of 200 years there were thirty kings and queens who preferred the religious habits to their crowns, and founded stately monasteries, where they ended their days in solitude and retirement. The dissolution of houses of this kind began so early as 1512, when the templars were suppressed; and in 1523 their lands, churches,

churches, advowsons, and liberties, in England, were given by 17 Ed. II. st. 3, to the prior and brethren of the hospital of St. John at Jerusalem. In 1390, 1437, 1441, 1459, 1497, 1503, 1508, and 1515, several other houses were dissolved, and their revenues settled on different colleges in Oxford and Cambridge. Soon after the last period, Cardinal Wolsey, by licence of the king and pope, obtained a dissolution of above thirty religious houses for the founding and endowing his colleges at Oxford and Ipswich. About the same time a bull was granted by the same pope to Cardinal Wolsey to suppress monasteries, where there were not above six monks to the value of 8000 ducats a year, for endowing Windsor and King's College in Cambridge; and two other bulls were granted to Cardinals Wolsey and Campeius, where there were less than twelve monks, and to annex them to the greater monasteries; and another bull to the same cardinals to inquire about abbeys to be suppressed in order to be made cathedrals. Although nothing appears to have been done in consequence of these bulls, the motive which induced Wolsey and many others to suppress these houses was the desire of promoting learning; and archbishop Cranmer engaged in it with a view of carrying on the Reformation. There were other causes that concurred to bring on their ruin: many of the religious were loose and vicious; the monks were generally thought to be in their hearts attached to the pope's supremacy; their revenues were not employed according to the intent of the donors; many cheats in images, feigned miracles, and counterfeit relics, had been discovered, which brought the monks into disgrace; the observant friars had opposed the king's divorce from Queen Catherine; and these circumstances operated, in concurrence with the king's want of a supply and the people's desire to save their money, to forward a motion in parliament, that in order to support the king's state and supply his wants, all the religious houses might be conferred upon the crown which were not able to spend above 200*l.* a year; and an act was passed for that purpose 27 Hen. VIII. c. 28. By this act about 380 houses were dissolved, and a revenue of 30,000*l.* or 32,000*l.* a year came to the crown; besides about 100,000*l.* in plate and jewels. The suppression of these houses occasioned discontent, and at length an open rebellion: when this was appeased, the king resolved to suppress the rest of the monasteries, and appointed a new visitation; which caused the greater abbeys to be surrendered; and it was enacted by 31 Hen. VIII. c. 13, that all monasteries, &c. which have been surrendered since the 4th of February, in the 27th year of his reign, and which hereafter shall be surrendered, shall be vested in the king. The knights of St. John of Jerusalem were also suppressed by the 32 Hen. VIII. c. 24. The suppression of these greater houses by these two acts produced a revenue to the king of above 100,000*l.* a year, besides a large sum in plate and jewels. The last act of dissolution in this king's reign was the act of 37 Hen. VIII. c. 4, for dissolving colleges, free chapels, chantries, &c. which act was farther enforced by 1 Edw. VI. c. 14. By this act were suppressed 90 colleges, 110 hospitals, and 2374 chantries and free chapels. The number of houses and places suppressed from first to last, so far as any calculations appear to have been made, has been estimated at 3,182; besides many others of inferior rank, of which no account was kept. The total annual revenue of these is estimated at not less than 140,784*l.* 19*s.* 3*d.* all of which, besides a vast quantity of silver-plate, came into the king's hands, which, considering the value of money at that time, is inestimable. The total number of persons contained in these houses is estimated at 50,000. It is observable, upon the whole, that the dissolution of these houses was an act, not of the church, but of the state; in the period preceding the Reformation, by a king and parliament of the Roman Catholic communion in all points except the king's supremacy; to which the pope himself, by his bulls and licences, had led the way.

MONASTIC LIFE, or **PROFESSION**, a kind of civil death, which in all worldly matters has the same effect with the natural death. The council of Trent, &c., fix sixteen years for the age at which a person may be admitted into the monastical state. St. Antony, in the fourth century, first instituted the monastic life, as St. Pachomius, in the same century, first set on foot the cœnobitic life, i. e. regular communities of religious. In a short time the deserts of Egypt became inhabited with a set of solitaries, who took upon them the monastic profession. St. Basil

carried the monkish humour into the east, where he composed a rule which afterwards obtained through a great part of the west.

MONASTIRSKA, a town of Russia, in Tobolsk, on the Mura. Lon. 99. 30. E. Lat. 57. 4. N.

MONBODDO, JAMES BURNET, Lord, a late eminent Scottish judge and man of letters, descended of an ancient family in Kincardineshire. He was born in 1714. Having gone through the usual course of studies preparatory to the profession of a lawyer, with uncommon diligence, he was admitted a member of the faculty of advocates in 1737; and, in 1767, was appointed one of the Senators of the college of justice; an office which he discharged with assiduity, integrity, and abilities. The course of his studies, and his particular habits of thinking, led him to entertain a most enthusiastic veneration for the wisdom and learning of the ancients, and a proportional degree of contempt for those of the moderns. The first evidence he gave to the public, of this admiration of ancient authors, was in his work *Of the Origin and Progress of Language*; the first volume of which was published at Edin. in 4to. 1772. This and the subsequent volumes were perused by critics with sentiments of mingled respect, indignation, and ridicule. Along with the philosophical history of language, his plan included that of civilization and science; upon all of which he certainly advanced opinions equally singular and whimsical. Those who were partial to modern literature, or were strangers to the deeper mysteries of Greek erudition, condemned his lordship's work with the most severe censures. The Scottish literati, almost to a man, declared it to be unworthy of perusal, unless as a piece of amusement from its ridiculous absurdity. Nothing else (they alleged) could have prevented it from falling as a dead-born abortion from the press. During the vacations of the Court of Session, Lord Monboddoo retired every spring and autumn to his seat of Monboddoo, where he usually lived in a style of the most primitive simplicity, dressed in the habit of a country-farmer, in coarse cloth of Scots manufacture. Among his tenants he lived familiarly like the kind father of a large family. His patrimonial estate did not afford above 300*l.* a year; yet he never raised their rents, or dismissed a poor old tenant for the sake of any augmentation, though such offers were often made both to him and lord Gardenstone. He reckoned the chief improvement of an estate to consist in the increase of the number and happiness of its inhabitants. To vindicate the honour of the ancients, and the principles of the Grecian philosophy, more fully than he had done in his former work, lord Monboddoo published another 4to. volume, intitled "*Ancient Metaphysics*," which was much more favourably received than the former. He died in 1799.

MONCALLIER, a town of Italy, in the department of the Po, and late province of Piedmont, 5 miles S. E. of Turin.

MONCALVO, a town of Italy, in the department of Marengo, and late duchy of Montferrat, 7 miles S. W. of Casale.

MONCAON, or **MONZON**, a town of Portugal, in the province of Entre-Douro-e-Minho. Lon. 8. 2. W. Lat. 41. 52. N.

MONCON, or **MONZON**, a town of Spain, in Arragon.

MONDAY, the second day of the week. Monday is so called as being anciently sacred to the moon, or to Mona, the Diana of the Saxons.

MONDONNEDO, a town of Spain, in Galicia, 60 miles N. E. of Compostella. Lon. 7. 10. W. Lat. 43. 30. N.

MONDOVI, a considerable town and district of Italy, in the late province of Piedmont, now included in the department of Stura, 18 miles S. E. of Saluzzo, and 30 S. of Turin. Lon. 8. 6. E. Lat. 44. 33. N.

MONEMUGI, **MONO-EMUGI**, or **NIMAAMA**, an empire in the S. of Africa, which has Zanguebar on the E. Monomotapa on the S. Motamba and Mokoko on the W. and Abyssinia on the N. and partly on the E. though its boundaries that way cannot be ascertained. It is divided into the kingdoms of Mujaco, Makoko or Ansiko, Gingiro, Cambata, Alaba, and Monemugi Proper. It abounds with gold, silver, copper-mines, and elephants. The natives clothe themselves in silks and cottons, and wear collars of transparent amber-beads, brought from Cambaya: which serve also instead of money; gold and silver being common, and of little value among them. Their monarch always endeavours to be at peace with the princes round about him, and

to keep an open trade with Quitoa, Melinda, and Mombaza, on the E. and with Congo on the W. from all which places the black merchants resort thither for gold. On the E. side of Monemugi there is a great lake full of small islands, abounding with all sorts of fowl and cattle, and inhabited by negroes. This country affords also abundance of palm-wine and oil, and such quantities of honey, that above half of it is lost, the natives not being able to consume it. The air is generally very unwholesome, and excessively hot.

MONETARIUS, or **MONEYER**, a name which antiquaries and medalists give to those who struck the ancient coins or monies.

MONETIA, in botany, a genus of the monogynia order, and tetrandria class of plants. Calyx four-cleft; petals four; berry two-celled; seeds solitary. There is but one species; viz. *M. barlerioides*, four-spined *Monetia*, a native of the East Indies and the Cape of Good Hope.

MONEY, [*moneta*, Lat.] a substance, commonly metal, and generally of a determined shape and weight, to which public authority has affixed a certain value to serve as a medium in commerce. See **BANK**, **COIN**, **NUMISMATOGRAPHY**, and **TRADE**. Money is usually divided into real or effective, and imaginary or

money of account. Real money includes all coins or species of gold, silver, copper, &c. which exist and have currency, such as guineas, louis d'ors, pistoles, ducats, &c. Imaginary money, or money of account, is that which has never existed, or at least which does not exist in real specie, but is a denomination invented or retained to facilitate the stating of accounts by keeping them still on a fixed footing not to be changed, like current coins, which the authority of the sovereign raises or lowers according to the exigencies of the state. Of this kind are pounds in England and its dependencies, for which there never was a coin to answer. In France livres were of that kind, but for the franc of modern France, which answers in value to the livre, there is a corresponding coin. Among the ancients, the Greeks reckoned their monies of account by the drachma, mina, and talenta. The drachma was equal to about 7½*d.* sterling; of these 100 made a mina, equal to 3*l.* 4*s.* 7*d.* and 60 minæ made a talent, equal to 193*l.* 15*s.*; hence 100 talents amount to 19,375*l.* The same denominations were used in other Asiatic nations, but the values were different. Roman monies of account were the sestertius and the sestertium; the former was worth something less than 2*d.* and 1000 of these, equal to the sestertium was worth 8*l.* 1*s.* 5½*d.* sterling.

MONEY—UNIVERSAL TABLE

OF THE PRESENT STATE OF THE REAL AND IMAGINARY MONIES OF THE WORLD.

† This mark is prefixed to the Imaginary Money, or Money of Account.

All Fractions in the Value English are Parts of a Penny.

EUROPE—NORTHERN PARTS.

ENGLAND AND SCOTLAND.

London, Bristol, Liverpool, Edinburgh, Glasgow, Aberdeen, &c.

	L.	s.	d.
A Farthing.....	0	0	0½
2 Farthings..... = a Halfpenny.....	0	0	0½
2 Halfpence..... a Penny.....	0	0	1
4 Pence..... a Groat.....	0	0	4
6 Pence..... a Half-Shilling.....	0	0	6
12 Pence..... a Shilling.....	0	1	0
5 Shillings..... a Crown.....	0	5	0
20 Shillings..... † a Pound Sterling.....	1	0	0
21 Shillings..... a Guinea.....	1	1	0

IRELAND.

Dublin, Cork, Londonderry, &c.

A Farthing.....	0	0	0½
2 Farthings..... = a Halfpenny.....	0	0	0½
2 Halfpence..... † a Penny.....	0	0	0½
6½ Pence..... a Half Shilling.....	0	0	6
12 Pence..... † a Shilling Irish.....	0	0	11¾
13 Pence..... a Shilling.....	0	1	0
65 Pence..... a Crown.....	0	5	0
20 Shillings..... † a Pound Irish.....	0	18	5½
22½ Shillings..... a Guinea.....	1	1	0

FLANDERS AND BRABANT.

Ghent, Ostend, &c. Antwerp, Brussels, &c.

† A Pening.....	0	0	0¼
4 Penings..... = an Urche.....	0	0	0¼
8 Penings..... † a Grote.....	0	0	0½
2 Grotes..... a Petard.....	0	0	0½
6 Petards..... † a Scalin.....	0	0	5½
7 Petards..... a Scalin.....	0	0	6¾
40 Grotes..... † a Florin.....	0	1	6
17½ Scalins..... a Ducat.....	0	9	3
240 Grotes..... † a Pound Flemish.....	0	9	0

HOLLAND AND ZEALAND.

Amsterdam, Rotterdam, Middleburg, Flushing, &c.

	L.	s.	d.
† A Pening.....	0	0	0¼
8 Penings..... = † a Grote.....	0	0	0½
2 Grotes..... a Stiver.....	0	0	1½
6 Stivers..... a Scalin.....	0	0	6½
20 Stivers..... a Guilder.....	0	1	9
50 Stivers..... a Rix dollar.....	0	4	4½
60 Stivers..... a Dry Guilder.....	0	5	3
105 Stivers..... a Ducat.....	0	9	3
6 Guilders..... † a Pound Flemish.....	0	10	6

GERMANY.

HAMBURG. Altena, Lubec, Bremen, &c.

† A Tryling.....	0	0	0¾
2 Trylings..... = † a Sexling.....	0	0	0¾
2 Sexlings..... a Fening.....	0	0	0¾
12 Fenings..... a Schilling Lub.....	0	0	1½
16 Schillings Lub. † a Marc.....	0	1	6
2 Marcs..... a Slet dollar.....	0	3	0
3 Marcs..... a Rix-dollar.....	0	4	6
6½ Marcs..... a Ducat.....	0	9	4½
120 Schillings..... † a Pound Flemish.....	0	11	3

HANOVER. Lunenburgh, Zell, &c.

† A Fening.....	0	0	0¾
3 Fenings..... = † a Dreyer.....	0	0	0¾
8 Fenings..... a Marien.....	0	0	1½
12 Fenings..... a Grosh.....	0	0	1½
8 Groshen..... a Half-Gulden.....	0	1	2
16 Groshen..... a Gulden.....	0	2	4
24 Groshen..... † a Rix-dollar.....	0	3	6
32 Groshen..... † a Double Gulden.....	0	4	8
4 Guldens..... a Ducat.....	0	9	2

SAXONY AND HOLSTEIN.

Dresden, Leipsic, &c. Wismar, Keil, &c.

† An Heller.....	0	0	0¾
2 Hellers..... = a Fenning.....	0	0	0¾

SAXONY, &c.

SAXONY, &c.

			<i>L. s. d.</i>
16	Hellers	= a Marien	0 0 $1\frac{1}{4}$
12	Fenings	= a Grosh	0 0 $1\frac{1}{2}$
16	Groschen	= a Gould	0 2 4
24	Groschen	= a Rix-dollar	0 3 6
32	Groschen	= a Specie-dollar	0 4 8
4	Goulds	= a Ducat	0 9 4

BRANDENBURGH AND POMERANIA.

Berlin, Potsdam, &c. Sictin, &c.

1	A Denier	= a Polchen	0 0 $0\frac{2}{3}$
9	Deniers	= a Polchen	0 0 $0\frac{2}{3}$
18	Deniers	= a Grosh	0 0 $0\frac{2}{3}$
3	Polchens	= an Abrass	0 0 $0\frac{2}{3}$
20	Groschen	= a Marc	0 0 $9\frac{1}{2}$
30	Groschen	= a Florin	0 1 2
90	Groschen	= a Rix-dollar	0 3 6
108	Groschen	= an Albertus	0 4 2
8	Florins	= a Ducat	0 9 4

COLOGN, Mentz, Triers, Liege, Munich, Munster, Paderborn, &c.

A	Dute	= a Cruitzer	0 0 $0\frac{2}{3}$
3	Dutes	= a Cruitzer	0 0 $0\frac{2}{3}$
2	Cruiters	= an Albus	0 0 $0\frac{2}{3}$
8	Dutes	= a Stiver	0 0 $0\frac{2}{3}$
3	Stivers	= a Plapert	0 0 $2\frac{1}{5}$
4	Plaperts	= a Copstuck	0 0 $8\frac{2}{3}$
40	Stivers	= a Guilder	0 2 4
2	Guilders	= a Hard Dollar	0 4 8
4	Guilders	= a Ducat	0 9 4

BOHEMIA, SILESIA, AND HUNGARY.

Prague, Breslaw, Presburg, &c.

A	Fening	= a Dreyer	0 0 $0\frac{2}{3}$
2	Fenings	= a Dreyer	0 0 $0\frac{2}{3}$
3	Fenings	= a Grosh	0 0 $0\frac{2}{3}$
4	Fenings	= a Cruitzer	0 0 $0\frac{2}{3}$
2	Cruiters	= a White Grosh	0 0 $0\frac{2}{3}$
60	Cruiters	= a Gould	0 2 4
90	Cruiters	= a Rix-dollar	0 3 6
2	Goulds	= a Hard Dollar	0 4 8
4	Goulds	= a Ducat	0 9 4

AUSTRIA AND SUABIA.

Vienna, Triest, &c. Augsburg, Blenheim, &c.

A	Fening	= a Dreyer	0 0 $0\frac{2}{3}$
2	Fenings	= a Dreyer	0 0 $0\frac{2}{3}$
4	Fenings	= a Cruitzer	0 0 $0\frac{2}{3}$
14	Fenings	= a Grosh	0 0 $1\frac{1}{2}$
4	Cruiters	= a Batzen	0 0 $1\frac{1}{2}$
15	Batzen	= a Gould	0 2 4
90	Cruiters	= a Rix-dollar	0 3 6
30	Batzen	= a Specie-dollar	0 4 8
60	Batzen	= a Ducat	0 9 4

FRANCONIA. Frankfort, Nuremberg, Dettingen, &c.

A	Fening	= a Cruitzer	0 0 $0\frac{2}{3}$
4	Fenings	= a Cruitzer	0 0 $0\frac{2}{3}$
3	Cruiters	= a Keyser Grosh	0 0 $1\frac{1}{2}$
4	Cruiters	= a Batzen	0 0 $1\frac{1}{2}$
15	Cruiters	= an Oort Gould	0 0 7
60	Cruiters	= a Gould	0 2 4
90	Cruiters	= a Rix-dollar	0 3 6
2	Goulds	= a Hard Dollar	0 4 8
240	Cruiters	= a Ducat	0 9 4

POLAND AND PRUSSIA.

Cracow, Warsaw, &c. Dantzic, Koningsberg, &c.

A	Shelon	= a Ducat	0 0 $0\frac{2}{3}$
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POLAND, &c.

			<i>L. s. d.</i>
3	Shelons	= a Grosh	0 0 $0\frac{2}{3}$
5	Groschen	= a Coustic	0 0 $2\frac{1}{2}$
3	Coustics	= a Tinc	0 0 7
18	Groschen	= an Ort	0 0 $8\frac{2}{3}$
30	Groschen	= a Florin	0 1 2
90	Groschen	= a Rix-dollar	0 3 6
8	Florins	= a Ducat	0 9 4
5	Rix-dollars	= a Frederic d'Or	0 17 6

LIVONIA.

Riga, Revel, Narva, &c.

A	Blacken	= a Grosh	0 0 $0\frac{2}{3}$
6	Blackens	= a Grosh	0 0 $0\frac{2}{3}$
9	Blackens	= a Vording	0 0 $0\frac{2}{3}$
2	Groschen	= a Whiten	0 0 $0\frac{2}{3}$
6	Groschen	= a Marc	0 0 $2\frac{1}{2}$
30	Groschen	= a Florin	0 1 2
90	Groschen	= a Rix-dollar	0 3 6
108	Groschen	= an Albertus	0 4 $2\frac{1}{2}$
64	Whitens	= a Copper-plate Dollar	0 5 0

DENMARK, ZEALAND, AND NORWAY.

Copenhagen, Sound, &c. Bergen, Drontheim, &c.

A	Skilling	= a Duggen	0 0 $0\frac{2}{3}$
6	Skillings	= a Duggen	0 0 $3\frac{1}{2}$
16	Skillings	= a Marc	0 0 9
20	Skillings	= a Rix-marc	0 0 $11\frac{1}{4}$
24	Skillings	= a Rix-ort	0 1 $1\frac{1}{2}$
4	Mares	= a Crown	0 3 0
6	Mares	= a Rix-dollar	0 4 6
11	Mares	= a Ducat	0 8 3
14	Mares	= a Hatt Ducat	0 10 6

SWEDEN AND LAPLAND.

Stockholm, Upsal, &c. Thorn, &c.

1	A Runstick	= a Stiver	0 0 $0\frac{2}{3}$
2	Runsticks	= a Copper Marc	0 0 $0\frac{2}{3}$
3	Copper Mares	= a Silver Marc	0 0 $4\frac{2}{3}$
4	Copper Mares	= a Copper Dollar	0 0 $6\frac{2}{3}$
9	Copper Mares	= a Caroline	0 1 2
3	Copper Dollars	= a Silver Dollar	0 1 $6\frac{2}{3}$
3	Silver Dollars	= a Rix-dollar	0 4 8
2	Rix-dollars	= a Ducat	0 9 4

RUSSIA AND MUSCOVY.

Petersburgh, Archangel, &c. Moscow, &c.

A	Polusca	= a Denusca	0 0 $0\frac{2}{3}$
2	Poluscas	= a Copec	0 0 $0\frac{2}{3}$
2	Denuscas	= a Copec	0 0 $0\frac{2}{3}$
3	Copecs	= an Altin	0 0 $1\frac{1}{2}$
10	Copecs	= a Grievener	0 0 $5\frac{1}{2}$
25	Copecs	= a Polpotin	0 1 $1\frac{1}{2}$
50	Copecs	= a Poltin	0 2 3
100	Copecs	= a Ruble	0 4 6
2	Rubles	= a Xervonitz	0 9 0

EUROPE—SOUTHERN PARTS.

SWITZERLAND.

Basil. Zurich, Zug, &c.

A	Rap	= a Fening	0 0 $0\frac{2}{3}$
3	Rapen	= a Fening	0 0 $0\frac{2}{3}$
4	Fenings	= a Cruitzer	0 0 $0\frac{2}{3}$
12	Fenings	= a Sol	0 0 $1\frac{1}{2}$
15	Fenings	= a Coarse Batzen	0 0 $1\frac{1}{2}$
18	Fenings	= a Good Batzen	0 0 $2\frac{1}{4}$
20	Sols	= a Livre	0 2 6
60	Cruiters	= a Gulden	0 2 6
108	Cruiters	= a Rix-dollar	0 4 6

7 L

ST. GALL.

ST. GALL. *Apenzel, &c.*

	L.	s.	d.
An Heller.....	0	0	0 $\frac{1}{16}$
2 Hellers..... = a Fening.....	0	0	0 $\frac{1}{16}$
4 Fenings..... a Cruizer.....	0	0	0 $\frac{1}{16}$
12 Fenings..... †a Sol.....	0	0	1 $\frac{1}{2}$
4 Cruizers..... a Coarse Batzen.....	0	0	2
5 Cruizers..... a Good Batzen.....	0	0	2 $\frac{1}{2}$
20 Sols..... †a Livre.....	0	2	6
60 Cruizers..... a Gould.....	0	2	6
102 Cruizers..... a Rix-dollar.....	0	4	3

BERN. *Lucern, Neufchatel, &c.*

A Denier.....	0	0	0 $\frac{1}{16}$
4 Deniers..... = a Cruizer.....	0	0	0 $\frac{1}{2}$
3 Cruizers..... †a Sol.....	0	0	1 $\frac{1}{2}$
4 Cruizers..... a Plapert.....	0	0	1 $\frac{1}{2}$
5 Cruizers..... a Gros.....	0	0	2
6 Cruizers..... a Batzen.....	0	0	2 $\frac{1}{2}$
20 Sols..... †a Livre.....	0	2	0
75 Cruizers..... a Gulden.....	0	2	6
125 Cruizers..... a Crown.....	0	4	6

GENEVA. *Pekay, Bonne, &c.*

A Denier.....	0	0	0 $\frac{1}{2}$
2 Deniers..... = a Denier current.....	0	0	0 $\frac{1}{2}$
12 Deniers..... a Small Sol.....	0	0	0 $\frac{1}{2}$
12 Deniers current..... a Sol current.....	0	0	0 $\frac{1}{2}$
12 Small Sols..... †a Florin.....	0	0	4 $\frac{1}{2}$
20 Sols current..... †a Livre current.....	0	1	3
10 $\frac{1}{2}$ Florins..... a Patacon.....	0	3	11 $\frac{1}{2}$
15 $\frac{3}{4}$ Florins..... a Croisade.....	0	5	10 $\frac{1}{2}$
24 Florins..... a Ducat.....	0	9	0

FRANCE.

Lisle, Cambray, Valenciennes, &c.

A Denier.....	0	0	0 $\frac{1}{2}$
12 Deniers..... a Sol.....	0	0	0 $\frac{1}{2}$
15 Deniers..... †a Patard.....	0	0	0 $\frac{1}{2}$
15 Patards..... †a Piette.....	0	0	9 $\frac{1}{2}$
20 Sols..... a Livre Tournois.....	0	0	10
20 Patards..... †a Florin.....	0	1	0 $\frac{1}{2}$
60 Sols..... an Ecu of Ex.....	0	2	6
10 $\frac{1}{2}$ Livres..... a Ducat.....	0	9	3
24 Livres..... a Louis d'Or.....	1	0	0

Dunkirk, St. Omers, St. Quintin, &c.

A Denier.....	0	0	0 $\frac{1}{2}$
12 Deniers..... = a Sol.....	0	0	0 $\frac{1}{2}$
15 Deniers..... †a Patard.....	0	0	0 $\frac{1}{2}$
15 Sols..... †a Piette.....	0	0	7 $\frac{1}{2}$
20 Sols..... †a Livre Tournois.....	0	0	10
3 Livres..... an Ecu of Ex.....	0	2	6
24 Livres..... a Louis d'Or.....	1	0	6
24 $\frac{1}{2}$ Livres..... a Guinea.....	1	1	0
30 $\frac{3}{8}$ Livres..... a Moeda.....	1	7	0

Paris, Lyons, Marseilles, &c. Bourdeaux, Bayonne, &c.

A Denier.....	0	0	0 $\frac{1}{2}$
3 Deniers..... = a Liard.....	0	0	0 $\frac{1}{2}$
2 Liards..... a Dardene.....	0	0	0 $\frac{1}{2}$
12 Deniers..... a Sol.....	0	0	0 $\frac{1}{2}$
20 Sols..... †a Livre Tournois.....	0	0	10
60 Sols..... an Ecu of Ex.....	0	2	6
6 Livres..... an Ecu.....	0	5	0
10 $\frac{1}{2}$ Livres..... †a Pistole.....	0	8	4
24 Livres..... a Louis d'Or.....	1	0	0

PORTUGAL.

Lisbon, Oporto, &c.

†A Re.....	0	0	0 $\frac{2}{7}$
10 Rez..... = a Half Vintin.....	0	0	0 $\frac{2}{7}$
20 Rez..... a Vintin.....	0	0	1 $\frac{2}{7}$

PORTUGAL. *Lisbon, Oporto, &c.*

	L.	s.	d.
5 Vintins..... a Testoon.....	0	0	6 $\frac{3}{4}$
4 Testoons..... a Crusade of Ex.....	0	2	3
24 Vintins..... a New Crusade.....	0	2	8 $\frac{1}{2}$
10 Testoons..... †a Milre.....	0	5	7 $\frac{1}{2}$
48 Testoons..... a Moldore.....	1	7	0
64 Testoons..... a Joanues.....	1	16	0

SPAIN AND CATALONIA.

Madrid, Cadiz, Seville, &c. New Plate.

A Maravedie.....	0	0	0 $\frac{2}{3}$
2 Maravedies.. = a Quartil.....	0	0	0 $\frac{2}{3}$
54 Maravedies..... a Rial.....	0	0	5 $\frac{1}{2}$
2 Rials..... a Pistarine.....	0	0	10 $\frac{1}{2}$
8 Rials..... †a Piastre of Ex.....	0	3	7
10 Rials..... a Dollar.....	0	4	6
375 Maravedies..... †a Ducat of Ex.....	0	4	11 $\frac{1}{2}$
32 Rials..... †a Pistole of Ex.....	0	14	4
36 Rials..... a Pistole.....	0	16	9

Gibraltar, Malaga, Denia, &c. Velon.

†A Maravedie.....	0	0	0 $\frac{2}{3}$
2 Maravedies.. = an Ochavo.....	0	0	0 $\frac{2}{3}$
4 Maravedies..... a Quartil.....	0	0	0 $\frac{2}{3}$
34 Maravedies..... †a Rial Velon.....	0	0	2 $\frac{1}{2}$
15 Rials..... †a Piastre of Ex.....	0	3	7
512 Maravedies..... a Piastre.....	0	3	7
60 Rials..... †a Pistole of Ex.....	0	14	4
2048 Maravedies..... a Pi-tole of Ex.....	0	14	4
70 Rials..... a Pistole.....	0	16	9

Barcelona, Saragossa, Valencia, &c. Old Plate.

A Maravedie.....	0	0	0 $\frac{2}{7}$
16 Maravedies.. = a Soldo.....	0	0	3 $\frac{1}{2}$
2 Soldos..... a Rial Old Plate.....	0	0	6 $\frac{1}{2}$
16 Soldos..... †a Dollar.....	0	4	6
20 Soldos..... †a Libra.....	0	5	7 $\frac{1}{2}$
21 Soldos..... †a Ducat.....	0	5	10 $\frac{1}{2}$
22 Soldos..... †a Ducat.....	0	6	2 $\frac{1}{2}$
24 Soldos..... †a Ducat.....	0	6	9
60 Soldos..... a Pistole.....	0	16	9

ITALY.

GENOA. *Novi, &c.* CORSICA. *Bastia, &c.*

A Denari.....	0	0	0 $\frac{4}{12}$
12 Denari..... = a Soldi.....	0	0	0 $\frac{4}{12}$
4 Soldi..... a Chevalet.....	0	0	1 $\frac{1}{2}$
20 Soldi..... †a Lire.....	0	0	8 $\frac{1}{2}$
30 Soldi..... a Testoon.....	0	1	0 $\frac{1}{2}$
5 Lires..... a Croisade.....	0	3	7
115 Soldi..... †a Pezzo of Ex.....	0	4	2
6 Testoons..... a Genouine.....	0	6	2
20 Lires..... a Pistole.....	0	14	4

PIEDMONT, SAVOY, AND SARDINIA.

Turin, Chamberry, Cagliari, &c.

A Denari.....	0	0	0 $\frac{1}{6}$
3 Denari..... = a Quatrini.....	0	0	0 $\frac{1}{6}$
12 Denari..... a Soldi.....	0	0	0 $\frac{1}{6}$
12 Soldi..... †a Florin.....	0	0	9
20 Soldi..... †a Lire.....	0	1	3
6 Florins..... a Scudi.....	0	4	6
7 Florins..... a Ducatoon.....	0	5	3
13 Lires..... a Pistole.....	0	16	3
16 Lires..... a Louis d'Or.....	1	0	0

Milan, Modena, Parma, Pavia, &c.

A Denari.....	0	0	0 $\frac{1}{2}$
3 Denari..... = a Quatrini.....	0	0	0 $\frac{1}{2}$
12 Denari..... a Soldi.....	0	0	0 $\frac{1}{2}$
20 Soldi..... †a Lire.....	0	0	8 $\frac{1}{2}$

Milan, Modena, Parma, Pavia, &c.

		L.	s.	d.
115	Soldi.....a Scudi current.....	0	4	2½
117	Soldi.....†a Scudi of Ex.....	0	4	3
6	Lires.....a Philip.....	0	4	4½
22	Lires.....a Pistole.....	0	16	0
23	Lires.....a Spanish Pistole.....	0	16	9

Leghorn, Florence, &c.

A	Denari.....	0	0	0 ½
4	Denari..... = a Quatrini.....	0	0	0 ½
12	Denari.....a Soldi.....	0	0	0 ½
5	Quatrini.....a Craca.....	0	0	0 ½
8	Cracas.....a Quilo.....	0	0	5 ½
20	Soldi.....†a Lire.....	0	0	8 ½
6	Lires.....a Piastre of Ex.....	0	4	2
7½	Lires.....a Ducat.....	0	5	2½
22	Lires.....a Pistole.....	0	15	6

ROME.

Civita Vecchia, Ancona, &c.

A	Quatrini.....	0	0	0 ½
5	Quatrini..... = a Bayoc.....	0	0	0 ½
8	Bayocs.....a Julio.....	0	0	6
10	Bayocs.....a Stamped Julio.....	0	0	7½
24	Bayocs.....a Testoon.....	0	1	6
10	Julios.....a Crown current.....	0	5	0
12	Julios.....†a Crown stamped.....	0	6	0
18	Julios.....a Chequin.....	0	9	0
31	Julios.....a Pistole.....	0	15	6

NAPLES.

Gaieta, Capua, &c.

A	Quatrini.....	0	0	0 ½
3	Quatrini..... = a Grain.....	0	0	0 ½
10	Grains.....a Carlin.....	0	0	4
40	Quatrini.....a Paulo.....	0	0	5½
20	Grains.....a Tarin.....	0	0	8
40	Grains.....a Testoon.....	0	1	4
100	Grains.....a Ducat of Ex.....	0	3	4
23	Tarins.....a Pistole.....	0	15	4
25	Tarins.....a Spanish Pistole.....	0	16	9

SICILY AND MALTA.

Palermo, Messina, &c.

A	Pichila.....	0	0	0 ½
6	Pichili..... = a Grain.....	0	0	0 ½
8	Pichili.....a Ponti.....	0	0	0 ½
10	Grains.....a Carlin.....	0	0	1½
20	Grains.....a Tarin.....	0	0	3½
6	Tarins.....†a Florin of Ex.....	0	1	6 ½
13	Tarins.....a Ducat of Ex.....	0	3	4
40	Carlins.....†an Ounce.....	0	7	8 ½
2	Ounces.....a Pistole.....	0	15	4

Bologna, Ravenna, &c.

A	Quatrini.....	0	0	0 ½
6	Quatrini..... = a Bayoc.....	0	0	0 ½
10	Bayocs.....a Julio.....	0	0	6
20	Bayocs.....†a Lire.....	0	1	0
3	Julios.....a Testoon.....	0	1	6
85	Bayocs.....a Scudi of Ex.....	0	4	3
100	Bayocs.....a Crown.....	0	5	0
105	Bayocs.....a Ducatoon.....	0	5	3
31	Julios.....a Pistole.....	0	15	6

VENICE.

Bergamo, &c.

A	Picoli.....	0	0	0 ½
12	Picoli..... = a Soldi.....	0	0	0 ½
6½	Soldi.....†a Gros.....	0	0	2½
18	Soldi.....a Jule.....	0	0	6

Bergamo, &c.

		L.	s.	d.
20	Soldi.....†a Lire.....	0	0	6½
3	Jules.....a Testoon.....	0	1	6
124	Soldi.....a Ducat current.....	0	3	5½
24	Gros.....†a Ducat of Ex.....	0	4	4
17	Lires.....a Chequin.....	0	9	2

TURKEY.

Morea, Candia, Cyprus, &c.

A	Mangar.....	0	0	0 ½
4	Mangars..... =†an Asper.....	0	0	0 ½
3	Aspers.....a Parac.....	0	0	1½
5	Aspers.....a Bestic.....	0	0	3
10	Aspers.....an Ostic.....	0	0	6
20	Aspers.....a Soloto.....	0	1	0
80	Aspers.....†a Piastre.....	0	4	0
100	Aspers.....a Caragrouch.....	0	5	0
10	Solotas.....a Xerif.....	0	10	0

ASIA.

ARABIA. Medina, Mecca, Mocha, &c.

A	Carret.....	0	0	0 ½
5½	Carrets..... = a Caveer.....	0	0	0 ½
7	Carrets.....†a Comashee.....	0	0	0 ½
80	Carrets.....a Larin.....	0	0	10½
18	Comashees.....an Abyss.....	0	1	4½
60	Comashees.....†a Piastre.....	0	4	6
80	Caveers.....a Dollar.....	0	4	6
100	Comashees.....a Sequin.....	0	7	6
80	Larins.....†a Tomond.....	3	7	6

PERSIA.

Ispahan, Ormus, Combroon, &c.

A	Coz.....	0	0	0 ½
4	Coz..... = a Bisti.....	0	0	1½
10	Coz.....a Shahee.....	0	0	4
20	Coz.....a Mamooda.....	0	0	8
25	Coz.....a Larin.....	0	0	10
4	Shahees.....an Abashee.....	0	1	4
5	Abashees.....an Or.....	0	6	8
12	Abashees.....a Bovello.....	0	16	0
50	Abashees.....†a Tomond.....	3	6	8

GUZURAT.

Surat, Cambay, &c.

A	Pecka.....	0	0	0 ½
2	Peckas..... = a Pice.....	0	0	0 ½
4	Pices.....a Fanam.....	0	0	1½
5	Pices.....a Viz.....	0	0	2½
16	Pices.....an Ana.....	0	0	7½
4	Anas.....a Rupee.....	0	2	6
2	Rupees.....an English Crown.....	0	5	0
14	Anas.....a Pagoda.....	0	8	9
4	Pagodas.....a Gold Rupee.....	1	15	0

EAST INDIES.

Bombay, Dabul, &c.

†A	Budbrook.....	0	0	0 ½
2	Budbrooks..... =†a Rez.....	0	0	0 ½
5	Rez.....a Pice.....	0	0	0 ½
10	Pices.....a Laree.....	0	0	5½
20	Pices.....a Quarter.....	0	0	6½
240	Rez.....a Xeraphim.....	0	1	4½
4	Quarters.....a Rupee.....	0	2	3
14	Quarters.....a Pagoda.....	0	8	0
60	Quarters.....a Gold Rupee.....	1	15	0

Goa, Visapour, &c.

†A	Re.....	0	0	0 ½
2	Rez..... = a Bazaraco.....	0	0	0 ½
2	Bazaracos.....a Pecka.....	0	0	0 ½

Goa, Visapour, &c.

		L.	s.	d.
20	Rez.....a Vintin.....	0	0	1 $\frac{7}{8}$
4	Vintins.....a Laree.....	0	0	5 $\frac{1}{2}$
3	Larees.....a Xeraphim.....	0	1	4 $\frac{1}{2}$
42	Vintins.....a Tangu.....	0	4	6
4	Tangus.....a Paru.....	0	18	0
8	Tangus.....a Gold Rupee.....	1	15	0

COROMANDEL.

Madraas, Pondicherry, &c.

	A Cash.....	0	0	0 $\frac{1}{2}$
5	Cash..... = a Viz.....	0	0	0 $\frac{1}{2}$
2	Viz.....a Pice.....	0	0	0 $\frac{1}{2}$
6	Pices.....a Pical.....	0	0	2 $\frac{1}{2}$
8	Pices.....a Fanam.....	0	0	3
10	Fanam.....a Rupee.....	0	2	6
2	Rupees.....an English Crown.....	0	5	0
36	Fanam.....a Pagoda.....	0	8	9
4	Pagodas.....a Gold Rupee.....	1	15	0

BENGAL.

Calicut, Calcutta, &c.

	A Pice.....	0	0	0 $\frac{5}{8}$
4	Pices..... = a Fanam.....	0	0	0 $\frac{5}{8}$
6	Pices.....a Viz.....	0	0	0 $\frac{1}{2}$
12	Pices.....an Ana.....	0	0	1 $\frac{1}{2}$
10	Anas.....a Fiano.....	0	1	6
16	Anas.....a Rupee.....	0	2	6
2	Rupees.....a French Ecu.....	0	5	0
2	Rupees.....an English Crown.....	0	5	0
56	Anas.....a Pagoda.....	0	8	9

SIAM.

Pegu, Malacca, Cambodia, Sumatra, Java, Borneo, &c.

	A Cori.....	0	0	0 $\frac{1}{2}$
800	Cori..... = a Fettee.....	0	0	0 $\frac{1}{2}$
125	Fettees.....a Sataleer.....	0	0	7 $\frac{1}{2}$
250	Fettees.....a Sooco.....	0	1	3
500	Fettees.....a Tical.....	0	2	6
900	Fettees.....a Dollar.....	0	4	6
2	Ticals.....a Rial.....	0	5	0
4	Soocos.....an Ecu.....	0	5	0
8	Sataleers.....a Crown.....	0	5	0

CHINA.

Pekin, Canton, &c.

	A Caxa.....	0	0	0 $\frac{2}{5}$
10	Caxa..... = a Candereen.....	0	0	0 $\frac{2}{5}$
10	Candereens.....a Mace.....	0	0	8
35	Candereens.....a Rupee.....	0	2	6
2	Rupees.....a Dollar.....	0	4	6
70	Candereens.....a Rix-dollar.....	0	4	4 $\frac{1}{2}$
7	Maces.....an Ecu.....	0	5	0
2	Rupees.....a Crown.....	0	6	0
10	Maces.....a Tale.....	0	6	8

JAPAN.

Jeddo, Meaco, &c.

	A Piti.....	0	0	0 $\frac{2}{5}$
20	Pitis..... = a Mace.....	0	0	4
15	Maces.....an Ounce Silver.....	0	4	10 $\frac{1}{2}$
20	Maces.....a Tale.....	0	6	8
30	Maces.....an Ingot.....	0	9	8 $\frac{1}{2}$
13	Ounces Silver.....an Ounce Gold.....	3	3	0
2	Ounces Gold.....a Japanese.....	6	6	0
2	Japaneses.....a Double.....	12	12	0
21	Ounces Gold.....a Cattee.....	66	3	0

AFRICA.

EGYPT. Old and New Cairo, Alexandria, Sayde, &c.

	An Asper.....	0	0	0 $\frac{5}{8}$
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AFRICA.

		L.	s.	d.
3	Aspers..... = a Medin.....	0	0	1 $\frac{3}{4}$
24	Medins.....an Italian Ducat.....	0	3	4
80	Aspers.....a Piastre.....	0	4	0
30	Medins.....a Dollar.....	0	4	6
96	Aspers.....an Ecu.....	0	5	0
32	Medins.....a Crown.....	0	5	0
200	Aspers.....a Sultanin.....	0	10	0
70	Medins.....a Pargo Dollar.....	0	10	6

BARBARY.

Algiers, Tunis, Tripoli, Una, &c.

	An Asper.....	0	0	0 $\frac{5}{8}$
3	Aspers..... = a Medin.....	0	0	1 $\frac{3}{4}$
10	Aspers.....a Rial Old Plate.....	0	0	6 $\frac{1}{2}$
2	Rials.....a Double.....	0	1	1 $\frac{1}{2}$
4	Doubles.....a Dollar.....	0	4	6
24	Medins.....a Silver Chequin.....	0	3	4
30	Medins.....a Dollar.....	0	4	6
180	Aspers.....a Zequin.....	0	8	10
15	Doubles.....a Pistole.....	0	16	9

MOROCCO.

Santa Cruz, Mequinez, Fez, Tangiers, Sallee, &c.

	A Fluce.....	0	0	0 $\frac{1}{2}$
24	Fluces..... = a Blanquil.....	0	0	2
4	Blanquils.....an Ounce.....	0	0	8
7	Blanquils.....an Octavo.....	0	1	2
14	Blanquils.....a Quarto.....	0	2	4
2	Quartos.....a Medio.....	0	4	8
28	Blanquils.....a Dollar.....	0	4	6
54	Blanquils.....a Xequin.....	0	9	0
100	Blanquils.....a Pistole.....	0	16	9

AMERICA.

ENGLISH. Jamaica, Barbadoes, &c.

	† Halfpenny.....	0	0	0 $\frac{1}{2}$
2	Halfpence..... = † a Penny.....	0	0	0 $\frac{1}{2}$
7 $\frac{1}{2}$	Pence.....a Bit.....	0	0	5 $\frac{1}{2}$
12	Pence.....a Shilling.....	0	0	8 $\frac{1}{2}$
75	Pence.....a Dollar.....	0	4	6
7	Shillings.....a Crown.....	0	5	0
20	Shillings.....a Pound.....	0	14	3
24	Shillings.....a Pistole.....	0	16	9
30	Shillings.....a Guinea.....	1	1	0

FRENCH.

St. Domingo, Martinico, &c.

	† A Half Sol.....	0	0	0 $\frac{1}{2}$
2	Half Sols..... = † a Sol.....	0	0	0 $\frac{1}{2}$
7 $\frac{1}{2}$	Sols.....a Half Scalin.....	0	0	2 $\frac{1}{2}$
15	Sols.....a Scalin.....	0	0	5 $\frac{1}{2}$
20	Sols.....a Livre.....	0	0	7 $\frac{1}{2}$
7	Livres.....a Dollar.....	0	4	6
8	Livres.....an Ecu.....	0	4	10 $\frac{1}{2}$
26	Livres.....a Pistole.....	0	16	9
32	Livres.....a Louis d'Or.....	1	0	0

ENGLISH.

Nova Scotia, Virginia, New England, &c.

	† A Penny.....	0	0	1
12	Pence..... = † a Shilling.....	0	1	0
20	Shillings.....a Pound.....	1	0	0
2	Pounds.....			
3	Pounds.....			
4	Pounds.....			
5	Pounds.....			
6	Pounds.....			
7	Pounds.....			
8	Pounds.....			
9	Pounds.....			
10	Pounds.....			

The value of the currency alters according to the plenty or scarcity of gold and silver coins that are imported.

Canada, Florida, Cayena, &c.

†A Denier.....	
12 Deniers.....	= †a Sol
20 Sols.....	†a Livre
2 Livres	
3 Livres	
4 Livres	
5 Livres	
6 Livres	
7 Livres	
8 Livres	
9 Livres	
10 Livres	

The value of the currency alters according to the plenty or scarcity of gold and silver coins that are imported.

MONEYERS, MONEYORS, or MONIERS, officers of the mint, who work and coin gold and silver money, and answer all waste and charges.

MONEYWORT, a species of *LYSIMACHIA*, which see.

MONFLANQUIN, a town of France, in the department of Lot and Garonne, 20 miles N. of Agen, and 24 E. of Marmande.

MONGALLO, a kingdom of Africa, north of Monomotapa; with its capital and river of the same name, running into the Indian Ocean.

MONGHIR, a large town of Hindostan, in Bahar, 110 miles S. E. of Patna, and 275 N. W. of Calcutta. Lon. 83. 30. E. Lat. 25. 15. N.

MONIKEDAM, or **MONIKENDAM**, a town of Holland, in the department of the Texel, and late province of N. Holland, on the Zuyder Zee; nine miles N. E. of Amsterdam. Lon. 4. 56. E. Lat. 52. 29. N.

MONJOY, a town of France, in the department of the Roer, and late duchy of Juliers, 19 miles S. of Juliers. Lon. 23. 53. E. of Ferro. Lat. 50. 39. N.

MONK, [*monac*, Sax. *monachos*, Gr.] anciently denoted, "a person who retired from the world to give himself up wholly to God, and to live in solitude and abstinence." The original word *monachos*, solitary, is derived from *monos*, alone. The persecutions which attended the first ages of the Gospel forced some Christians to retire from the world, and live in deserts and places most private and unfrequented, in hopes of finding that peace and comfort among beasts which were denied them among men. And this being the case of some very extraordinary persons, their example gave so much reputation to retirement, that the practice was continued when the reason of its commencement ceased. After the empire became Christian, instances of this kind were numerous; and those, whose security had obliged them to live in solitude, became afterwards united into societies. The mystic theology also, which gained ground towards the close of the third century, contributed to produce the same effect, and to drive men into solitude for the purposes of enthusiastic devotion. St. Cyril of Alexandria, in one of his letters, censures certain monks in Egypt, who, under pretence of devoting themselves to prayer, led a lazy scandalous life; a censure justly applicable to monks in general. The ancient monks were distinguished into solitaries, cœnobites, and sarabaites. The solitaries were those who lived alone, remote from all towns, as do still some of the hermits. The cœnobites were those who lived in community with others in the same house, and under the same superiors. The sarabaites were strolling monks, having no fixed rule or residence. The houses of monks again were of two kinds, viz. monasteries and laurie. See LAURA, and MONASTERY. Those we now call monks are cœnobites, who live together in a monastery, who make vows of living according to a certain rule established by the founder, and wear a habit which distinguishes their order. Those that are endowed, or have a fixed revenue, are most properly called monks; as the Chartreux, Benedictines, Bernardines, &c. The Mendicants, or those that beg as the Capuchins and Franciscans, are more properly called religious and friars; though the names are frequently confounded.

MONK, GEORGE, the principal agent in restoring the British monarchy, in the person of King Charles II. was descended from a very ancient family, and born in Devonshire in 1608. He dedicated himself to arms from his youth, and obtained a pair of colours in the expedition to the Isle of Rhé; he served afterwards in the Low Countries with reputation in both King Charles's

northern expeditions; and did such service in quelling the Irish rebellion, that he was appointed governor of Dublin, but was superseded by the parliament. Being made major general of the Irish brigade employed in the siege of Nantwich in Cheshire, he was taken prisoner by Sir Thomas Fairfax, and remained confined in the Tower of London, until 1646; when, to procure his liberty, he took the covenant, and accepted a command in the Irish service under the parliament. He obtained the command in chief of all the parliamentary forces in the north of Ireland, where he did signal services, until he was called to account for a treaty made with the Irish rebels. But he served in Scotland under Oliver Cromwell with such success, that he was left there as commander-in-chief; and he was one of the commissioners for uniting that kingdom with the commonwealth. He served at sea also against the Dutch; and was treated so kindly on his return, that Oliver is said to have grown jealous of him. He was, however, again sent to Scotland as commander-in-chief, and continued there five years: when he dissembled so well, and improved circumstances so dextrously, that he restored the king without any disturbance; for which he was duly rewarded. He was created Duke of Albemarle, with a grant of 7000*l.* per annum estate, beside other emoluments. After his death in 1670, there was published a treatise composed by him while he was prisoner in the Tower, intitled, "Observations on Military Political Affairs," folio.

MONKEY, [*monikin*, a little man.] See SIMIA.

MONKEY-FLOWER. See MIMULUS.

MONKLAND, an extensive district of Lanarkshire, originally forming only one parish, so named from the Monks of Newbottle.

MONKS-HOOD. See ACONITUM.

MONMOUTH, JAMES, Duke of, son of King Charles II. by Mrs. Lucy Walters, was born at Rotterdam in 1649. Upon the Restoration, he was called over to England, created Earl of Orkney, and afterwards of Monmouth, and took his seat in the house of peers. He married Anne, the heiress of Francis, Earl of Buccleugh; and hence he had also the title of Buccleugh, and took the surname of Scott. In 1668 his father made him captain of his life-guard of horse; and in 1672 he attended the French king in the Netherlands, and gave proofs of bravery and conduct. In 1673 the King of France made him lieutenant-general of his army, with which he came before Maestricht, and behaved with incredible gallantry, being the first who entered it himself. He returned to England, was received with all possible respect, and was made Chancellor of the University of Cambridge. After this he went to assist the Prince of Orange to raise the siege of Mons, and contributed much towards it. He returned to England; and was sent, in quality of his father's general, to quell an insurrection in Scotland, which he effected: but soon after he fell into disgrace; for, being a Prote-tant, he was deluded into ambitious schemes, upon the hopes of the exclusion of the Duke of York: he conspired against his father and the duke: and when the latter came to the throne, he openly appeared in arms, encouraged by the Prote-tant army; but coming to a decisive battle before he had sufficient forces to oppose the royal army, he was defeated, taken soon after concealed in a ditch, tried for high treason, condemned, and beheaded in 1685, aged 36.

MONMOUTH, the capital of Monmouthshire, 21 miles W. of Gloucester, and 128 W. by N. of London. Lon. 2. 46. W. Lat. 51. 49. N.

MONMOUTH, a large maritime county of New Jersey, of a triangular form; eighty miles long, and from twenty-five to forty broad.

MONMOUTH, or MONMOUTHSHIRE, a county of England; anciently reckoned a part of Wales, but in Charles II's reign, erected into a county, and added to the Oxford circuit. It is bounded on the N. by Herefordshire. It is subdivided into six hundreds. The air is temperate and healthy; and the soil fruitful, though mountainous and woody. The hills feed sheep, goats, and horned cattle; and the valleys produce plenty of grass and corn. This county is well watered; its rivers are the Wye, the Mynow, the Rumney, and the Usk. All these rivers, especially the Wye and Usk, abound with fish, particularly salmon and trouts.

MONNIERIA, in botany, a genus of the pentandria order, and diadelphia class of plants; natural order, Corydalis. Calyx five-parted, with the upper segment long; corolla ringent; stamens two, the upper with two anthers, the lower with three; capsules

sules five, one-seeded. There is but one species, viz. *M. trifolia*. This is an annual American plant, with a dichotomous stem, ternate leaves, and white flowers in a bifid spike.

MONOCEROS, *Unicorn*, in astronomy, a southern constellation formed by Hevelius, containing in his catalogue nineteen stars, and in the Britannic Catalogue thirty-one. See **ASTRONOMY**.

MONOCEROS, in zoology. See **MONODON**.

MONOCHORD, [*μονοχρ.* and *χρῆστις*.] 1. An instrument of one string: as, the trumpet-marine. 2. A kind of instrument anciently of singular use for the regulating of sounds: the ancients made use of it to determine the proportion of sounds to one another. When the chord was divided into two equal parts, so that the terms were as one to one, they called them unisons; but if as two to one, they called them octaves or diapasons; when they were as three to two, they called them fifths or diapentes; if they were as four to three, they called them fourths or diatessérons; if as five to four, they called it diton, or a tierce major; but if as six to five, then they called it a demi-diton, or a tierce minor; and lastly, if the terms were as twenty-four to twenty-five, they called it a demiton, or dieze; the monochord being thus divided, was properly that which they called a system, of which there were many kinds, according to the different divisions of the monochord.

MONOCHORD is used, as well in the natural as in tempered scales. Originally it had, as its name implies, only one string; but it is better constructed with two, as we have, by means of this additional string, an opportunity of judging of the harmony of two tempered notes in every possible variety of temperament. It consists of a brass-rule placed upon a sound board, and accurately divided into different scales according to the purposes for which it is chiefly intended. Above this rule the strings are to be stretched over two fixed bridges, between which there is a moveable fret, so contrived as to divide at pleasure one of the strings into the same proportional parts as are engraved upon the scales beneath. The figure of the instrument, the manner of striking the strings so as to produce the sound, as likewise the construction of the moveable bridge, may be varied at pleasure according to the wish and ingenuity of the artist: but with the assistance of such an instrument accurately constructed, any person with a good ear may be enabled to tune a keyed instrument with sufficient precision to answer every practical purpose. The curious reader, who may wish for further information respecting the construction and use of monochords, will be highly gratified in perusing the appendix of Mr. Atwood's *Treatise on Rectilinear Motion*, and Mr. Jones's ingenious and entertaining observations on the scale of music, monochord, &c. in his *Physiological Disquisitions*.

MONOCULUS, in zoology, a genus of insects of the order aptera. Body short, roundish, covered with a firm crustaceous skin; fore-legs ramose, formed for leaping and swimming; only one eye, large, and composed of three smaller ones. Of this genus, many of which have been reckoned among the microscopic animals, authors enumerate fifty species. The name monocus has been given to this genus, as consisting of individuals which apparently have but one eye: and from the manner in which they proceed forward in the water by leaping, they have also been called water-fleas. The branching antennæ serve them instead of oars, the legs being seldom used for swimming.

M. QUADRICORNIS, the **FOUR-HORNED MONOCULUS**, a very small species about half a line in length, and of an ashen-grey colour. From the head arise four antennæ, two forwards and two backwards; all furnished with a few hairs, which give them the figure of a branch. Between the antennæ, on the fore-part of the head, is situated a single eye. From the head to the tail the body goes down, decreasing in shape like a pear; and is composed of seven or eight rings, which grow continually more straitened. *Monocus pulex* is represented magnified in Plate LXXVI.

MONODON, in ichthyology, a genus of fishes of the order cete. It has two very long, straight, and spirally-twisted teeth, which stick out from the upper jaw; and the spiracle, or breathing hole, is situated on the anterior part of the skull. There is but one species:

M. MONOCEROS, the **HORNED NARWHAL**, sometimes grows to 25 feet in length, exclusive of the horn; or, as some authors say, to 40 or even 60 feet long, and 12 broad; but the usual size is

from 16 to 20. It is particularly noted for its horn or horns, as they are called; but which are real teeth. Of these there are always two in young animals; though the old ones have generally but one, sometimes none. From the circumstance of only one tooth being usually found, the animal has acquired the name of Unicorn-Fish, or Sea-Unicorn. See Plate LV. They inhabit the northern seas, from Norway to within the arctic circle: they are plentiful in Davis's straits, and the north of Greenland; where the natives, for want of wood, make rattles of the teeth. From the tooth or horn may be distilled a very strong sal volatile: the scrapings are esteemed alexipharmic, and were used of old in malignant fevers, and against the bites of serpents.

MONODY, [*from* *μονος*, alone, and *αδω*, I sing,] was, in ancient poetry, a mournful kind of song, sung by a person all alone, to give vent to his grief.

MONECIA, [*from* *μονος*, alone, and *οικος*, a house,] the 21st class in Linnaeus's sexual method. See **BOTANY**.

MONEMUGI. See **MONEMUGI**.

MONOGAMIA. See **BOTANY**.

MONOGAMY, [*from* *μονος*, alone, and *γαμος*, marriage,] the state of those who have only married once, or are restrained to a single wife. See **POLYGAMY**.

MONOGLOSSUM, in ancient geography, a town of India, on the Sinus Canthi, into which the Indus runs; now called Mangalore.

MONOGRAM, [*μονο*, alone, and *γραμμα*, a letter,] a cypher; a character composed of several letters interwoven; being a kind of abbreviation of a name, used for seals, badges, arms, &c.

MONOGYNIA, [*from* *μονος*, alone, and *γυνη*, a woman,] the first order in the first thirteen classes of Linnaeus's sexual method; consisting of plants which, besides their agreement in their classic character, generally derived from the number of their stamina, have only one style, or female organ. See **BOTANY**.

MONOLOGUE, [*μονος*, and *λογος*,] a scene in which a person in the drama speaks by himself; a soliloquy.

MONOME, in algebra, a quantity that has but one denomination or name: as, *ab*, *aab*, &c.

MONOMIAL, in algebra, consisting of one term or member; a monomial quantity is sometimes called a monome. See **BINOMIAL**.

MONOMOTAPA, a country of Africa, which has the kingdom of Sofala on the E. the river Spiritu Santo on the S. the mountains of Caffraria on the W. and the river Cauma on the N. which parts it from Monemugi. The air is very temperate; the land fertile in pastures and all the necessities of life, being watered by several rivers. The inhabitants are rich in black cattle, which they value more than gold. They have a vast number of elephants, as appears from the great quantity of ivory that is exported from hence. There are many gold-mines, and the rivers that run through their veins carry a great deal of gold-dust along with them. The inhabitants are lovers of war. This country is divided into seven provinces or petty kingdoms, under the king; viz. Monomotapa Proper, Quiteve, Manica, Inhambana, Inhemiôr, Sabia, and Sofala.

MONOPETALOUS, [*μονος*, and *πεταλον*, a petal,] in botany, a term applied to flowers that have only one petal, or flower-leaf. See **BOTANY**.

MONOPHYLLOUS, [*μονος*, and *φυλλον*, a leaf,] in botany, a plant which has but one blade. See **BOTANY**.

MONOPHYSITES, [*μονος*, alone, and *φυσις*, nature,] a general name given to all those sectaries in the Levant who only own one nature in Jesus Christ; and who maintain, that the divine and human nature of Christ were so united as to form only one nature, yet without any change, confusion, or mixture, of the two natures. The monophysites, however, properly so called, are the followers of Severus, a monk of Palestine, who was created patriarch of Antioch, in 513, and Petrus Fullensis. They were encouraged by the emperor Anastasius, but depressed by Justin and succeeding emperors. However, this sect was restored by Jacob Baradaud an obscure monk, inasmuch that when he died Bishop of Edessa, A. D. 588, he left it in a most flourishing state in Syria, Mesopotamia, Armenia, Egypt, Nubia, Abyssinia, and other countries. The laborious efforts of Jacob were seconded in Egypt, and the adjacent countries, by Theodosius, Bishop of Alexandria; and he became so famous that all the monophysites of the east considered

sidered him as their second founder, and are to this day called Jacobites, in honour of their new chief.

MONOPOLY, [*μονοπωλ*, and *πωλ* to sell,] one or more persons making themselves the sole masters of the whole of a commodity, manufacture, and the like, in order to make private advantage of it, by selling it again at a very advanced price: or it is a licence or privilege allowed by the king for the sole buying and selling, making, working, or using, any thing whatsoever. Monopolies had been carried to an enormous height during the reign of Queen Elizabeth; and were heavily complained of by Sir Edward Coke, in the beginning of the reign of King James I. but were in great measure remedied by statute 21 Jac. I. c. 3, which declares such monopolies to be contrary to law, and void; (except as to patents, not exceeding the grant of 14 years, to the authors of new inventions, and except also patents concerning printing, salt-petre, gunpowder, great ordnance, and shot); and monopolists are punished with the forfeiture of treble damages and double costs, to those whom they attempt to disturb; and if they procure any action brought against them for these damages, to be stayed by any extrajudicial order, other than of the court wherein it is brought, they incur the penalties of *præmunire*. Combinations also among victuallers or artificers, to raise the price of provisions, or any commodities, or the rate of labour, are in many cases severely punished by particular statute; and, in general, by statute 2 and 3 Edward VI. c. 15, with the forfeiture of 10*l.* or 20 days imprisonment, with an allowance of only bread and water for the first offence; 20*l.* or the pillory for the second; and 40*l.* for the third, or else the pillory, loss of one year, and perpetual infamy.

MONOSYLLABLE, [*μονοσυλλαβη*, and *συλλαβη*, a syllable,] a word of only one syllable.

MONOSYLLABLES, are too frequently used, and have a very bad effect in English poetry, as Mr. Pope both intimates and exemplifies in this verse;

“And ten slow words oft creep in one dull line.”

MONOTHELITES, [from *μονος*, single, and *θελημα*, will,] an ancient sect which sprung out of the Eutychians; thus called, as only allowing of one will in Jesus Christ. The Monothelites had their rise in 630, and had the emperor Heraclius for an adherent: they were the same with the Acephalous Severians.

MONOTONY, [from *μονος*, and *των*, a tone,] uniformity of sound, or a fault in pronunciation, when a long series of words are delivered in one unvaried tone.

MONOTROPA, **BIRDS-NEST**; a genus of the monogynia order, and monandria class of plants. Calyx none; petals ten, the five exterior have a melliferous hollow at the base; capsule five-valved. There are two species; viz. *M. hypopluithys*, and *M. uniflora*, natives of Europe and America.

MONPAZIER, a town of France, in the department of Dordogne, eight miles S. W. of Belvez. Lon. 0. 53. E. Lat. 44. 46. N.

MONQUEGNA, or **MONQUEGUA**, a province of Peru, in the bishopric of Arequipa, 120 miles long, very fertile in vines, olives, papas, &c. Its chief trade is in wine and brandy.

MONQUEGUA, the capital of the above province, is chiefly inhabited by Spanish nobles; and lies seventy miles S. E. of Arequipa.

MONREAL. See **MONTREAL**.

MONRO, **DR. ALEXANDER**, a most eminent physician and anatomist, was descended by his mother from the family of Forbes of Culloden. He shewed an early inclination to the study of physic; and the father, after giving him the best education that Edinburgh afforded, sent him successively to London, Paris, and Leyden, to improve himself. At London, he attended the lectures of Messrs. Hawksbee and Whiston on experimental philosophy, and the anatomical demonstrations of Mr. Cheselden. At Paris, he attended the hospitals and the lectures on physic and surgery. In autumn 1718, he went to Leyden, and studied under the great Boerhaave; by whom he was particularly esteemed. On his return to Edinburgh in autumn 1719, Messrs. Drummond and Macgill, who were then conjunct nominal professors of anatomy to the surgeons' company, having resigned in his favour, he began to read public lectures on anatomy, at the same time that Dr. Alston began his lectures on botany, which were the first regular course of lectures on any of the branches of medicine that had ever been read at Edinburgh, and may be considered as the opening of that medical school which has since acquired such great re-

putation all over Europe. About 1720, his father communicated to the physicians and surgeons at Edinburgh a plan, which he had long formed in his own mind, of having the different branches of physic and surgery regularly taught at Edinburgh; which was highly approved of by them, and by their interest regular professorships of anatomy and medicine were instituted in the university, of the former of which Dr. Monro was the first professor. But although he was elected to this professorship in 1721, he was not received into the university till the year 1725, when he was inducted along with Mr. Colin Maclaurin, with whom he ever lived in the strictest friendship. From this time he regularly gave a course of lectures on anatomy and surgery, from October to May, upon a most judicious and comprehensive plan; a task in which he persevered with the greatest assiduity, and without the least interruption, for near forty years; and so great was the reputation he had acquired, that students flocked to him from the most distant corners of his majesty's dominions. In 1759, our professor entirely relinquished the anatomical theatre to his son Dr. Alexander, who had returned from abroad, and had assisted him in the course of lectures in 1758. He still, however, rendered his labours useful to mankind, by reading clinical lectures at the hospital. Dr. Monro survived his father near thirty years, and had the satisfaction to behold that seminary of medical education, which his father had planned and he had begun, frequented yearly by 300 or 400 students, many of whom came from the most distant corners of his majesty's dominions; and to see it arrive to a degree of reputation far beyond his most sanguine hopes, being equalled by few, and excelled by none, in Europe. Few men were members of more societies than Dr. Monro; still fewer equally assiduous in their attendance of those which, in any way, tended to promote public utility. He was a manager of many public charities; and not only a member of different medical societies, but likewise of several others instituted for promoting literature, arts, sciences, and manufactures, in Scotland, and was one of their most useful members. While he was held in high estimation at home, he was equally esteemed and respected abroad, and was elected F. R. S. of London, and an honorary member of the Royal Academy of Surgery at Paris. He was not only very active in his profession, but as a citizen and member of the community; for, after he had resigned the anatomical chair to his son, he executed with the strictest punctuality the duties of several engagements both of a civil and political nature: he was a director of the Bank of Scotland, a Justice of the Peace, a Commissioner of High Roads, &c. At length, after a life spent in the most active industry, he became afflicted with a tedious and painful disease, which he bore with equal courage and resignation till his death, which happened July 10, 1767, in the 70th year of his age. A collection of all his works, properly arranged, corrected, and illustrated, with copper-plates, has been published by Dr. Alexander Monro, his son and successor, in a splendid 4to. volume; Edinburgh, 1781; to which is prefixed a life of the author, by another of his sons, Dr. Donald, physician in London.

MONS, an ancient, large, handsome, rich, and very strong city of France, capital of the department of Gemappes; as it was formerly of the Austrian province of Hainault. It lies 17 miles N. E. of Tournay, and 37 W. of Namur. Lon 3° 57' 15" E. Lat. 50° 27' 10" N.

MONSANTO, a town of Spain in Estremadura, Lon. 6. 20. W. Lat. 39. 40. N.

MONSARZA, a town of Portugal, in Alentejo, 25 miles S. W. of Elvas. Lon. 7. 32. W. Lat. 38. 26. N.

MONSEIGNEUR, [*Fr. mon*, my, and *seigneur*, lord, plural, *messeigneurs*,] a title of honour and respect used by the French in writing to persons of superior rank or quality, before the late abolition of titles.

MONSEIGNEUR, absolutely used, was a title restrained to the dauphin of France. This custom was unknown till the time of Lewis XIV. before which the dauphin was styled *Monsieur le Dauphin*.

MONSIEUR, [*Fr. mon* and *sieur*, plural *messieurs*,] a title of civility used by the French in speaking to their equals, or those a little below them, before the revolution, answering to Mr. or Sir among the English. After that event it was changed for the democratic term, citizen.

MONSIEUR, absolutely used, was a title appropriated to the second

cond son of the king of France. The king was also called mon-sieur, but that only by the children of the royal family.

MONSONIA, in botany, a genus of the dodecandria order, and polyadelphia class of plants. Calyx five-leaved; corolla five-petaled; stamina fifteen, united into five filaments: style five-cleft; capsule five-grained. There are three species, all natives of the Cape of Good Hope.

MONSOON, in physiology, a species of trade-wind in the East Indies, which for six months blows constantly the same way, and the contrary way the othersix months. However, it ought to be observed, that the points of the compass whence the monsoons blow, as well as the times of their shifting, differ in different parts of the Indian Ocean. The cause of monsoons is this: when the sun approaches the northern tropic, there are countries, as Arabia, Persia, India, &c. which become hotter, and reflect more heat, than the seas beyond the equator, which the sun has left; the winds, therefore, instead of blowing from thence, to the parts under the equator, blow the contrary way; and, when the sun leaves those countries, and draws near the other tropic, the winds turn about, and blow on the opposite point of the compass. The shutting of the monsoons is not all at once; in some places the time of the change is attended with calms, in others with variable winds, and particularly those of China, at ceasing to be westerly, are very apt to be tempestuous; and such is their violence, that they seem to be of the nature of the West India hurricanes, and render the navigation of those seas very unsafe. These tempests the seamen call the breaking up of the monsoons. Monsoons take their name from an ancient pilot, who first crossed the Indian sea by means hereof: but others derive the name from a Portuguese word signifying motion or change of wind and sea. Lucretius and Apollonius mention annual wind, which arise every year, etesia flabria, which seem to be the same with what in the East Indies we now call monsoons. See **WIND**.

MONSTER, a birth or production of a living being, degenerating from the proper and usual disposition of parts in the species to which it belongs; as, when there are too many members, or too few; or some of them are extravagantly out of proportion, either on the side of defect or excess. The word comes from the Latin *monstrare*, to shew. Aristotle defines a monster to be a defect of nature, when, acting towards some end, it cannot attend to it, from some of its principles being corrupted. Monsters do not propagate their kind; for which reason some rank mules among the number of monsters, as also hermaphrodites. But Buffon and other naturalists affirm that mules do propagate. Females which bring forth twins are most liable to produce monsters. The reason probably is, that though the twins are covered with one common chorion, yet they have each their separate amnios, which by their contiguity may chance to grow together, and so occasion a confusion or blending of the parts.

MONSTER is also used for an animal enormous for bulk; such as the elephant among terrestrial quadrupeds, and the shark and whale among sea-animals; to other animals remarkable for fierceness and cruelty; and to animals of an extraordinary species, arising from the copulation of one animal with another of a different genus. According to reports of travellers, Africa abounds with monsters of this kind.

MONSTIER, **MOUTIER**, or **MOUSTIER**, a town of Italy, in the department of Mont-Blanc, near the conflux of the Isere and Doron, 27 miles E. S. E. of Chambery, 45 S. E. of Geneva, and 62 N. W. of Turin. Lon. 6. 23. E. Lat. 45. 30. N.

MONTABAUR, or **MONTABOUR**, a town of Germany, in the late electorate of Trier, seven miles N. of Nassau, and eleven E. of Coblenz. Lon. 7. 50. E. Lat. 50. 30. N.

MONTAGNIAC, a town of Asiatic Turkey, in Natolia, in the province of Bee-Sangel, on the sea of Marmora, 60 miles S. E. of Constantinople.

MONTAGUE, **CHARLES**, Earl of Halifax, was born of an ancient family in Northamptonshire, in 1661. He received his education at Westminster school, from whence he removed to Trinity College, Cambridge. In 1687 he wrote, in conjunction with Prior, a piece called the Country Mouse and the City Mouse, to ridicule Dryden's poem in favour of the church of Rome, intitled, the Hind and Panther. The satire was happy, and had so good an effect, that, at the revolution, Mr. Halifax received a pension. In 1691 he was made one of the commissioners

of the treasury, and three years after chancellor of the exchequer. In 1698 he was appointed first commissioner of the treasury, and in 1700 was advanced to the peerage, by the title of Baron Halifax. He was, however, twice impeached of high crimes and misdemeanors by the commons, but the accusations were rejected by the house of lords. At the accession of George I. he was created Earl of Halifax, and installed Knight of the garter. His lordship died in 1715. He was the patron of Addison, and intimate with Swift, Pope, and the most eminent writers and wits of his day. He wrote poems and other works. (*Watkins*).

MONTAGUE, **ELIZABETH**, an ingenious lady, was the daughter of Matthew Robinson, Esq. of Yorkshire, and of Horton, in Kent. The care of her education was undertaken by the celebrated Dr. Conyers Middleton. About 1742 she married Edward Montague, of Allertorpe, in the county of York, Esq. son of Charles, fifth son of Edward, the first Earl of Sandwich. By him she had a son, who died before he was two years old. She became early a widow with an ample fortune and honourable connections. In 1769 Mrs. Montague published, "An Essay on the Writings and Genius of Shakespeare," which obtained a great and deserved reputation. She formed a literary society known by the name of the Blue Stocking Club, from the circumstance that a gentleman belonging to it wore stockings of that colour. Mrs. Montague was noticed for another peculiarity, that of giving an annual dinner on May-day to the chimney-sweepers of the metropolis. She died in 1800. (*Watkins*).

MONTAGUE, in geography, a township of Massachusetts, in Hampshire county, on the E. bank of the Connecticut, 18 miles N. of Northampton, and 97 W. by N. of Boston.

MONTAGUE, an island in the N. Pacific Ocean, 50 miles long, and 10 broad, on the N. W. coast of North America. Lon. 147° to 148° W. Lat. 59° 50' to 60° 30' N.

MONTAGUE ISLAND, one of the New Hebrides, in the South Sea, near Sandwich Island. Lon. 168. 37. E. Lat. 17. 26. S.

MONTAIGNE, **MICHAEL DE**, a French gentleman, born in Perigord, in 1533. His father educated him with great care, and made him learn Latin as other children learn their mother-tongue. His tutors were Nicholas Gronchi, who wrote "De Comitibus Romanorum;" William Guarenti, who wrote on Aristotle; George Buchanan; and Anthony Moret. He was also taught Greek by way of recreation; and was awakened every morning with the sound of music. He was a counsellor in the parliament of Bourdeaux, and afterwards mayor of Bourdeaux. He published his celebrated Essays, in 1580. He had a great deal of wit and subtility, but no small share of conceit and vanity. The learned are much divided in their opinions about his works. He died in 1592.

MONTAIGU, a town of France, in the department of the Vendée, and late province of Poitou; 16 miles S. S. E. of Nantes. Lon. 1. 30. W. Lat. 47. 0. N.

MONT-ALBAN, a town of Spain, in Arragon, 44 miles S. of Saragossa. Lon. 0. 30. W. Lat. 41. 9. N.

MONTALCINO, a small populous town of Etruria, in Siena, 17 miles S. E. of Sienna, and 44 of Florence. Lon. 11. 30. E. Lat. 43. 7. N.

MONTALTO, an episcopal town of Ancona; 10 miles N. of Ascoli. Lon. 13. 30. E. Lat. 43. 0. N.

MONTANISTS, Christian heretics, who sprung up about A. D. 171, in the reign of the emperor Marcus Aurelius. They were so called from their leader, the heresiarch Montanus, a Phrygian by birth; whence they are sometimes styled Phrygians and Cataphrygians. They formed a schism, and set up a society under the direction of those who called themselves prophets. Montanus, in conjunction with Priscilla and Maximilla, was at the head of the sect. These sectaries made no alteration in the creed. They only held, that the Holy Spirit made Montanus his organ for delivering a more perfect form of discipline than what was delivered by the apostles.

MONTANUS, a heretic of the second century, born in Phrygia. He embraced Christianity in hopes of rising to the dignities of the church. He pretended to inspiration; and gave out that the Holy Ghost had instructed him in several points, which had not been revealed to the apostles. Priscilla and Maximilla, two enthusiastic women of Phrygia, presently became his disciples; and in a short time he had a great number of followers. The bishops of Asia, being assembled, condemned his prophecies, and excommunicated

excommunicated those who dispersed them. Afterwards they wrote an account of what had passed to the western churches, where the pretended prophecies of Montanus and his followers were likewise condemned.

MONTANUS, JOHN BAPTIST, an eminent Italian physician, styled the Galen of his country. He was born at Verona, in 1482; and studied at Padua, where he displeased his father by preferring physic to law; but, though deprived of his assistance, he soon made such progress, that he was promoted to the professor's chair at Padua, after having practised physic with great success in several other cities. His fame became so great that he was invited to Paris, Florence, and Vienna, by Francis I. Duke Cosmo, and Charles V. but preferred his professorship at Padua; where he died of the stone, in 1551. He wrote many medical, and some poetical, works.

MONTARGIS, a considerable town of France, in the department of Loiret, and late province of Orléannois, fifteen miles S. of Nemours. Lon. 2. 36. E. Lat. 48. 1. N.

MONTAUBAN, a town of France, in the department of Lot, late province of Guienne, and territory of Quercy, 20 miles N. of Toulouse. Lat. 44° 0' 55" N. Lon. 1° 20' 51" E. from Greenwich.

MONTBAZON, a town of France, in the department of Indre and Loire, and late province of Touraine, 135 miles S. W. of Paris. Lon. 0. 45. E. Lat. 47. 17. N.

MONTBELIARD, or **MONTBELLARD**, a late principality of Germany, insulated in France: now included in the department of the Upper Rhine.

MONTBELLARD, a town of France, capital of the above principality, 33 miles W. of Basle. Lon. 6. 50. E. Lat. 47. 31. N.

MONT-BLANC, a town of Spain, in Catalonia, 15 miles N. of Tarragon. Lon. 1. 5. E. Lat. 41. 20. N.

MONT-BLANC, a department of France, comprehending the late duchy of Savoy. See **BLANC**, and **SAVOY**.

MONTBRISON, a town of France, in the department of Rhone and Loire, and late capital of the province of Forez, 40 miles W. of Vienne. Lon. 4. 27. E. Lat. 45. 32. N.

MONT-DIDIER, an ancient town of Italy, in the department of the Somme, and late province of Picardy, 24 miles S. E. of Amiens, and 58 N. of Paris. Lon. 2. 34. W. Lat. 49. 39. N.

MONTECCHIO, a town of Italy, in the department of Crostolo, and late duchy of Reggio, ten miles S. E. of Parma.

MONTE CHRIST, a cape, bay, town, district, and river, on the N. side of St. Domingo. The town is in the form of an amphitheatre, 200 fathoms square. The cape is a very high hill, seen at 42 miles distance in a clear day. Lon. 71. 50. W. Lat. 19. 54. N.

MONTECUCULI, RAYMOND, generalissimo of the emperor's army, and one of the greatest commanders of his time, was born in Modena, of a distinguished family, in 1608. Ernest Montecuculi his uncle, who was general of the artillery in the Imperial army, resolved that he should serve first as a common soldier, and that he should pass through all the military degrees before he was raised to command. This he did with applause. In 1644, when he was at the head of 2000 horse, he surprised, by a precipitate march, 10,000 Swedes, who laid siege to Nemessau in Silesia, and obliged them to abandon their artillery and baggage; but soon after he was defeated and taken prisoner by General Banier. Having obtained his liberty at the end of two years, he joined his troops to those of John de Wert; and defeated General Wrangel in Bohemia, who was killed in the battle. In 1657 the emperor made him general marshal de camp; and sent him to the assistance of John Casimir, King of Poland. Montecuculi vanquished Ragotzi, Prince of Transylvania, drove out the Swedes, and distinguished himself in an extraordinary manner against the Turks in Transylvania and Hungary. In 1673 he commanded the imperial army against the French, and took Bonne; he then proceeded with feint marches to deceive Turenne, in which he obtained great honour. However, the command of that army was taken from him in 1674, but was restored to him in 1675, that he might make head against the great Turenne. All Europe had their eyes fixed on these two able warriors, who then made use of all the stratagems which genius and military knowledge were capable of suggesting. Marshal Turenne was obtaining the superiority when he was taken off by a cannon-ball. Montecuculi wept at the death of so formidable an enemy, and bestowed upon him the

greatest praises. The great Prince of Condé, being the only remaining French general fit to oppose Montecuculi, was sent to the Rhine, and stopped the Imperial general; who considered this last campaign as the most glorious of his life, not from his being conqueror, but for his not being conquered, when he was opposed by a Turenne and a Condé. He spent the rest of his life at the Imperial court; and died at Linz in 1680. He wrote *Memoirs*: the best edition is that of Strasburg, in 1735.

MONTE-FALCO, a town of Italy, in the late territory of the church and duchy of Spoleto; twelve miles W. of Spoleto.

MONTE-FALCONE, a town of Italy, in Friuli, ten miles N. W. of Aquileia, and twelve N. W. of Trieste.

MONTE-FIASCONE, a town of Italy, in the late territory of the Church, 45 miles N. W. of Rome.

MONTEGO BAY, a town of Jamaica, and, next to Kingston, the most flourishing in the island. Lon. 78. 15. W. Lat. 18. 31. N.

MONTE-LEONE, a town of Naples, in Calabria Ultra, on a hill, overlooking the sea, twelve miles N. E. of Nicotera.

MONTELMART, a populous town of France, in the department of Drome, and late province of Dauphiny, 25 miles S. of Valence. Lon. 4. 55. E. Lat. 44. 33. N.

MONTE-MARANO, a populous town of Naples, in Principato Ultra, eighteen miles S. of Benevento. Lon. 15. 0. E. Lat. 40. 48. N.

MONTE-MORO NOVO, or **MONTE-MAJOR EL NOVO**, a town of Portugal, between Lisbon and Badajoz. Lon. 9. 35. W. Lat. 38. 42. N.

MONTE-MORO VELO, or **MONTE-MAJOR EL VELHO**, a town of Portugal in Beira, ten miles S. W. of Coimbra, and 83 N. of Lisbon.

MONTE-PULSIANO, a town of Etruria, 25 miles S. E. of Sienna, and 50 S. by E. of Florence. Lon. 11. 49. E. Lat. 43. 10. N.

MONTEREAN, a town of France, in the department of Seine and Marne, at the conflux of the Seine and Yonne, fifteen miles S. E. of Melun.

MONTESA, a very strong town of Spain, in Valentia, five miles from Nativa. Lon. 0. 10. W. Lat. 39. 0. N.

MONTE-SANCTO, the ancient **ATHOS**, a mountain of Turkey in Europe, on the Gulph of Contessa. See **ATHOS**. It is 17 miles S. of Salonichi. Lon. 24. 39. E. Lat. 40. 27. N.

MONTESEQUIEU, CHARLES DE SECONDAT, baron, a most illustrious Frenchman, descended from a noble family of Guienne, was born at the castle of Brede, near Bourdeaux, in 1689. He shewed an early genius, and at the age of 20, had prepared materials for his "Spirit of Laws," by well digested extracts from those immense volumes of civil law, which he had studied. He became a counsellor of the parliament of Bourdeaux in 1714, and in 1716 was received president à mortier. In 1721 he published his *Persian Letters*; in which, under the screen of Oriental manners, he satirized those of France. He did not avow this publication, but was no sooner pointed out as the author, than zeal and envy united at once against the works. He was received into the French academy in 1728; and having quitted his civil employments, he travelled through Germany, Italy, Switzerland, Holland, and England, in which last country he desired three years, and contracted intimacies with the greatest men then alive. On his return he retired for two years to his estate at Brede, where he finished his work "On the Causes of the Grandeur and Declension of the Romans," which appeared in 1734. The reputation acquired by this work only cleared the way for his great undertaking, the *Spirit of Laws*, which was printed at Geneva, in 2 vols. 4to. 1750. This was immediately attacked in a multitude of illiberal anonymous pamphlets. Montesquieu drew up a defence of it; which for truth, moderation, and delicacy of ridicule, may be regarded as a model. He died at Paris on the 10th Feb. 1755. His virtues did honour to human nature, his writings justice. He was of a sweet, gay, and even temper. His conversation was spirited, agreeable, and instructive. Besides the above works, he wrote several small pieces, as the "Temple of Guindus," "Lysimachus," and "Essay upon Taste," which is left unfinished. His works have been collected since his death, and printed at Paris in a splendid edition, in 4to; and have all been translated into English.

MONTE VERDE, a town of Naples, in Principato Ultra, 60 miles E. of Naples. Lon. 15. 42. E. Lat. 40. 51. N.

MONTEZUMA, or **MONTECUMA**, was emperor of Mexico when Cortez invaded that country in 1518, who defeated, loaded him with chains, and obliged him to acknowledge himself in public the vassal of Charles V. in name of tribute for which homage, Cortez received 600,000 merks of pure gold. Montezuma soon afterwards fell a sacrifice to his submission to the Spaniards. He and Alvaro, the lieutenant of Cortez, were besieged in the palace by 200,000 Mexicans. The emperor proposed to shew himself to his subjects, that he might persuade them to desist from the attack: but the Mexicans no longer considered him in any other light but as the slave of foreign conquerors. In the midst of his speech, he received a blow with a stone, and he expired soon after, A. D. 1520. See **CORTES**. This unfortunate prince left two sons and three daughters, who embraced the Christian faith. The eldest son obtained from Charles V. lands, revenues, and the title of Count de Montezuma. He died in 1608; and his family is one of the most powerful in Spain.

MONTFAUCON, three towns of France, viz. 1. in the department of Mayne and Loire, 16 miles S. of Amiens: 2. in that of the Meuse, 5 miles N. E. of Varrennes; 3. in that of Upper Loire, 21 miles N. E. of Puy.

MONTFERRAT, a late province and duchy of Italy, now annexed to France, and included in the department of Marengo. It was bounded on the E. by the late duchy of Milan, and part of the territory of Genoa; on the N. by the Vercellese and Canavese; on the W. by Piedmont; and on the S. by the late Ligurian republic, whence it is separated by the Appennine mountains. It is very fertile and well cultivated, abounding in corn, wine, oil, and silk.

MONTFORT, a town of Holland, in the department of the Zuýder Zee (the late department of the Rhine,) and late province of Utrecht, 7 miles S. by E. of Utrecht. Lon. 5. 0. E. Lat. 52. 4. N.

MONTFORT, a town of France, in the department of Ille and Vilaine, and late province of Upper Bretagne, 12 miles from Rennes.

MONTFORT, a town of Germany, in the circle of Suabia, on the confines of Tirol, 16 miles S. of Lindow, and the lake Constance. Lon. 9. 51. E. Lat. 47. 22. N.

MONTFORT DE LEMOS, an ancient town of Spain, in Galicia, 55 miles S. E. of Compostella. Lon. 7. 9. W. Lat. 42. 28. N.

MONTFORT L'AMULY, a town of France, in the department of the Seine and Oise, and late province of the Isle of France, 25 miles from Paris. Lon. 2. 50. E. Lat. 48. 45. N.

MONTGATZ, a town of Lower Hungary, in the county of Perczas, 52 miles E. S. E. of Cassovia. Lon. 21. 55. E. Lat. 46. 26. N.

MONTGOLFIER, **STEPHEN JAMES**, was born at Annonay in France. He became celebrated by his paper-manufacture, and he was the first who fabricated the vellum-paper, so remarkable for its smoothness and colour. In 1783 he invented air-balloons, for which he was admitted a member of the Academy of Sciences, created chevalier of the order of St. Michael, and rewarded with a pension of two thousand livres. It is said, that the incident of covering a coffee-pot, in which water was boiling, with a spherical cap of paper, which rose in the air as the water heated, first gave him the idea of an air-balloon. Others affirm, that reflecting on the ascent of smoke and clouds in the atmosphere suggested the hint. However this were, it appears that Stephen, in the middle of November, 1782, made an experiment at Avignon with a bag of fine silk, of the shape of a parallelopipedon, and of forty cubic feet in capacity, to the aperture of which he applied burning paper till it was filled with a kind of cloud, when it ascended rapidly to the ceiling. This experiment was repeated by him and his brother at Annonay, with a success that induced them to form a machine of a much larger capacity, which was followed, by other successful attempts, for an account of which see **AEROSTATION**. He died in France, June 26, 1810.

MONTGOMERY, **JAMES**, Lord of Lorges in the Orleansnois, one of the bravest men of his age, and famous under the title of Lorges in the wars of Francis I. In 1545 he succeeded John Stuart count d'Aubigny in the command of the 100 archers in the Scotch guard. He wounded Francis I. in the chin with a firebrand, while engaged in some frolic with that

prince. This accident occasioned the wearing of long beards in France for 50 years. Lorges died aged above 80, a short time after Henry II. He obtained the title of count de Montgomery in 1553, which he claimed as belonging to his ancestors, and as being descended, by the earls of Eglinton in Scotland, from a younger son of the ancient house of Montgomery in England. According to a memoir given by the family to the author of the Genealogical Dictionary, James was the son of Robert Montgomery, who left Scotland, and entered into the service of the French king about the beginning of the reign of Francis I. and this Robert was grandson to Alexander Montgomery, cousin by the mother's side to James I. king of Scotland.

MONTGOMERY, **GABRIEL DE**, count Montgomery in Normandy, the son of the preceding, was remarkable for his valour and noble achievements, but still more so for occasioning the death of Henry II. by accidentally wounding him in the eye at a tournament, in 1559. After this unlucky accident, Montgomery visited Italy and other foreign countries; and did not return to France till the commencement of the civil wars, when he joined the Protestants, and became one of their principal leaders. In 1562, he defended Rouen against the royal army with great valour. The city being at length taken by storm, he swept into a galley; and having surmounted by dint of rowing a chain which had been thrown across the Seine at Caudebec, to prevent succours from England, he escaped to Havre. In 1569 he raised the siege of Bearne in Navarre, then closely pressed by the Catholics; after which he followed the besiegers to Orthez, which he took by assault. Montgomery was at Paris at the time of the massacre of the Protestants in 1572, but escaped though closely pursued. With his family he retired to Jersey, and from thence to England. In 1573 he returned to Normandy, where he was joined by some of the Protestant nobility at St. Lo, at which place he was besieged by Matignon, lieutenant-general in Lower Normandy. But Montgomery escaped from thence, and went to Domfront, whither he was followed by Matignon, who after a long combat made him prisoner. This gallant nobleman was beheaded at Paris in 1574. Montgomery married in 1549 Elizabeth de la Fouché, of a noble family in Brittany, by whom he left several children.

MONTGOMERY, a city of North Wales, 161 miles N. W. from London. Lon. 3. 5. W. Lat. 52. 26. N.

MONTGOMERY, or **MONTGOMERY-SHIRE**, a county of North Wales, 40 miles long and 37 broad; bounded on the N. by Merionethshire and Denbighshire. The air is pleasant and salubrious; but being extremely mountainous, the soil is not very fertile, except in the valleys, which afford some corn, and plenty of pastures.

MONTH, [*monath*, Sax.] in its proper acceptation, is that space of time which the moon takes up in passing from any certain point to the same again, which is called a periodical month; or it is the space of time between two conjunctions of the moon with the sun, which is called a synodical month. That space of time which the sun takes up in passing through one sign or 12th part of the zodiac, is also called (but improperly) a month. So that there are two sorts of months; lunar, which are measured by the moon; and solar, which are measured by the sun. A solar month contains, upon a mean calculation, 30 days, 10 hours, 29 minutes, 4 seconds. The Jews, Greeks, and Romans, made use of lunar synodical months; but, to avoid fractions, they consisted alternately of 29 and 30 days. The former the Romans called *cavi*, and the Greeks *χαλοί*; the latter were termed *pleni* and *πληγεις*. See **CHRONOLOGY**, and **ASTRONOMY**.

MONTHS, **GREGIAN**. The months of the Athenian year consisted alternately of 29 and 30 days. The first month, according to Meton's reformation of the calendar, began with the first new moon after the summer-solstice, and was called hecatombæon, answering to the latter half of June, and the former half of July. The order of the months, with the number of days in each, were as follows:

1 Hecatombæon,	30	7 Posideon,	30
2 Metagilnion,	29	8 Gamelion,	29
3 Boedromion,	30	9 Elaphebolion,	30
4 Mæacterion,	29	10 Munichion,	29
5 Panepsion,	30	11 Thargelion,	30
6 Anthesterion,	29	12 Scirrophorion,	29

Each

Each month was divided into three decades of days called *δεκαήμερα*. The first was called *Μηνος αρχομένης* or *εξαμένης*, or the decade of the beginning of the month; the second was *Μηνος ενυμένης* or the decade of the middle; and the third was *Μηνος φθινούσης*, *παραμένης* or *λγούσης*, the decade of the expiring month. The first day of the first decade was termed *Νεμηνια*, because the first month began with the new moon; the second day was *δευτέρα εξαμένης*; the third *τρίτη εξαμένης*, &c. The first day of the second decade was *πρώτη μεσυνίας*, the second *δευτέρα μεσυνίας*, &c.—the days of this decade were also called *πρώτη επί δεκάς*, *δευτέρα επί δεκάς*, &c. The first day of the third decade was *πρώτη ἐπ' εικάδης*; the second was *δευτέρα ἐπ' εικάδης*, &c. *i. e.* the first, second, &c. after 20, because the last decade began on the 20th day. This decade was also counted by inversion thus; *φθινούσης δεκάτη* the 21st, *φθινούσης ενυάτη* the 22d, *φθινούσης αρχόνη* the 23d, and so of the rest to the last day of the month, which was called *ἐνὶ και νεα*, the old and the new, because one part of that day belonged to the old and the other to the new moon; but after the time of Demetrius, the last day of the month was called from him *Δημητρίαις*; it sometimes was named *τρεμακίς*. The Grecian months, thus consisting of 29 and 30 days alternately, fell short of the solar year 11 days 6 hours. To remedy this the cycle of four years, called *πρόξινος*, was invented.—In this cycle, after the first two years, they added an intercalated month called *εμβολαιος*, consisting of 22 days; and again, after the expiration of two years more, they inserted another month of 23 days, the fourth part of a day having in the space of four years amounted to a whole year.

MONTHS, HEBREW. The Hebrew months were ranged differently in their sacred and in their civil year.

Order of the sacred Year.

Order of the civil Year.

1 Nisan or Abib	Mar.	1 Tisri	Sep.
2 Iar or Zif	Apr.	2 Marshevan	Oct.
3 Sivan	May	3 Casleu or Cisleu	Nov.
4 Thammuz	June	4 Thebet	Dec.
5 Ab	July	5 Sebat	Jan.
6 Elul	Aug.	6 Adar	Feb.
7 Tisri	Sep.	7 Nisan	Mar.
8 Marshevan	Oct.	8 Iar	Apr.
9 Casleu or Cisleu	Nov.	9 Sivan	May
10 Thebet	Dec.	10 Thammuz	June
11 Sebat	Jan.	11 Ab	July
12 Adar	Feb.	12 Elul	Aug.

Answering to our

Answering to our

These months being lunar cannot exactly answer to our solar months; but every Jewish month must be conceived to answer to two of ours, and partake of both. As these 12 lunar months consisted only of 354 days, the Jews in order to bring it nearer to the true year, took care every three years to intercalate a 13th month into the number, which they called *ve-adar*, or the second *adar*. The new moon was always the beginning of the month; and it is said the Jews had people posted on elevated places, to give notice to the Sanhedrim as soon as she made her appearance: After this, proclamation was made by sound of trumpet, and "the feast of the new moon," resounded among the people. The ancient Hebrew months were of 30 days each, excepting the last, which consisted of 35; so that the year contained 365 days, with an intercalary month at the end of 120 years, which, by absorbing the odd hours which remained at the conclusion of each year, brought it back nearly to its proper place. This regulation of the year was borrowed from the Egyptians.

MONTHS, ROMAN. The Roman year under Romulus consisted of 10 months only, and began with March, which contained 31 days, then followed April which had 30, May 31, June 30, Quintilis 31, Sextilis 30, September 30, October 31, November 30, December 30. These 10 months containing no more than 304 days, this division was soon found deficient. Numa Pompilius, therefore, took away one day from each of these six months, April, June, Sextilis, September, November, December; and to the six days thus obtained he added 51, which was the number that Romulus's year, in his opinion, wanted to make it perfect. Numa had now 57 days to dispose of; he therefore divided them, and constituted two other months, January and February; the former consisting of 29 and the latter of 28 days. January, which he placed at the winter-solstice, he made instead of March, to begin the year. Thus Numa's year consisted of 355 days: but this being found 11 days 6 hours short of the solar year, he made use of the intercalation of 90 days at the expiration of eight years per-

petually; which number, being made up of the 11 days and a quarter, kept the year pretty well to its place. The beginning of the year in Julius Caesar's time had anticipated its true place 67 whole days; these he intercalated betwixt November and December; so that the year consisted, for this one time, of 15 months or 445 days. This reformation was called the Julian correction, and this year the year of confusion. At the end of 12 years, by the ignorance of priests, who did not understand intercalation, 12 days had been intercalated for nine. This was observed by Augustus, and rectified, by ordering 12 years to pass without any intercalary days. The order and succession of months were the same as that of Numa; But January, March, May, Quintilis, Sextilis, October, and December, had each 31 days; April, June, September 30, and February, in common years, 28; and every fourth year or bissextile 29. This, with a very little difference, is the account observed at present. Quintilis, in compliment to Julius Caesar, was called July, because in this month he was born; and Sextilis, in honour of Augustus, was called August; both which names are still continued. See **YEAR**. Each month by the Romans was divided into kalends, nones, and ides, all of which were reckoned backwards. The kalends were the first day of the month. The nones fell on the 7th, and the ides on the 15th, of March, May, July, and October; but in all other months the nones were on the 5th, and ides on the 13th; as in the following table:

	March May July October	January August December	April June September November	February
1	Kalendæ	Kalendæ	Kalendæ	Kalendæ
2	6	4	4	4
3	5	3	3	3
4	4	Prid. Non.	Prid. Non.	Prid. Non.
5	3	Nonæ	Nonæ	Nonæ
6	Prid. Non.	8	8	8
7	Nonæ	7	7	7
8	8	6	6	6
9	7	5	5	5
10	6	4	4	4
11	5	3	3	3
12	4	Prid. Idus	Prid. Idus	Prid. Idus
13	3	Idus	Idus	Idus
14	Prid. Idus	19	18	16
15	Idus	18	17	15
16	17	17	16	14
17	16	16	15	13
18	15	15	14	12
19	14	14	13	11
20	13	13	12	10
21	12	12	11	9
22	11	11	10	8
23	10	10	9	7
24	9	9	8	6
25	8	8	7	5
26	7	7	6	4
27	6	6	5	3
28	5	5	4	Prid. Kal.
29	4	4	3	
30	3	3	Prid. Kal.	
31	Prid. Kal.	Prid. Kal.		

N. B. Every leap-year, February consisting of 29 days, the 24th and 25th of that month were written *sexto Kal. Mart.*; hence leap-year is called *Bissextilis*.

MONTIA, in botany, a genus of the trigynia order, and triandria class of plants. Calyx two-leaved; corolla one-petaled, irregular; capsule one-celled, three-valved. It has but one species, *M. Fontana*, water-chickweed, a native of Europe.

MONTINIA, in botany, a genus of the tetrandria order, and diœcia class of plants. Calyx four-toothed, superior; petals four. Female filaments barren; style bifid; capsule oblong, two-celled. There is only one species, viz. *M. acris*; glaucous *montinia*, a native of the Cape of Good Hope.

MONTJOY,

MONTJOY, two towns of France, in the department of Lot and Garonne: 1. five miles N. of Valence, and 13½ E. of Agen; 2. eight miles S. W. of Agen, and 8 S. E. of Nérac.

MONTIVILLIERS, a town of France, in the department of the Lower Seine, and late province of Normandy; 6 miles N. of Harre, and 95 N. W. of Paris. Lon. 0. 20. E. Lat. 49. 35. N.

MONT-L'HIERI, a town of France, in the department of the Seine and Cise, and late province of the Isle of France, 15 miles S. of Paris.

MONT-LOUIS, a town of France, in the department of the Eastern Pyrenees, and late province of Roussillon, 40 miles W. S. W. of Perpignan, and 430 S. of Paris. Lon. 2. 5. E. Lat. 42. 30. N.

MONT-LUET, a town of France, in the department of Ain, and late province of Bresse, 205 miles S. E. of Paris. Lon. 5. 8. E. Lat. 45. 49. N.

MONT-LUZON, a town of France, in the department of Allier, and late province of Bourbonnois; 35 miles S. W. of Moulins.

MONTMEDI, or **MONTMEDY**, a town of France, 27 miles S. W. of Luxemburg.

MONTMELIAN, a town of France, in the department of Mont Blanc, near the Isère, 7 miles S. S. E. of Chambéry.

MONTMORENCY, a town of France, in the department of Seine and Oise, 6 miles W. of Connesse, and 8 N. of Paris.

MONTOIR, [Fr.] in horsemanship, a stone as high as the stirrups, which Italian riding-masters mount their horses from, without putting their foot in the stirrup.

MONTONA, a borough and district of Italy in Istria. The town lies 16 miles E. S. E. of Umago.

MONTORIO, a town and district of Italy in the department of the Mincio, and district and late province of Verona.

MONTPELLIER, a city of France, capital of the department of Hérault, and of the late province of Languedoc. It is reckoned one of the handsomest cities in France. It lies 27 miles S. W. of Nîmes; 47 E. N. E. of Narbonne; and 180 W. by S. of Paris. Lon. 3° 51' 45" E. from Greenwich. Lat. 43° 36' 29" N.

MONTPENSIER, a town of France, in the department of Puy de dome, and late province of Auvergne, 20 miles N. E. of Clermont. Lon. 3. 14. E. Lat. 46. 4. N.

MONTREAL, an island of N. America, in the St. Laurence, about 20 miles long, and 9 broad. The soil is exceedingly rich, producing all kinds of European fruits and vegetables in great abundance. The S. side is most populous, best cultivated, and adorned with villas. This place has suffered much by fires, the houses being mostly built of wood.

MONTREAL, the capital of the above island, formerly called Ville Marie, is the second place in Canada for extent, buildings, and strength; and besides the advantage of a better climate, for delightfulness of situation is much preferable to Quebec. It stands 120 miles S. W. of Quebec. Lon. 71. 20. W. Lat. 45. 55. N.

MONTREAL, or **MOUNT ROYAL**, a fortress of Germany in the late electorate of Triers; 22 miles N. E. of Triers; now included in the department of the Rhine and Moselle. Loc. 7. 6. E. Lat. 49. 59. N.

MONTREAL, a town of Sicily, in the valley of Mazara, 5 miles W. of Palermo. Lon. 13. 31. E. Lat. 38. 14. N.

MONTREAL, a town of Spain, in Arragon, 25 miles N. W. of Teruel. Lon. 1. 2. W. Lat. 41. 9. N.

MONTREUIL BELLERY, a town of France in the department of Maine and Loire, 10 miles S. of Saumur. Lon. 0. 9. W. Lat. 47. 6. N.

MONTREUIL SUR MER, a town of France in the department of the Straits of Calais, 40. miles S. of Calais, and 117 N. of Paris. Lon. 1. 52. E. Lat. 50. 27. N.

MONT-RICHARD, a town of France in the department of Loire and Cher, 112 miles S. W. of Paris. Lon. 1. 22. E. Lat. 47. 22. N.

MONTROSE, a town of Scotland in Angus-shire, 28 miles N. E. of Dundee. Lon. 2. 22. W. Lat. 56. 34. N.

MONTROSS, an under-gunner, or assistant to a gunner, engineer, or fire-master.

MONTSERRAT, a mountain of Spain, in Catalonia, one of the most singular in the world for situation, shape, and composition. It stands single, towering over a hilly country like a pile of grotto-work of Gothic spires; and its height so great, that to a

beholder on the top the neighbouring mountains appear to be sunk to a level with the plain. It is composed of steep rocks, which at a distance seem indented; whence its name Montserrat, from the Latin, *scerra*, a saw. Montserrat is famous for the adoration paid to an image of the Virgin, which, according to tradition, was found in a cave in this mountain by some shepherds in 880. Over this image, Guthread earl of Barcelona caused a monastery and chapel to be erected: but, after remaining in this receptacle upwards of 700 years, Philip II. and Philip III. built a magnificent church for its reception. Innumerable miracles are ascribed to this image. The monastery is situated in a corner of the mountain; it seems as if vast torrents of water, or some violent convulsion of nature, had split the eastern face of Montserrat, and forined in the cleft a sufficient platform to build the monastery upon. This mountain is 25 miles N. W. of Barcelona. Lon. 2. 26. E. Lat. 41. 40. N.

MONTSERRAT, one of the Caribbee Isles, so called by Columbus from its resemblance to the above mountain. In its figure it is nearly round, about 9 miles in extent every way, 27 in circumference, and supposed to contain above 50,000 acres. The climate is warm, but less so than in Antigua, and is esteemed very healthy. The surface is mountainous, but interspersed with pleasant, rich, and fertile, valleys: the hills are covered with cedars and other fine trees. Here are all the animals, vegetables, and fruits, that are to be found in the other islands. The principal productions are cotton, rum, and sugar. This island lies 30 miles S. W. of Antigua. Lon. 62. 22. W. Lat. 16. 49. N.

MONT TERRIBLE, a department of France formed out of the late principality of Monaco, and county of Nice.

MONT-TONNERE, a department of France on the left or W. bank of the Rhine. Worms is the capital.

MONUMENT, [*monumentum*, Lat.] in architecture, a building destined to preserve the memory, &c. of the person who raised it, or for whom it was raised; such are a triumphal arch, a mausoleum, a pyramid, &c. The first monuments that were erected by the ancients, were of stones, which were laid over tombs, on which were cut the names and actions of the deceased. These stones were distinguished by various names, according as their figures were different: the Greeks called those which were square at the base, and were the same depth throughout their whole length, steles; from whence our square pilasters, or Attic columns, are derived: those which were round in their base, and ended in a point at top, they called styles; which gave occasion to the invention of diminished columns: those which were square at the foot, and terminated in a point at the top, in the manner of a funeral, they called pyramids: to those whose bases were more in length than in breadth, and rose still lessening to a very great height resembling the figure of the splits or instruments used by the ancients in roasting the flesh of their sacrifices, they called obelisks. See **OBELISKS**, **PYRAMID**, &c.

MONUMENT, absolutely so called among us, is a magnificent pillar, erected by order of parliament, in memory of the burning of the city of London, A. D. 1666, in the very place where the fire began. This pillar is of stone, of the Doric order, and fluted. It is one of the boldest pieces of architecture that ever was attempted, being 202 feet high, and the diameter 15; it stands on a pedestal 40 feet high, and 21 feet square, the front being enriched with curious emblems in basso relievo: within are winding stairs, up to the very top.

MONZA, a town of Italy in the late duchy of Milan, 8 miles N. N. E. of Milan. Lon. 9. 20. E. Lat. 45. 33. N.

MOOD, or **MODE**, in grammar. See **GRAMMAR**.

MOODS OF SYLLOGISM. See **LOGIC**.

MOON, [*luna*, Gr. *mena*, Sax.] in astronomy one of the satellites, or secondary planets, denoted by this character ☾. The moon constantly revolves about the earth. See **ASTRONOMY**.

MOON-EYES, in the manege, a horse is said to have moon-eyes when the weakness of his eyes increases or decreases according to the course of the moon: so that in the wane his eyes are muddy and troubled, and at new moon clear; but still he is in danger of losing his eye-sight entirely. See **FARRIER**.

MOON-STONE, a species of a silicious earth, of a clear white colour approaching to that of milk. In a certain position, it reflects a strong light like mother-of-pearl; in others, it shews spots of a carnation-colour. It is found in pieces with obtuse angles, sometime of a quadrangular figure. Werner supposes it to be the andro-

dramas

dramas of Pliny, the girasole of the Italians, and the water-opal of Ceylon; and is classed with the opal and the cat's eye.

MOON-FREFOIL. See **MEDICAGO**.

MOONWORT, in botany. See **LUNARIA**.

MOOR, SIR JONAS, in biography, an eminent English mathematician, born at Whitby in Lancashire, about the year 1620. He enjoyed the advantage of a liberal school-education, and afterwards applied himself principally to the study of the mathematics, for which, from his childhood, he had discovered a strong partiality. King Charles I. expressed much approbation of his acquirements, and gave him a promise of encouragement; which laid the foundation of his future fortune. Afterwards he was appointed mathematical tutor to the King's second son, James, to instruct him in arithmetic, geography, the use of the globes, &c. During Cromwell's government, he appears to have followed the profession of a public teacher of mathematics; for he is styled in the title-pages of some of the publications, "professor of the mathematics." Mr. Granger says, in his "Biographical History of England," that he was employed by the commissioners, for draining and dividing the fens; and in his survey took notice that the sea made a curve-line on the beach, from which he took the hint to keep it effectually out of Norfolk. After the restoration of King Charles II. he was noticed and employed by that prince, who bestowed on him the honour of knighthood, and at length promoted him to the important office of surveyor-general of the ordnance. He frequently availed himself of his interest at court for the advancement of learning, the encouragement of merit, and the establishment of institutions highly favourable and beneficial to the interests of the public, and of science in general. He wrote a general system of mathematics in 2 vols. 4to. which was published after his death in 1681. Besides the system of mathematics, he published arithmetic, in two books, viz. *Vulgar Arithmetic*, and *Algebra*. To which are added, two Treatises, the one a new Contemplation Geometrical, upon the oval figure called the Ellipsis; the other, the two first Books of Mydorgius, his Conical Sections analyzed, 1660, octavo; *A Mathematical Compendium*; or, useful Practices in Arithmetic, Geometry, and Astronomy, Geography, and Navigation, &c. &c. the fourth edition of which is dated in 1705, 12mo.; *A General Treatise of Artillery*; or, Great Ordnance. Written in Italian by Thomas Moretti of Brescia. Translated into English, with Notes thereupon, and some Additions out of French for Sea-gunners. By Sir Jonas Moor, Knt. octavo, with the date of 1688.

MOOR, MOOR-LAND, or MOORY SOIL, a black, light, soft soil, remarkably loose, without any admixture of stones, and containing a very small proportion of clay, or sand. This earth usually forms the uppermost stratum of fen-lands, and consists almost wholly of pure vegetable matter, which renders it very fertile. Moors, however, are subject to inundations, and they retain moisture for a considerable time, so as to render it difficult for cattle to graze, without poaching the soil. To remedy this inconvenience, the tenants of such lands pare and burn them at certain seasons of the year; by which process their nature is considerably improved, as the surface readily takes fire, and burns freely. The course of crops that has been found most profitable, is for the first three years, grass; that is, hay-seeds, and the different kinds of clover, sown after the surface has been burnt and plowed in: during the next three years, two crops of corn, with an intermediate fallow; by such rotation, lands that were naturally of little value, have been rendered fit to produce very beneficial crops. Where moors occur in mountainous situations, Mr. Young recommends them first to be drained and irrigated, as the water will work numerous passages round the heath, that is usually found in moorlands; but which will speedily perish when flooded, and will be succeeded by sweet grasses, and other useful plants. The next step will be to inclose the land with a double, dry stone-wall, between which young oaks, alders, ash, holly, mountain-ash, &c. may be advantageously planted; for, independently of the immediate shelter thus afforded to cattle, they will, in the course of a few years, become very profitable woods. In some cases, a simple inclosure has, without farther cultivation, been found very beneficial for feeding the common Scotch wethers, which are distinguished by black faces and legs, and long coarse wool.—Mr. Young observes, that mountainous moors, if tolerably well covered with heath, intermixed with spots of sedge, rushes, and coarse grass, will support

a sheep on an acre, throughout the year; and, as the rot seldom occurs on these lands, it has been found, that flocks pastured on them, without the addition of hay, thrive well, and oftentimes better than those which are regularly foddered. If, however, the design be to establish a grass-farm, it will be advisable to pare, burn, and lime, the lands, after which they must be once thinly plowed, that the lime and ashes may not be too deeply buried. As the cultivation of mountainous moors is either productive of great profit, or of total ruin, the greatest judgement is requisite in fixing the course of crops. The chief object being to convert these soils ultimately into good meadows, or sheep-walks, the tillage ought only to extend to the destruction of spontaneous growth; to the removal of the acidity peculiar to peat-soils, and to support a flock during the winter: which purposes may be effected by paring and liming judiciously, and also by sowing hay.—The first course, which Mr. Young considers as deserving more particular attention, is: 1. Turnips, or cabbages. 2. Oats. 3. Grasses, mown. 4. Grasses, &c. fed. This course is generally preferable to others; but, in case it should be found inadequate, he recommends the following variation to be adopted, viz. 1. Turnips or cabbages. 2. Cabbages or turnips. 3. Oats. 4. Grasses, mown. 5. Grasses, fed.

MOORING, the act of confining and securing a ship in a particular station, by chains or cables, which are either fastened to the adjacent shore, or to anchors in the bottom. A ship may be either moored by the head, or by the head and stern: i. e. she may be secured by anchors before her, without any behind; or she may have anchors out, both before and behind her; or her cables may be attached to posts, rings, or moorings, which answer the same purpose. When a ship is moored by the head with her own anchors, they are disposed according to the circumstances of the place where she lies, and the time she is to continue therein. Thus wherever a tide ebbs and flows, it is usual to carry one anchor out towards the flood, and another towards the ebb, particularly where there is little room to range about.

MOORINGS, in sea-language, are usually an assemblage of anchors, chains, and bridles, laid athwart the bottom of a river or haven, to ride the shipping contained therein.

MOORS, MAURI, the inhabitants of the ancient Mauritania, and of the modern empire of Morocco. The Moors are a mixture of Arabian and African nations formed into tribes; with the origin of whom we are very imperfectly acquainted. These tribes, strangers to each other, and ever divided by traditional hatred or prejudice, seldom mingle. Most of the casts who occupy the provinces of Morocco have probably been repulsed from the eastern to the western Africa, during those different revolutions by which this part of the world has been agitated; that they have followed the standard of their chiefs, whose names they have preserved; and that by these they, as well as the countries they inhabit, are distinguished. At present these tribes are called *cafiles* or *cabiles*, from the Arabic word *kobeila*; and they are so numerous, that it is impossible to have a knowledge of them all. In the northern provinces are enumerated Beni-Garir, Beni, Guernid, Beni-Mansor, Beni-Oriegan, Beni-Chelid, Beni-Juseph, Beni-Zanuol, Beni-Razin, Beni-Gebara, Beni-Buseibet, Beni-Gualid, Beni-Yeder, Beni-Gueiaghel, Beni-Gueseval, Beni-Guamud, &c. Towards the east are, Beni-Sayd, Beni-Teusin, Beni-Isletin, Beni-Buhalel, Beni-Telid, Beni-Soffian, Beni-Becil, Beni-Zequer, &c.—and to the south, those of Beni-Fonseccara, Beni-Ares, Beni-Hassen, Beni-Mager, Beni-Basti, Beni-Seba, with an infinite number of others. In these names, the word *Ben*, or *Beni*, is used for sons or descendants. The people who depend on Algiers, Tunis, and Tripoli, are in like manner divided into a great number of tribes, who are all so ancient that they themselves have no idea of their origin.

MOORS, in the Isle of Man, those who summon the courts for the several shreadings; such as the lord's bailiffs. The office is similar to that of bailiff of the hundred.

MOORSIEDABAD, a large city of Hindostan, in Bengal, 100 miles N. of Calcutta, and 113 S. E. of Patna. Lon. 88. 28 E. Lat. 24. 15. N.

MOOT CASE or POINT, a point or case unsettled and disputable, such as may properly afford a topic of disputation. It is a difficult case, argued by the young barristers and students at the inns of court, by way of exercise, to qualify them for practice, and to defend the causes of their clients. This, which is called

mooting, is the chief exercise of the inns of court. Particular times are appointed for the arguing moot-cases: the place where this exercise is performed was anciently called Moot-hall; and there is a bailiff, or surveyor of the moots, annually chosen by the bench, to appoint the moot-men for the inns of chancery, and to keep an account of the performance of exercises.

MOPSUS, in fabulous history, a celebrated prophet, son of Apollo, by Manto, the daughter of Tiresias, who flourished about the time of the Trojan war. After death he was ranked among the gods, and had an oracle at Melin, celebrated for the true and decisive answers which it gave.

MORSUS, the son of Ampyx and Chloris, born at Titaressa in Thessaly. He was the prophet and soothsayer of the Argonauts,

and died at his return from Colchis by the bite of a serpent in Libya.

MORÆA, in botany, a genus of the monogynia order, and triandria class of plants; natural order, *Ensateæ*. Corolla six-petalled, the three inner parts spreading narrower; stigma trifid. There are seventeen species.

MORAI, the name given at Otaheite to the burying-grounds, which are also places of worship. A morai is a pile of stone raised pyramidally upon an oblong base or square 267 feet long and 87 wide. On each side is a flight of steps; those at the sides being broader than those at the ends; so that it terminates not a square of the same figure with the base, but in a ridge like the roof of a house.

MORAL PHILOSOPHY.

MORAL PHILOSOPHY, is the knowledge of what ought to be, or the application of rules that ought to determine, the choice of voluntary agents. Moral Philosophy has this in common with Natural Philosophy, that it appeals to nature or fact; depends on observation; and builds its reasonings on plain uncontroverted experiments, or upon the fullest induction of particulars of which the subject will admit. We must observe, in both these sciences, how nature is affected, and what her conduct is in such and such circumstances: or, in other words, we must collect the appearances of nature in any given instance; trace these to some general principles or laws of operation; and then apply these principles or laws to the explaining of other phenomena. Therefore Moral Philosophy inquires, not how man might have been, but how he is, constituted; not into what principles or dispositions his actions may be artfully resolved, but from what principles and dispositions they actually flow; not what he may, by education, habit, or foreign influence, come to be or do; but, what, by his nature, or original constituent principles, he is formed to be and do. We discover the office, use, or destination, of any work, whether natural or artificial, by observing its structure, the parts of which it consists, their connection or joint action. It is thus we understand the office and use of a watch, a plant, an eye, or hand. It is the same with a living creature of the rational or brute kind. Therefore, to determine the office, duty, or destination, of man; or, in other words, what his business is, or what conduct he is obliged to pursue, we must inspect his constitution, take every part to pieces, examine their mutual relations one to the other, and the common effect or tendency of the whole.

OF MAN AND HIS CONNECTIONS.

Man is born a weak, helpless, delicate creature, unprovided with food, clothing, and whatever is necessary for subsistence or defence. And yet, exposed as he is in his infantile state, to numberless wants and dangers, he is utterly incapable of supplying the former, or securing himself against the latter. But, though thus feeble and exposed, he finds immediate and sure resources in the affection and care of his parents, who refuse no labours, and forego no dangers, to nurse and rear up the tender babe. By these powerful instincts, as by some mighty chain, does nature link the parent to the child, and form the strongest moral connection on his part, before the child has the least apprehension of it. Hunger and thirst, with all the sensations that accompany or are connected with them, explain themselves by a language strongly expressive, and irresistibly moving. As the several senses bring in notices of surrounding objects, the young spectator shews early signs of growing wonder and admiration. Bright objects and striking sounds are beheld and heard with a sort of commotion and surprise. But, without resting on any, he eagerly passes on from object to object, still pleased with whatever is most new. Thus the love of novelty is formed, and the passion of wonder kept awake. By degrees he becomes acquainted with the most familiar objects, his parents, his brethren, and those of the family who are most conversant with him. He contracts a fondness for them, is uneasy when they are gone, and charmed to see them again. These feelings become the foundation of a moral attach-

ment on his side; and by this reciprocal sympathy he forms the domestic alliance with his parents, brethren, and other members of the family. Hence he becomes interested in their concerns; and feels joy or grief, hope or fear, on their account, as well as his own. As his affections now point beyond himself, to others, he is denominated a good or ill creature, as he stands well or ill affected to them. These, then, are the first links of the moral chain; the early rudiments, or outlines, of his character; his first rude essays towards free agency. When he begins to make excursions from the nursery, and extends his acquaintance abroad, he forms a little circle of companions; engages with them in play, or in quest of adventures; and leads, or is led by them, as his genius is more or less aspiring. Though this is properly the season in which appetite and passion have the ascendant, yet his imagination and intellectual powers open apace; and as the various images of things pass before the mental eye, he forms variety of tastes; relishes some things, and dislikes others, as his parents, companions, and a thousand other circumstances, lead him to combine agreeable or disagreeable sets of ideas, or represent to him objects in alluring or odious lights. As his views are enlarged, his active and social powers expand in proportion; the love of action, of imitation, and of praise, emulation, curiosity, docility, a passion for command; and fondness of change.—His passions are quick, variable, and pliant to every impression; his attachments and disgust quickly succeed each other. He compares things, distinguishes actions, judges of characters, and loves or hates them, as they appear well or ill affected to himself, or to those he holds dear. Meanwhile he soon grows sensible of the consequences of his own actions, as they attract applause, or contempt: he triumphs in the former; and is ashamed of the latter, wants to hide them, and blushes when they are discovered. By these powers he becomes a fit subject of culture, the moral tie is drawn closer, he feels that he is accountable for his conduct to others as well as to himself, and thus gradually ripens for society and action. As man advances from childhood to youth, his passions as well as perceptions take a more extensive range. New senses of pleasure invite him to new pursuits; he grows sensible to the attractions of beauty, feels a peculiar sympathy with the sex, and forms a more tender kind of attachment than he has yet experienced. This becomes the cement of a new moral relation, and gives a softer turn to his passions and behaviour. In this turbulent period he enters more deeply into a relish of friendship, company, exercises, and diversions; the love of truth, of imitation, and of design, grows upon him; and as his connections spread among his neighbours, fellow-citizens, and countrymen, his thirst of praise, emulation, and social affections, grow more intense and active. Meanwhile, it is impossible for him to have lived thus long without having become sensible of those more august signatures of order, wisdom, and goodness, which are stamped on visible creation; and of those strong suggestions within himself of a parent mind, the source of all intelligence and beauty; an object as well as source of that activity, and those aspirations which sometimes rouse his inmost frame, and carry him out of himself to an almighty and all-governing power: Hence arise those sentiments of reverence, and those affections of gratitude, resignation, and love, which link the soul with the Au-

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thor of Nature, and form that most sublime and god-like of all connections. Man having now reached his prime, either new passions succeed, or the old set are wound up to an higher pitch. For, growing more sensible of his connections with the public, and that particular community to which he more immediately belongs; and taking withal a larger prospect of human life, and its various wants and enjoyments; he forms more intimate friendships, grasps at power, courts honour, lays down cooler plans of interest, and becomes more attentive to the concerns of society: he enters into family-connections, and indulges those charities which arise from thence. The reigning passions of this period powerfully prompt him to provide for the decays of life: and in it compassion and gratitude exert their influence in urging the man, now in full vigour, to requite the affection and care of his parents, by supplying their wants, and alleviating their infirmities. At length human life verges downwards; and old age creeps on apace, with its anxiety, love of ease, interestness, fearfulness, foresight, and love of offspring.—The experience of the aged is formed to direct, and their coolness to temper, the heat of youth: the former teaches them to look back on past follies; and the latter to look forward into the consequences of things, and provide against the worst. Thus every age has its peculiar genius and set of passions corresponding to that period, and most conducive to the prosperity of the rest. And thus are the wants of one period supplied by the capacities of another, and the weaknesses of one age tally to the passions of another. Besides these, there are other passions and affections of a less ambulatory nature, not peculiar to one period, but belonging to every age, and acting more or less in every breast throughout life. Such are self-love, benevolence, love of life, honour, shame, hope, fear, desire, aversion, joy, sorrow, anger, and the like. The two first are affections of a cooler strain; one pointing to the good of the individual, the other to that of the species: joy and sorrow, hope and fear, seem to be only modifications, or different exertions, of the same original affections of love and hatred, desire and aversion, arising from the different circumstances or position of the object desired or abhorred, as it is present or absent. From these likewise arise other secondary or occasional passions, which depend, as to their existence and several degrees, upon the original affections being gratified or disappointed: as anger, complacence, confidence, jealousy, love, hatred, dejection, exultation, contentment, disgust, which do not form leading passions, but rather hold of them. By these simple but powerful springs, whether periodical or fixed, the life of man, weak and indigent as he is, is preserved and secured, and the creature is prompted to a constant round of action, even to supply his own numerous and ever returning wants, and to guard against the various dangers and evils to which he is obnoxious. By these links men are connected with each other, formed into families, drawn into particular communities, and all united as by a common league into one system or body, whose members feel and sympathise one with another. By this admirable adjustment of the constitution of man to his state, and the gradual evolution of his powers, order is maintained, society upheld, and human life filled with that variety of passion and action which at once enliven and diversify it. This is a short sketch of the principal movements of the human mind. Yet these movements are not the whole of man; they impel to action, but do not direct it; they need a regulator to guide their motions, to measure and apply their forces; and accordingly they have one that naturally superintends and directs their actions. We are conscious of a principle within us, which examines, compares, and weighs, things; notes the differences, observes the forces, and foresees the consequences, of affections and actions. By this power we look back on past times, and forward into futurity, gather experiences, estimate the real and comparative value of objects, lay out schemes, contrive means to execute them, and settle the whole order and economy of life. This power we commonly distinguish by the name of reason or reflection, the business of which is not to suggest any original notions or sensations, but to canvass, range, and make deductions, from them. We are intimately conscious of another principle within us, which approves of certain sentiments, passions, and actions, and disapproves of their contraries. In consequence of the decisions of this inward judge, we denominate some actions and principles of conduct right, honest, good; and others wrong, dishonest, ill. The former excite our esteem, moral complacence,

and affection, immediately and originally of themselves, without regard to their consequences, and whether they affect our interest or not. The latter do as naturally and necessarily call forth our contempt, scorn, and aversion. That power by which we perceive this difference in affections and actions, and feel a consequent relish or dislike, is commonly called conscience or the moral sense. These two powers of reason and conscience are evidently principles different in nature and kind from the passions and affections. For the passions are mere force or power, blind impulses, acting violently and without choice, and ultimately tending each to their respective objects, without regard to the interest of the others or of the whole system. Whereas the directing and judging powers distinguish and ascertain the different forces, mutual proportions, and relations, which the passions bear to each other and to the whole; recognise their several degrees of merit, and judge of the whole temper and conduct, as they respect either the individual or the species; and are capable of directing or restraining the blind impulses of passion in a due consistency one with the other, and a regular subordination to the whole system. This is some account of the constituent principles of our nature, which, according to their different mixtures, degrees, and proportions, mould our character and sway our conduct in life. In reviewing that large train of affections which fill up the different stages of human life, we perceive this obvious distinction among them; that some of them respect the good of the individual, and others carry us beyond ourselves to the good of the species or kind. The former have therefore been called private, and the latter public affections. Of the first sort are love of life, of pleasure, of power, and the like. Of the last are compassion, gratitude, friendship, natural affection, patriotism, and the like. To discover the proper use and application of these powers, and the right direction of these movements, is the business of Moral Philosophy: and this will be found to depend in a great measure on our moral obligations, which it will be necessary to consider.

OF DUTY, OR MORAL OBLIGATION.

It is by the end or design of any power or movement that we must direct its motions, and estimate the degree of force necessary to its just action. If it want the force requisite for the obtaining its end, we reckon it defective; if it has too much, so as to be carried beyond it, we say it is overcharged; and in either case it is imperfect and ill-contrived. If it has just enough to reach the scope, we esteem it right and as it should be. Let us apply this reasoning to the passions. The defence and security of the individual being the aim of the defensive passions, that security and defence must be the measure of their strength or indulgence. If they are so weak as to prove insufficient for that end, or if they carry us beyond it, *i. e.* raise unnecessary commotions, or continue longer than is needful, they are unfit to answer their original design, and therefore are in an unsound and unnatural state. The exercise of fear or of resentment has nothing desirable in it, nor can we give way to either without painful sensations. Without a certain degree of them, we are naked and exposed. With too high a proportion of them, we are miserable, and often injurious to others. Thus cowardice or timidity, which is the excess of fear, instead of saving us in danger, makes us incapable of attending to the best means of preservation, and disarms us of courage, our natural armour. Fool-hardiness, which is the want of a due measure of fear, leads us heedlessly into danger, and lulls us into a pernicious security. Revenge, *i. e.* excessive resentment, by the violence of its commotion, robs us of the presence of mind which is often the best guard against injury, and inclines us to pursue the aggressor with more severity than self-defence requires. Pusillanimity, or the want of a just imagination against wrong, leaves us quite unguarded, and tends to sink the mind into a passive enervated tameness. Therefore, "to keep the defensive passions duly proportioned to our dangers, is their natural pitch and tenor." The private passions lead us to pursue some positive species of private good: that good therefore which is the object and end of each must be the measure of their respective force, and direct their operation. If they are too weak or sluggish to engage us in the pursuit of their several objects, they are evidently deficient; but if they defeat their end by their impetuosity, then are they strained beyond the just tone of nature. Thus vanity, or an excessive passion for applause, betrays into such meannesses and little

little arts of popularity, as makes us forfeit the honour we so anxiously court. On the other hand, a total indifference about the esteem of mankind, removes a strong guard and spur to virtue, and lays the mind open to the most abandoned prosecutions. Therefore, "to keep our private passions and desires proportioned to our wants, is the just measure and pitch of this class of affections." The private passions all agree in general, in their tendency to the good of the individual. Therefore, when there is a collision of interest, as may sometimes happen, that aggregate of good or happiness, which is composed of the particular goods to which they respectively tend, must be the common standard by which their comparative degrees of strength are to be measured. Therefore, "to proportion our defensive and private passions in such measure to our dangers and wants as best to secure the individual, to obtain the greatest aggregate of private good or happiness, is their just balance or comparative standard in case of competition." In like manner as the public or social affections point at the good of others, that good must be the measure of their force. When a particular social affection, as gratitude or friendship, which belongs to a particular social connection, viz. that of a benefactor or of a friend, is too feeble to make us act the grateful or friendly part, that affection, being insufficient to answer its end, is defective and unsound. If, on the other hand, a particular passion of this class counteract or defeat the interest it is designed to promote, by its violence or disproportion, then is that passion excessive and irregular. This natural affection, if it degenerates into a passionate fondness, not only hinders the parents from judging coolly of the interest of their offspring, but often leads them into a most partial and pernicious indulgence. As every kind affection points at the good of its particular object, it is possible there may be sometimes a collision of interests or goods. Thus the regard due to a friend may interfere with that which we owe to a community. In such a competition of interests, it is evident that the greatest is to be chosen; and that is the greatest interest which contains the greatest sum or aggregate of public good, greatest in quantity as well as duration. This then is the common standard by which the respective forces and subordinations of the social affections must be adjusted. Therefore we conclude, that "this class of affections are sound and regular when they prompt us to pursue the interest of individuals in an entire consistency with the public good." However, as there are no independent affections in the fabric of the mind, no passion that stands by itself, without some relation to the rest, we cannot pronounce of any one, considered apart, that it is either too strong or too weak. Its strength and just proportion must be measured not only by its subserviency to its own immediate end, but, by the respect it bears to the whole system of affections. Therefore, we say a passion is too strong, not only when it defeats its own end, but when it impairs the force of other passions, which are equally necessary to form a temper of mind suited to a certain æconomy or state; and too weak, not merely on account of its insufficiency to answer its end, but because it cannot sustain its part or office in the balance of the whole system. If it be asked, "How far may the affections towards private good or happiness be indulged?" One limit was before fixed for the particular indulgence of each, viz. their subordination to the common aggregate of good to the private system. In these therefore a due regard is always supposed to be had to health, reputation, fortune, freedom of action, the unimpaired exercise of reason, the calm enjoyment of one's self, which are all private goods. Another limit now results from the balance of affection just named, viz. "The security and happiness of others;" or, to express it more generally, "a private affection may be safely indulged, when, by that indulgence, we do not violate the obligations which result from our higher relations or public connections." A just respect, therefore, being had to these boundaries which nature has fixed in the breast of every man, what should limit our pursuits of private happiness? Now, whatever adjusts or maintains the balance of affections, whatever in the human constitution is formed for directing the passions so as to keep them from defeating their own end or interfering with each other, must be a principle of a superior nature to them, and ought to direct their measures and govern their proportions. But it was found that reason is such a principle, which points out the tendency of our passions, weighs their influence upon private and public happiness, and shews the best means of attaining either. It having been likewise found that here is another directing or controlling principle, which we call

conscience, or the moral sense, which, by a native kind of authority, judges of affections and actions, pronouncing some just and good, and others unjust and ill; it follows, that the passions, which are mere blind forces, are principles inferior and subordinate to this judging faculty. Therefore, the passions ought to be subjected to the direction and authority of the controlling principles. We conclude, therefore, from this induction, that "the constitution or just æconomy of human nature consists in a regular subordination of the passions and affections to the authority of conscience and the direction of reason." To have our defensive passions duly proportioned to our dangers, is the surest way to avoid or get clear of them, and obtain the security we seek after. To proportion our private passions to our wants, is the best means to supply them; and, to adapt our public affections to our social relations, and the good of others, is the most effectual method of fulfilling the one, and procuring the other." But thus to regulate our affections is what we mean by a regular subordination of the passions and affections, which is therefore such an ornament to the mind, and such a conduct of its powers and affections as will stand the test of reason. In order to form an idea of moral obligations, let us suppose a parent, a friend, a benefactor, reduced to a condition of the utmost indigence and distress, and that it is in our power to give them immediate relief. To what conduct are we obliged? what duty does nature dictate and require in such a case? Attend to nature, and nature will tell, with a voice irresistibly audible and commanding to the human heart, with an authority which no man can silence without being self-condemned, and which no man can elude but at his peril, "that immediate relief ought to be given." Again, let a friend, a neighbour, or even a stranger, have lodged a deposit in our hands, and after some time reclaim it; no sooner do these ideas of the confidence reposed in us, and of property not transferred, but deposited, occur, than we immediately and unavoidably feel and recognize the obligation to restore it. In both these cases we should condemn and even loathe ourselves if we acted otherwise, as having done, or omitted doing, what we ought not, as having acted beneath the dignity of our nature; and contrary to our most intimate sense of right and wrong: we should accuse ourselves as guilty of ingratitude, injustice, and inhumanity, and be conscious of deserving the censure, and therefore dread the resentment, of all rational beings. But in complying with the obligation, we feel joy and self-approbation, are conscious of an inviolable harmony between our nature and duty, and think ourselves entitled to the applause of every impartial spectator of our conduct. To describe therefore what we cannot perhaps define, a state of moral obligation is "that state in which a creature, endued with such senses, powers, and affections, as man, would condemn himself, and think he deserved the condemnation of all others, should he refuse to fulfil it; but would approve himself, and expect the approbation of all others, upon complying with it." And we call him a moral agent, who is in such a state, or is subject to moral obligation. Therefore, as man's structure and connections often subject him to such a state of moral obligation, we conclude that he is a moral agent. But as men may sometimes act without knowing what he does, as in cases of frenzy or disease, or in many natural functions; or knowing what he does, he may act without choice or affection, as in cases of necessity or compulsion; therefore to denominate an action moral, i. e. approveable, or blameable, it must be done knowingly and willingly, or from affection and choice. "A morally good action, then, is to fulfil a moral obligation knowingly and willingly." And a morally bad action, or an immoral action, is, "to violate a moral obligation knowingly and willingly." As not an action, but a series of actions, constitute a character; as not an affection, but a series of affections, constitute a temper: and as we denominate things by the gross, a fortiori, or by the qualities which chiefly prevail in them; therefore we call that a "morally good character, in which a series of morally good actions prevail;" and that a "morally good temper, in which a series of morally good affections have the ascendant." A bad character and bad temper are the reverse. But where the above-mentioned order or proportion of passions is maintained, there a series of morally good affections and actions will prevail. Therefore, "to maintain that order and proportion, is to have a morally good temper and character." Hence it is evident that a "morally good temper and character is moral rectitude, integrity, virtue, or the completion of duty."

THE FINAL CAUSES OF OUR MORAL FACULTIES OF PERCEPTION AND AFFECTION.

The Supreme Being has seen fit to blend in the whole of things a prodigious variety of discordant and contrary principles, light and darkness, pleasure and pain, good and evil. There are multifarious natures, higher and lower, and many intermediate ones between the widely distant extremes. These are differently situated, variously adjusted, and subjected to each other, and all of them subordinate to the order and perfection of the whole. We may suppose man placed as in a centre amidst those innumerable orders of beings, by his outward frame drawing to the material system, and by his inward connected with the intellectual or moral, and of course affected by the laws which govern both. In this infinite variety of relations with which he is surrounded, and of contingencies to which he is liable, he feels strong attractions to the good, and violent repulsions or aversions to the ill. But as good and ill are often blended, and wonderfully complicated one with the other; as they sometimes immediately produce and run up into each other, and at other times lie at great distances, yet by means of intervening links introduce one another; and as these effects are often brought about in consequence of hidden relations and general laws, of the energy of which he is an incompetent judge; it is easy for him to mistake good for evil, and evil for good, and consequently he may be frequently attracted by such things as are destructive, or repelled by such as are salutary. Thus, by the tender and complicated frame of his body, he is subjected to a great variety of ills, to sickness, cold, heat, fatigue, and innumerable wants. Yet his knowledge is so narrow withal, and his reason so weak, that in many cases he cannot judge, in the way of investigation or reasoning, of the connections of those effects with their respective causes, or of the various latent energies of natural things.—He is therefore informed of this connection by the experience of certain senses or organs of perception, which, by a mechanical instantaneous motion, feel the good and the ill, receiving pleasure from one, and pain from the other. By these, without any reasoning, he is taught to choose what tends to his welfare, and to avoid what tends to his ruin. Thus, by his senses of taste and smell, or by the pleasure he receives from certain kinds of food, he is admonished which agree with his constitution; and by an opposite sense of pain he is informed which sort disagree, or are destructive of it; but is not by means of this instructed in the inward natures and constitutions of things. Some of these senses are armed with strong degrees of uneasiness or pain, in order to urge him to seek after objects as are suited to them. And these respect his more immediate and pressing wants; as the sense of hunger, thirst, cold, and the like; which, by their painful importunities, compel him to provide food, drink, raiment, and shelter. Those instincts by which we are thus prompted with some kind of commotion or violence to attract and pursue good, or to repel and avoid ill, we call appetites and passions. By our senses then we are informed of what is good or ill to the private system, or the individual; and by our private appetites and passions we are impelled to the one, and restrained from the other. In consequence of this machinery, and the great train of wants to which our nature subjects us, we are engaged in a continued series of occupations, which often require much application of thought, or great bodily labour, or both. The necessities of life, food, clothes, shelter, and the like, must be provided; conveniencies must be acquired to render life still more comfortable. To obtain these, arts, industry, manufactures, and trade, are necessary. And to secure the peaceable enjoyment of their fruits, civil government, policy, and laws, must be contrived, and the various business of public life carried on: thus, while man is concerned and busied in making provision or obtaining security for himself, he is by degrees engaged in connections with a family, friends, neighbours, a community, or a commonwealth. Hence arise new wants, new interests, new cares, and new employments. The passions of one man interfere with those of another. Interests are opposed. Competitions arise; contrary courses are taken. Disappointments happen, distinctions are made, and parties formed. This opens a vast scene of distraction and embarrassment, and introduces a mighty train of good and ill, both public and private. Yet amidst all this confusion and hurry, plans of action must be laid, consequences foreseen or guarded against, inconveniences provided for; and frequently particular resolutions must be taken,

and schemes executed, without reasoning or delay. Our Supreme Parent, watchful for the whole, has not left man to be informed, only by the cool notices of reason, of the good or ill, the happiness or misery, of his fellow-creatures.—He has made him sensible of their good and happiness, but especially of their ill and misery, by an immediate sympathy, or quick feeling, of pleasure or pain. The latter we call pity or compassion. For the former, though every one, who is not quite divested of humanity, feels it in some degree, we have got a name, unless we call it congratulation or joyful sympathy, or that good humour which arises on seeing others pleased or happy. Both these feelings have been called in general the public or common senses, *κοινή συναίσθησις*, by which we feel for others, and are interested in their concerns as really, though perhaps less sensibly, than in our own. When we see our fellow-creatures unhappy through the fault or injury of others, we feel resentment or indignation against the unjust causers of that misery. If we are conscious that it has happened through our fault or injurious conduct, we feel shame; and both these classes of senses and passions, regarding misery and wrong, are armed with such sharp sensations of pain, as not only prove a powerful guard and security to the species, or public system, against those ills it may, but serve also to lessen or remove those ills it does, suffer. Compassion draws us out of ourselves to bear a part of the misfortunes of others, powerfully solicits us in their favour, melts us at the sight of their distress, and makes us in some degree unhappy till they are relieved from it. It is peculiarly well adapted to the condition of human life, because it is much more and oftener in our power to do mischief than good, and to prevent or lessen misery than to communicate positive happiness; and therefore it is an admirable restraint upon the more selfish passions, or those violent impulses that carry us to the hurt of others. There are other particular instincts or passions by which we are interested in the concerns of others, even while we are most busy about our own, and which are strongly attractive of good, and repulsive of ill, to them. Of these a great variety might be noticed; such as natural affection, friendship, love, gratitude, desire of fame, love of society, of one's country, and others that might be named. Now as the private appetites and passions were found to be armed with strong sensations of desire and uneasiness, to prompt man the more effectually to sustain labours, and to encounter danger in pursuit of those goods that are necessary to the preservation and the welfare of the individual, and to avoid those ills which tend to his destruction; in like manner it was necessary, that this other class of desires and affections should be prompted with as quick sensations of pain, not only to counteract the strength of their antagonists, but to engage us in a virtuous activity for our relations, families, friends, neighbours, or country. Indeed our sense of right and wrong will admonish us that it is our duty, and reason and experience farther assure us that it is both our interest and best security, to promote the happiness of others; but that sense, that reason, and that experience, would frequently prove but weak and ineffectual prompters to such a conduct, especially in cases of danger and hard-ship, and amidst all the importunities of nature, and that constant hurry in which the private passions involve us, without the aid of those particular kind affections which mark out to us particular spheres of duty, and with an agreeable violence engage and fix us down to them. It is evident, therefore, that those two classes of affection, the private and public, are set one against the other, and designed to control and limit each other's influence, and thereby to produce a just balance in the whole. See Hutcheson's *Conduct of the Passions*, Treatise 1, Sect. 2. In general, the violent sensations of pain and uneasiness which accompany hunger, thirst, and the other private appetites, or too great fatigue of mind or of body, prevent the individual from running to great excesses in the exercise of the higher functions of the mind, as too intense thought in the search of truth, violent application to business of any kind, and different degrees of romantic heroism. On the other hand, the finer senses of perception, and those generous desires and affections which are connected with them, the love of action, of imitation, of truth, honour, public virtue, and the like, are wisely placed in the opposite scale, to prevent us from sinking into the dregs of the animal life, and debasing the dignity of man below the condition of brutes. So that, by the mutual re-action of those opposite powers, the bad effects are prevented that would naturally result from their acting singly

and apart; and the good effects are produced which each are severally formed to produce. The same wholesome opposition appears likewise in the particular counterworkings of the private and public affections one against the other. Thus compassion is adapted to counterpoise the love of ease, of pleasure, and of life, and to disarm or set bounds to resentment; and resentment of injury done to ourselves, or to our friends, prevents an effeminate compassion or consternation, and gives us a noble contempt of labour, pain, and death. Natural affection, friendship, love of one's country, may, zeal for religion, liberty, or any particular virtue, are frequently more than a match for the whole train of selfish passions. On the other hand, without that intimate over-ruling passion of self-love, and those private desires which are connected with it, the social and tender instincts of the human heart would degenerate into the wildest dotage, the most torturing anxiety, or downright frenzy. In like manner also the different passions of the same classes are checks one upon another. But this is not all the provision which God has made for the hurry and perplexity of the scene in which man is destined to act. For he has moreover implanted in man many particular perceptions or determinations to approve of certain qualities or actions, which, in effect, tend to the advantage of society, and are connected with private good, though he does not always see that tendency, or mind that connection. And these perceptions or determinations do without reasoning point out, and, antecedent to views of interest, prompt to a conduct beneficial to the public, and useful to the private system. Such is that sense of candour and veracity, that abhorrence of fraud and falsehood, that sense of fidelity, justice, gratitude, greatness of mind, fortitude, clemency, decorum; and that disapprobation of knavery, injustice, ingratitude, meanness of spirit, cowardice, cruelty, and indecorum, which are natural to the human mind. The former of those dispositions, and the actions flowing from them, are approved, and those of the latter kind disapproved by us, even abstracted from the view of their tendency or conduciveness to the happiness or misery of others or of ourselves. In one we discern a beauty, a superior excellency, a congruity to the dignity of man; in the other a deformity, a littleness, a debasement, of human nature. There are other principles also connected with the good of society, or the happiness and perfection of the individual, though that connection is not immediately apparent, which we behold with real complacency and approbation, though perhaps inferior in degree if not in kind, such as gravity, modesty, simplicity of deportment, temperance, prudent œconomy; and we feel some degree of contempt and dislike where they are wanting, or where the opposite qualities prevail. These and the like perceptions or feelings are either different modifications of the moral sense, or subordinate to it, and plainly serve the same important purpose, being expeditious monitors, in the several emergencies of a various and distracted life, of what is right, what is wrong, what is to be pursued, and what avoided; and, by the pleasant or painful consciousness which attends them, exerting their influence as powerful promoters to a suitable conduct.

THE PRINCIPAL DISTINCTIONS OF DUTY OR VIRTUE.

From what we noticed respecting the constitution and connections of man, it is evident, that there is one order or class of duties which man owes to himself: another to society: and a third to God.

I. The duties he owes to himself are founded chiefly on the defensive and private passions, which prompt him to pursue whatever tends to private good or happiness, and to avoid whatever tends to private ill or misery. Among the various goods which allure and solicit him, and the various ills which attack or threaten him, "to be intelligent and accurate in selecting the one, and rejecting the other, or in preferring the most excellent goods, and avoiding the most terrible ills, when there is a competition among either, and to be discreet in using the best means to attain the goods and avoid the ills, is what we call prudence." This, in our inward frame, corresponds to sagacity, or quickness of sense, in our outward, to proportion our defensive passions to our dangers, we call fortitude; which always implies "a just mixture of calm resentment or animosity, and well-governed caution. And this firmness of mind answers to the strength and muscles of the body. And "duty to adjust our private passions to our wants, or to the respective moment of the good we affect or pursue, we call temperance;"

which does therefore always imply, in this large sense of the word, "a just balance or command of the passions."

II. The second class of duties arises from the public or social affections, "the just harmony or proportion of which to the dangers and wants of others, and to the several relations we bear, commonly goes by the name of justice." This includes the whole of our duty to society, to our parents, and the general policy of nature; particularly gratitude, friendship, sincerity, natural affection, benevolence, and the other social virtues. This, being the noblest temper, and fairest complexion, of the soul, corresponds to the beauty and the proportion of the person. The virtues comprehended under the former class, especially prudence and fortitude, may likewise be transferred to this: and according to the various circumstances in which they are placed, and the more confined or more extensive sphere in which they operate, may be denominated private, œconomical, or civil prudence, fortitude, &c. These direct our conduct with regard to the wants and dangers of those less or greater circles with which they are connected.

III. The third class of duties respects the Deity, and arises from the public affections, and the several glorious relations which he sustains to us as our creator, benefactor, lawgiver, judge, &c. We consider this set of duties in the last place, because, though prior in dignity and excellency, they seem to be last in order of time, as thinking it the most simple and easy method to follow the gradual progress of nature, as it takes its rise from individuals, and spreads through the social system, and still ascends upwards, till at length it stretches to its almighty Parent and Head, and so terminates in those duties which are highest and best. The duties resulting from these relations are, reverence, gratitude, love, resignation, dependence, obedience, worship, praise: which, according to the model of our finite capacities, must maintain some sort of proportion to the grandeur and perfection of the object whom we venerate, love, and obey. "This proportion or harmony is expressed by the general name of piety or devotion," which is always stronger or weaker according to the greater or less apprehended excellency of its object. This sublime principle of virtue is the enlivening soul which animates the moral system, and that cement which binds and sustains the other duties which man owes to himself or to society. This then is the general temper and constitution of virtue, and these are the principal lines or divisions of duty. To those good dispositions which respect the several objects of our duty, and to all actions which flow from such dispositions, the mind gives its sanction or testimony. And this sanction or judgement concerning the moral quality, or the goodness of actions or dispositions, moralists call conscience. When it judges of an action that is to be performed, it is called an antecedent conscience; and when it passes sentence on an action which is performed, it is called a subsequent conscience. The tendency of an action to produce happiness, or its external conformity to a law, is termed its material goodness. But the good dispositions from which an action proceeds, or its conformity to law in every respect, constitutes its formal goodness. When the mind is ignorant or uncertain about the moment of an action or its tendency to private or public good; or when there are several circumstances in the case, some of which, being doubtful, render the mind dubious concerning the morality of the action; this is called a doubtful or scrupulous conscience; if it mistakes concerning these, it is called an erroneous conscience. If the error or ignorance is involuntary or invincible, the action proceeding from that error, or from that ignorance, is reckoned innocent, or not imputable. If the error or ignorance is supine or affected, *i. e.* the effect of negligence, or of affectation and wilful inadvertence, the conduct flowing from such error or such ignorance is criminal and imputable. Not to follow one's conscience, though erroneous and ill-informed, is criminal, as it is the guide of life; and to counteract it, shews a depraved and incorrigible spirit. Yet to follow an erroneous conscience is likewise criminal, if that error which misled the conscience was the effect of inattention, or of any criminal passion. If it be asked, "How an erroneous conscience shall be rectified, since it is supposed to be the only guide of life, and judge of morals?" we answer in the very same way that we would rectify reason if at any time it should judge wrong, as it often does, *viz.* by giving it proper and sufficient materials for judging right, *i. e.* by inquiring into the whole state of the case, the relations, connections, and several obligations, of the actor, the consequences and other circumstances

stances of the action, or the surplusage of private or public good which results, or is likely to result, from the action, or from the omission of it. If those circumstances are fairly and fully stated, the conscience will be just and impartial in its decision; for, by a necessary law of our nature, it approves and is well affected to the moral form; and if it seems to approve of vice or immorality, it is always under the notion or mask of some virtue. So that, strictly speaking, it is not conscience which errs; for its sentence is always conformable to the view of the case which lies before it; and is just, upon the supposition that the case is truly such as it is represented to it. All the fault is to be imputed to the agent, who neglects to be better informed, or who, through weakness or wickedness, hastens to pass sentence from an imperfect evidence.

OF MAN'S DUTY TO HIMSELF: OF THE NATURE OF GOOD, AND THE CHIEF GOOD.

Every creature, by the constitution of his nature, is determined to love himself; to pursue whatever tends to his preservation and happiness, and to avoid whatever tends to his hurt and misery. Being endued with sense and perception, he must necessarily receive pleasure from some objects, and pain from others. Those objects which give pleasure are called good; and those which give pain, evil. To the former he feels that attraction or motion we call desire, or love; to the latter, that impulse we call aversion, or hatred. To objects which suggest neither pleasure nor pain, and are apprehended of no use to procure the one or ward off the other, we feel neither desire nor aversion; and such objects are called indifferent. Those objects which do not of themselves produce pleasure or pain, but are the means of procuring either, we call useful or noxious. All the original and particular affections of our nature lead us out to, and ultimately rest in, the first kind of objects, viz. those which give immediate pleasure, and which we therefore call good, directly so. But, besides those sorts of objects which we call good, merely and solely as they give pleasure, or are means of procuring it, there is a higher and nobler species of good, towards which we feel that peculiar movement we call approbation or moral complacency; and which therefore we denominate moral good. Such are our affections, and the consequent actions, to them. The perception of this is, as has been already observed, quite distinct in kind from the perception of other species; and though it may be connected with pleasure or advantage by the benevolent constitution of nature, yet it constitutes a good independent of that pleasure and that advantage, and far superior not in degree only, but in dignity, to both. The other, viz. the natural good, consists in obtaining those pleasures which are adapted to the peculiar senses and passions susceptible of them, and is as various as are those senses and passions. This, viz. the moral good, lies in the right conduct of the several senses and passions, or their just proportion and accommodation to their respective objects and relations; and this is of a more simple and invariable kind. By our several senses we are capable of a great variety of pleasing sensations. These constitute distinct ends or objects ultimately pursuable for their own sake. To these ends, or ultimate objects, correspond peculiar appetites or affections, which prompt the mind to pursue them. When these ends are attained, there it rests, and looks no farther. Whatever therefore is pursuable, not on its own account, but as subservient or necessary to the attainment of something else that is intrinsically valuable for its own sake, be that value ever so great or ever so small, we call a mean, and not an end. So that ends and means constitute the materials or the very essence of our happiness. Consequently happiness, *i. e.* human happiness, cannot be one simple uniform thing in creatures constituted, as we are, with such various senses of pleasure, or such different capacities of enjoyment. Now the same principle, or law of our nature, which determines us to pursue any one end or species of good prompts us to pursue every other end or species of good of which we are susceptible, or to which our Maker has adapted an original propensity. But, amidst the great multiplicity of ends or goods which form the various ingredients of our happiness, we perceive an evident gradation of subordination suited to that gradation of senses, powers, and passions, which prevails in our mixed and various constitutions, and to that ascending series of connections which open upon us in the different stages of our progressive state. Thus the goods of the body, or the external senses, as health, strength, agility, hardi-

ness, patience of change, neatness, decency, &c. seem to hold the lowest rank in this gradation or scale of goods. These we have in common with the brutes: and though many men are brutish enough to pursue the goods of the body with a more than brutal fury, yet, when at any time they come in competition with goods of a higher order, the unanimous verdict of mankind, by giving the last the preference, condemns the first to the meanest place. Goods consisting in exterior social connections, as fame, fortune, power, civil authority, &c. seem to succeed next, and are chiefly valuable as the means of procuring natural or moral good, but principally the latter. Goods of the intellect are still superior, as taste, knowledge, memory, judgement, &c. including all intellectual virtues. The highest are moral goods of the mind, directly and ultimately regarding ourselves, as command of the appetites and passions, prudence, fortitude, benevolence, humility, love of virtue, love of God, resignation, &c. These are the great objects of our pursuit, and the principal ingredients of our happiness. As the Deity is the supreme and inexhausted source of good, on whom the happiness of the whole creation depends; as he is the highest object in nature, and the only object who is fully proportioned to the intellectual and moral powers of the mind, in whom they ultimately rest and find their most perfect exercise and completion; he is therefore termed the chief good of man, objectively considered. And virtue, or the proportioned and vigorous exercise of the several powers and affections on their respective objects, is, in the schools, termed the chief good, formally considered, or its formal idea, being the inward temper and native constitution of human happiness.

OF DUTIES TO SOCIETY.

FILIAL AND FRATERNAL DUTY. The second class of the moral obligation of man include all those which he owes to society. His parents are among the earliest objects of his attention: he becomes soonest acquainted with them, and seems to regard them with a fond affection, the early prognostics of his future piety and gratitude. Thus does nature dictate the first lines of filial duty, even before a just sense of the connection is formed. But when the child is grown up, and has attained to such a degree of understanding, as to comprehend the moral tie, and be sensible of the obligations he is under to his parents; when he looks back on their tender and disinterested affection, their incessant cares and labours in nursing, educating, and providing, for him, during that state in which he had neither prudence nor strength to care and provide for himself, he must be conscious that he owes to them these peculiar duties.

1. To reverence and honour them, as the instruments of nature in introducing him to life, and to that state of comfort and happiness which he enjoys; and therefore to esteem and imitate their good qualities, to alleviate and bear with, and spread, as much as possible, a decent veil over their faults and weaknesses.

2. To be highly grateful to them, for those favours which it can hardly ever be in his power fully to repay; to shew this gratitude by a strict attention to their wants, and a solicitous care to supply them; by a submissive deference to their authority and advice, especially by paying great regard to it in the choice of a wife, and of an occupation; by yielding to, rather than peevishly contending with, their humours, as remembering how oft they have been persecuted by his; and, in fine, by soothing their cares, lightening their sorrows, supporting the infirmities of age, and making the remainder of their life as comfortable and joyful as possible. As his brethren and sisters are the next with whom he forms a social and moral connection, to them he owes a fraternal regard; and with them he ought to enter into a strict league of friendship, mutual sympathy, advice, assistance, and a generous intercourse of kind offices, remembering their relation to common parents, and that brotherhood of nature which unites them into a closer community of interest and affection.

MARRIAGE. When man arrives at a certain age, he becomes sensible of a peculiar sympathy and tenderness towards the other sex; the charms of beauty engage his attention, and call forth new and softer dispositions than he has yet felt. The many amiable qualities exhibited by a fair outside, or by the mild allurements of female manners, or which the prejudiced spectator without much reasoning supposes those to include, with several other circumstances both natural and accidental, point his view and affection to a par-

a particular object, and of course contract that general rambling regard, which was lost and useless among the undistinguished crowd, into a peculiar and permanent attachment to one woman, which ordinarily terminates in the most important and delightful connection in life. Our Creator, ever wise and benevolent, by implanting a strong sympathy between the individuals of each sex, which urges them to form a particular moral connection, the spring of numberless domestic endearments, has measured out to each pair a particular sphere of action, proportioned to their views, and adapted to their respective capacities. Besides, by interesting them deeply in the concerns of their own little circle, he has connected them more closely with society, which is composed of particular families, and bound them down to their good behaviour in that particular community to which they belong. This moral connection is marriage, and this sphere of action is a family. Of the conjugal alliance the following are the natural laws:

1. Mutual fidelity to the marriage-bed. Disloyalty defeats the very end of marriage; dissolves the natural cement of the relation; weakens the moral tie, the chief strength of which lies in reciprocation of affection; and, by making the offspring uncertain, diminishes the care and attachment necessary to their education.

2. A union of counsels and endeavours to promote the common interest of the family, and to educate their common offspring. To observe these laws, it is necessary to cultivate, both before and during the married state, the strictest decency and chastity of manners, and a just sense of what becomes their respective characters.

3. The union must be inviolable, and for life. The nature of friendship, and particularly of this species of it, the education of their offspring, and the order of society and of successions, which would otherwise be extremely perplexed, all require it. To preserve this union, and render the matrimonial state harmonious and comfortable, a mutual esteem and tenderness, a mutual deference and forbearance, a communication of advice, and assistance and authority, are absolutely necessary. If each party keep within their proper department, there need be no disputes about power or superiority, and there will be none. They have no opposite, no separate interests, and therefore there can be no just ground for opposition of conduct. From this detail, and the present state of things, in which there is pretty near a parity of numbers of both sexes, it is evident that polygamy is an unnatural state; and though it should be granted to be more fruitful of children, which however it is not found to be, yet it is by no means so fit for rearing minds, which seems to be as much, if not more, the intention of the Creator than the propagation of bodies.

PARENTAL DUTY. The connection of parents with their children is a natural consequence of the matrimonial connection; and the duties which they owe them result as naturally from that connection. The feeble state of children, subject to so many wants and dangers, requires their incessant care and attention: their ignorant and uncultivated minds demand continual instruction and culture. Had human creatures come into the world with the full strength of men, and the weakness of reason and vehemence of passions which prevail in children, they would have been too strong or too stubborn to have submitted to the government and instruction of their parents. But as they were designed for a progression in knowledge and virtue, it was proper that the growth of their bodies should keep pace with that of their minds, lest the purposes of that progression should have been defeated. Among other admirable purposes which this gradual expansion of their outward as well as inward structure serves, this is one, that it affords ample scope to the exercise of many tender and generous affections, which fill up the domestic life with a beautiful variety of duties and enjoyments; and are of course a noble discipline for the heart, and a hardy kind of education for the more honourable and important duties of public life. The above-mentioned weak and ignorant state of children plainly invests their parents with such authority and power as is necessary to their support, protection, and education; but that authority and power can be construed to extend no farther than is necessary to answer those ends, and to last no longer than that weakness and ignorance continue. Whatever power or authority then it may be necessary or lawful for parents to exercise during the non-age of their children, to assume or usurp the same when they have attained the maturity or full exercise of their strength and reason would be tyrannical and un-

just. Hence it is evident, that parents have no right to punish the persons of their children more severely than the nature of their wardship requires, much less to invade their lives, to encroach upon their liberty, or transfer them as their property to any master whatsoever. The first class of duties which parents owe their children respect their natural life; and these comprehend protection, nurture, provision, introducing them into the world in a manner suitable to their rank and fortune, and the like. The second order of duties regards the intellectual and moral life of their children, or their education in such arts and accomplishments as are necessary to qualify them for performing the duties they owe to themselves and to others, and to direct them in the path of virtue. As this was found to be the principal design of the matrimonial alliance, so the fulfilling that design is the most important and dignified of all the parental duties. In order therefore to fit the child for acting his part wisely and worthily as a man, as a citizen, and a creature of God, both parents ought to combine their joint wisdom, authority, and power, and each apart to employ those talents which are the peculiar excellency and ornament of their respective sex. See **EDUCATION**.

OF HERILE AND SERVILE DUTIES. In the natural course of human affairs, it must necessarily happen that some of mankind will live in plenty and opulence, and others be reduced to a state of indigence and poverty. The former need the labours of the latter, and the latter the provision and support of the former. This mutual necessity is the foundation of that connection, whether we call it moral or civil, which subsists between masters and servants. He who feeds another has a right to some equivalent, the labour of him whom he maintains, and the fruits of it. And he who labours for another has a right to expect that he should support him. But as the labours of a man of ordinary strength are certainly of greater value than mere food and clothing; because they would actually produce more, even the maintenance of a family, were the labourer to employ them in his own behalf; therefore he has an undoubted right to rate and dispose of his service for certain wages above mere maintenance; and if he has incautiously disposed of it for the latter only, yet the contract being of the onerous kind, he may equitably claim a supply of that deficiency. If the service be specified, the servant is bound to that only; if not, then he is to be construed as bound only to such services as are consistent with the laws of justice and humanity. By the voluntary servitude to which he subjects himself, he forfeits no rights but such as are necessarily included in that servitude, and is obnoxious to no punishment but such as a voluntary failure in the service may be supposed reasonably to require. The offspring of such servants have a right to that liberty which neither they nor their parents have forfeited. As to those who, because of some heinous offence, as for some notorious damage, for which they cannot otherwise compensate, are condemned to perpetual service, they do not, on that account, forfeit all the rights of men; but those, the loss of which is necessary to secure society against the like offences for the future, or to repair the damage they have done. With regard to captives taken in war, it is barbarous and inhuman to make perpetual slaves of them, unless some peculiar and aggravated circumstances of guilt have attended their hostility. The bulk of the subjects of any government engaged in war may be fairly esteemed innocent enemies; and therefore they have a right to that clemency which is consistent with the common safety of mankind, and the particular security to that society, against which they are engaged. Though ordinary captives have a grant of their lives, yet to pay their liberty as an equivalent is much too high a price. There are other ways of acknowledging or returning the favour, than by surrendering what is far dearer than life itself. (Hutcheson's Mor. Inst. Lib. 3.) To those who, under the pretext of the necessities of commerce, drive the unnatural trade of bargaining for human flesh, and consigning their innocent but unfortunate fellow-creatures to eternal servitude and misery, we may address the words of a fine writer; "Let avarice defend it as it will, there is an honest reluctance in humanity against buying and selling, and regarding those of our own species as our wealth and possessions." See **SLAVERY**.

OF PRIVATE SOCIAL DUTIES.

As man passes beyond the little circle of a family, he forms connections with relations, friends, neighbours, and others; from whence

whence results a new train of duties of the more private social kind, as "friendship, chastity, courtesy, good-neighbourhood, charity, forgiveness, hospitality." Man is admirably formed for particular social attachments and duties. There is a peculiar and strong propensity in his nature to be affected with the sentiments and dispositions of others. Men, like certain musical instruments, are set to each other so that the vibrations or notes excited in one raise correspondent notes and vibrations in the others. The impulses of pleasure or pain, joy or sorrow, made on one mind, are by an instantaneous sympathy communicated in some degree to all; especially when hearts are (as a humane writer expresses it) in unison of kindness; the joy that vibrates in one communicates to the other also. We may add, that though joy thus imparted swells the harmony, yet grief vibrated to the heart of a friend, and rebounding from thence in sympathetic notes, melts, as it were, and almost dies away. All the passions, but especially those of the social kind, are contagious; and when the passions of one man mingle with those of another, they increase and multiply prodigiously. There is a most moving eloquence in the human countenance, air, voice, and gesture, wonderfully expressive of the most latent feelings and passions of the soul, which darts them like a subtle flame into the hearts of others, and raises correspondent feelings there: friendship, love, good-humour, joy, spread through every feature, and particularly shoot from the eyes their solter and fiercer fires with an irresistible energy. In like manner the opposite passions of hatred, enmity, ill-humour, melancholy, diffuse a sullen and saddening air over the face, and flashing from eye to eye, kindle a train of similar passions. By these, and other admirable pieces of machinery, men are formed for society and the delightful interchange of friendly sentiments and duties, to increase the happiness of others by participation, and their own by rebound; and to diminish, by dividing, the common stock of their misery. The first emanations of the social principle beyond the bounds of a family lead us to form a nearer conjunction of friendship or good-will with those who are any wise connected with us by blood or domestic alliance. But frequently the view of distinguishing moral qualities in some of our acquaintance may give birth to that more noble connection we call friendship, which is far superior to the alliances of consanguinity. For these are of a superficial, and often of a transitory nature, of which, as they hold more of instinct than of reason, we cannot give such a rational account. But friendship derives all its strength and beauty, and the only existence which is durable, from the qualities of the heart, or from virtuous and lovely dispositions. Or, should these be wanting, they, or some resemblance of them, are supposed present. Therefore friendship may be described to be, "The union of two souls by means of virtue, the common object and cement of their mutual affection." The duties of friendship are a mutual esteem of each other, unbribed by interest, and independent of it; a generous confidence as far distant from suspicion as from reserve; an inviolable harmony of sentiments and dispositions, of designs and interests; a fidelity unshaken by the changes of fortune; a constancy unalterable by distance of time or place; a resignation of one's personal interest to those of one's friend; and a reciprocal, unenvious, unreserved exchange of kind offices. But, amidst all the exertions of this moral connection, humane and generous as it is, we must remember that it operates within a narrow sphere, and its immediate operations respect only the individual; and therefore its particular impulses must still be subordinate to a more public interest, or be directed and controlled by the more extensive connections of our nature. Courtesy, good-neighbourhood, affability, and the like duties, which are founded on our private social connections, are no less necessary and obligatory to creatures united in society, and supporting and supported by each other in a chain of mutual want and dependence. They do not consist in a smooth address, an artificial or obsequious air, fawning flatteries, or a polite servility of manner; but in a just and modest sense of our own dignity and that of others, and of the respect due to mankind, especially to those who hold the higher links of the social chain; in a discreet and manly accommodation of ourselves to the foibles and humours of others: in a strict observance of the rules of decorum and civility; but, above all, in a frank obliging carriage, and generous interchange of good deeds rather than words. Such a conduct is of great use and advantage, as it is an excellent security against injury, and the best claim and re-

commendation to the esteem, civility, and universal respect, of mankind. This inferior order of virtues unite the particular members of society more closely, and forms the less pillars of the civil fabric; which, in many instances, supply the unavoidable defects of laws, and maintain the harmony and decorum of social intercourse, where the more important and essential lines of virtue are wanting. Charity and forgiveness are truly amiable and useful duties of the social kind. There is a two-fold distinction of rights commonly taken notice of by moral writers, viz. perfect and imperfect. To fulfil the former, is necessary to the being and support of society; to fulfil the latter, is a duty equally sacred and obligatory, and tends to the improvement and prosperity of society; but as the violation of them is not equally prejudicial to the public good, the fulfilling of them is not subjected to the cognizance of law, but left to the candour, humanity, and gratitude of individuals. And thus ample scope is given to exercise all the generosity, and display the genuine merit and lustre, of virtue. Thus the wants and misfortunes of others call for our charitable assistance and seasonable supplies. And the good man, uncontrained by law, and uncontrolled by human authority, will cheerfully acknowledge, and generously satisfy, this mournful and moving claim; a claim supported by the sanction of heaven, of whose bounties he is honoured to be the grateful trustee. If his own perfect rights are invaded by the injustice of others, he will not therefore reject their imperfect right to pity and forgiveness, unless his grant of these should be inconsistent with the more extensive rights of society, or the public good. In that case he will have recourse to public justice and the laws, and even then he will prosecute the injury with no unnecessary severity, but rather with mildness and humanity. When the injury is merely personal, and of such a nature as to admit of alleviations, and the forgiveness of which would be attended with no worse consequences, especially of a public kind, the good man will generously forgive his offending brother. And it is his duty to do so, and not to take private revenge, or retaliate evil for evil. The most enlarged and humane connection of the private kind seems to be the hospitable alliance, from which flow the amiable and disinterested duties we owe to strangers. If the exercise of passions of the most private and instinctive kind is beheld with moral approbation and delight, how lovely and venerable must those appear which result from a calm philanthropy, are founded in the common rights and connections of society, and embrace men, not of a particular sect, party, or nation, but all in general without distinction, and without any of the little partialities of self-love.

OF SOCIAL DUTIES OF THE COMMERCIAL KIND.

The next order of connections are those which arise from the wants and weakness of mankind, and from the various circumstances in which their different situations place them. These we may call commercial connections, and the duties which result from them commercial duties, as justice, fair-dealing, sincerity, fidelity to compacts, and the like. Though the works of the Almighty are all perfect, yet there is a manifest distinction among them. All such as lie beyond the reach of human skill and power, are completely finished. These man may design after and imitate, but he can never rival them, nor add to their beauty or perfection. Such are the forms and structure of vegetables, animals, and many of their productions, as the honey-comb, the spider's web, and the like. There are others purposely left unfinished, as it were, in order to exercise the ingenuity and power of man. A rich profusion of materials of every kind is produced for his conveniency and use; but many of them are rude and unpolished, or not to be come at without art and labour. These therefore he must apply, to adapt them to his use, and to enjoy them in perfection. Thus an infinite variety of herbs, grain, fossils, minerals, wood, water, earth, air, and a thou and other crude materials, is naturally produced to supply his numerous wants. But he must sow, plant, dig, refine, polish, build, and manufacture, these various productions to obtain even the necessaries, and much more the conveniences and elegancies, of life. These then are the price of his labour and industry, without which he will enjoy nothing. - But as the wants of mankind are many, and the single strength of individuals small, they could hardly find the necessities, much less the conveniences, of life, without uniting their ingenuity and strength in acquiring these, and without a mutual inter-

tercourse of good offices. Some men are better formed for some kinds of ingenuity and labour, and others for other kinds; and different soils and climates are enriched with different productions; so that men, by exchanging the produce of their respective labours, and supplying the wants of one country with the superfluities of another, do in effect diminish the labours of each, and increase the abundance of all. This is the foundation of all commerce, or exchange of commodities and goods, one with another; to facilitate which, men have contrived different species of coin, or money, as a common standard, by which to estimate the comparative values of their respective goods. But to render commerce sure and effectual, justice, fair-dealing, sincerity, and fidelity to compacts, are absolutely necessary. Justice, or fair-dealing, or, in other words, a disposition to treat others as we would be treated by them, is a virtue of the first importance, and inseparable from the virtuous character. It is the cement of society, or that pervading spirit which connects its members, inspires its various relations, and maintains the order and subordination of each part to the whole. Without it, society would become a den of thieves and banditti, hating and hated, devouring and devoured, by one another. And a little reflection will teach us, that justice is a virtue which exactly corresponds with the will of God, and therefore, that a strict adherence to the principle of justice is universally, and in all possible circumstances, a duty from which we cannot deviate without offending our Creator, and ultimately bringing misery upon ourselves. Sincerity, or veracity, in our words and actions, is another duty of great importance to society, being one of the great bands of mutual intercourse, and the foundation of mutual trust. Without it, society would be the dominion of mistrust, jealousy, and fraud, and conversation a traffic of lies and dissimulation. It includes in it a conformity of our words with our sentiments, a correspondence between our actions and dispositions, a strict regard to truth, and an irreconcilable abhorrence of falsehood. Fidelity to promises, compacts, and engagements, is likewise a duty of such importance to the security of commerce and interchange of benevolence among mankind, that society would soon grow intolerable without the strict observance of it. A promise is a voluntary declaration by words, or by an action equally significant, of our resolution to do something in behalf of another, or for his service. When it is made, the person who makes it is by all supposed under an obligation to perform it. And he to whom it is made may demand the performance as his right. That perception of obligation is a simple idea, and is on the same footing as our other moral perceptions, which may be described by instances, but cannot be defined. It is, however, proper to remark, that in this, as in all other instances, our chief good is combined with our duty. "Men act from expectation. Expectation is in most cases determined by the assurances and engagements which we receive from others. If no dependence could be placed upon these assurances, it would be impossible to know what judgement to form of many future events, or how to regulate our conduct with regard to them. Confidence, therefore, in promises, is essential to the intercourse of human life, because without it the greatest part of our conduct would proceed upon chance. But there could be no confidence in promises, if men were not obliged to perform them." Fair-dealing and fidelity to compacts require that we take no advantage of the ignorance, passion, or incapacity, of others, from whatever cause that incapacity arises;—that we be explicit and candid in making bargains, just and faithful in fulfilling our part of them. And if the other party violates his engagements, redress is to be sought from the laws, or from those who are entrusted with the execution of them. In fine, the commercial virtues and duties require that we not only do not invade, but maintain, the rights of others; that we be fair and impartial in transferring, bartering, or exchanging, property, whether in goods or service; and be inviolably faithful to our word and our engagements, where the matter of them is not criminal, and where they are not extorted by force.

SOCIAL DUTIES OF THE POLITICAL KIND.

The social principle in man is of such an expansive nature, that it cannot be confined within the circuit of a family, of friends, or a neighbourhood; it spreads into wider systems, and draws men into larger confederacies, communities, and commonwealths. It is in these only that the superior powers of our nature attain the highest improvement and perfection of which they are capable.

These principles hardly find objects in the solitary state of nature. In solitude all are employed in the same way, in providing for the animal life. But in society, the mutual aids which men give and receive shorten the labours of each, and the combined strength and reason of individuals give security and protection to the whole body. There is both a variety and subordination of genius among mankind. Some are formed to lead and direct others, to contrive plans of happiness for individuals, and of government for communities; to take part in a public interest, invent laws and arts, and superintend their execution: and, in short, to refine and civilize human life. Others, who have not such good heads, may have honest hearts, a truly public spirit, love of liberty, hatred of corruption and tyranny, a generous submission to laws, order, and public institutions, and an extensive philanthropy. And others, who have none of those capacities either of heart or head, may be well formed for manual exercises and bodily labour. The former of these principles has no scope in solitude, where a man's thoughts and concerns do all either centre in himself or extend no farther than a family; into which little circle all the duty and virtue of the solitary mortal is crowded. But society finds proper objects and exercises for every genius, and the noblest objects and exercises for the noblest geniuses, and for the highest principles in the human constitution; particularly for that warmest and most divine passion which God hath kindled in our bosoms, the inclination of doing good, and honouring our nature; which may find here both employment and the most exquisite satisfaction. In society, a man has not only more leisure, but better opportunities, of applying his talents with much greater perfection and success, especially as he is furnished with the joint advice and assistance of his fellow-creatures, who are more closely united one with the other, and sustain a common relation to the same moral system or community. This then is an object proportioned to his most enlarged social affections; and in serving it he finds scope for the exercise and refinement of his highest intellectual and moral powers. Therefore society, or a state of civil government, rests on these two principal pillars, "That in it we find security against those evils which are unavoidable in solitude—and obtain those goods, some of which cannot be obtained at all, and others not so well, in that state where men depend solely on their individual sagacity and industry." From this short detail it appears, that man is a social creature, and formed for society; and the duties suited to the social state, and resulting from those principles and destinations, or in other words, from our social passions and social connections, or relation to a public system, are, love of our country, resignation, and obedience to the laws, public spirit, love of liberty, willingness to suffer for the public good, and the like.

OF DUTY TO GOD.

Of all the relations which the human mind sustains, that which subsists between the Creator and his creatures, the supreme law-giver and his subjects, is the highest and the best. This relation arises from the nature of a creature in general, and the constitution of the human mind in particular; the noblest powers and affections which point to an universal mind, and would be imperfect and abortive without such a direction. How lame then must that system of morals be, which leaves a Deity out of the question! How disconsolate, and how destitute of its firmest support! It does not appear, from any true history or experience of the mind's progress, that any man, by any formal deduction of his discursive power, ever reasoned himself into the belief of a God. Whether such a belief is derived from father to son, and from one man to another, in the way of tradition, or is suggested to us in consequence of an immutable law of our nature, on beholding the august aspect and beautiful order of the universe, we will not determine. What seems most agreeable to experience is, that a sense of its beauty and grandeur, and the admirable fitness of one thing to another in its vast apparatus, leads the mind necessarily and unavoidably to a perception of a design, or of a designing cause, the origin of all, by a progress as simple and natural as that by which a beautiful picture or a fine building suggests to us the idea of an excellent artist. For it seems to hold universally true, that wherever we discern a tendency or co-operation of things towards a certain end, or producing a common effect, there, by a necessary law of association, we apprehend design, a designing energy or cause. No matter whether the objects are natural or artificial, still that suggestion is unavoidable, and the connection between

the effect and its adequate cause obtrudes itself on the mind, and it requires no nice search or elaborate deduction of reason to trace or prove that connection. We are particularly satisfied of its truth in the subject before us by a kind of direct intuition; attending to the maxim of the schools, "That there cannot be an infinite series of causes and effects producing and produced by one another." That maxim is familiar only to metaphysicians; but all men of sound understanding are led to believe the existence of a God. We are conscious of our existence, of thought, sentiment, and passion, and sensible withal that these came not of ourselves; therefore we immediately recognise a parent mind, an original intelligence, from whom we borrowed those little portions of thought and activity. And while we not only feel kind affections in ourselves, and discover them in others, but likewise behold round us such a number and variety of creatures, endued with natures nicely adjusted to their several stations and economies, supporting and supported by each other, and all sustained by a common order of things, and sharing different degrees of happiness according to their respective capacities, we are naturally and necessarily led up to the Father of such a numerous offspring, the fountain of such wide-spread happiness. As we conceive this Being before all, above all, and greater than all, we naturally, and without reasoning, ascribe to him every kind of perfection, wisdom, power, and goodness, without bounds, existing through all time, and pervading all space. We apply to him those glorious epithets of our Creator, Preserver, Benefactor, the supreme Lord and Lawgiver of the whole society of rational and intelligent creatures. Not only the imperfections and wants of our being and condition, but some of the noblest instincts and affections of our minds, connect us with this great and universal Being. The mind, in its progress from object to object, from one character and prospect of beauty to another, finds some blemish or deficiency in each, and soon exhausts or grows weary and dissatisfied with its subject; it sees no character of excellency among men equal to that pitch of esteem which it is capable of exerting; no object within the compass of human things adequate to the strength of its affection: nor can it stay any where in this self-expansive progress, or find repose after its highest flights, till it arrives at a Being of unbounded greatness and worth, on whom it may employ its sublimest powers without exhausting the subject, and give scope to the utmost force and fulness of its love without satiety or disgust. So that the nature of this being corresponds to the nature of man; nor can his intelligent and moral powers obtain their entire end, but on the supposition of such a Being, and without a real sympathy and communication with him. The native propensity of the mind to reverence whatever is great and wonderful, finds a proper object of homage in him who spreads out the heavens and the earth, and who sustains and governs the whole. The admiration of beauty, the love of order, and the complacency we feel in goodness, must rise to the highest pitch, and attain the full vigour and joy of their operations, when they unite in him who is the sum and source of all perfection. It is evident from the slightest survey of morals, that how punctual soever one may be in performing the duties which result from our relations to mankind, yet to be deficient in performing those which arise from our relation to the Almighty, must argue a strange perversion of reason, or depravity of heart. If imperfect degrees of worth attract our veneration, and if the want of it would imply an insensibility, or, which is worse, an aversion to merit, what lameness of affection or immorality of character must it be to be unaffected with, and much more to be ill affected to, a Being of superlative worth! To love society, or particular members of it, and yet to have no sense of our connection with its Head, no affection to our common Parent and Benefactor; to be concerned about the approbation or censure of our fellow-creatures, and yet to feel nothing of this kind towards him who sees and weighs our actions with unerring wisdom and justice, and can fully reward or punish them, betrays equal madness and partiality of mind. It is plain, therefore, beyond all doubt, that some regards are due to the great Father of all, in whom every lovely and adorable quality combines to inspire veneration and homage. As our affections depend on our opinions of their objects, and generally keep pace with them, it must be of the highest importance, and seems to be among the first duties we owe to the Author of our being, "to form the best possible conceptions of his character and administration." For such conceptions tho-

roughly imbibed, will render our religion rational, and our dispositions refined. If our opinions are diminutive and distorted, our religion will be superstitious, and our temper abject. Thus, if we ascribe to the Deity that false majesty which consists in the unbenignant and sullen exercise of mere will or power, or suppose him to delight in the prostrations of servile fear, or as servile praise, he will be worshipped with mean adulation and a profusion of compliments. Farther, if he be looked upon as a stern and implacable Being, delighting in vengeance, he will be adored with pompous offerings, sacrifices, or whatever else may be thought proper to soothe and mollify him. But if we believe perfect goodness to be the character of the supreme Being, and that he loves those most who resemble him most, the worship paid him will be rational and sublime, and his worshippers will seek to please him by imitating that goodness which they adore. Wherever right conceptions of the Deity and his providence prevail, when he is considered as the inexhaustible source of light, and love, and joy, as acting in the joint character of a Father and Governor, imparting an endless variety of capacities to his creatures, and supplying them with every thing necessary to their full completion and happiness; what veneration and gratitude must such conceptions, thoroughly believed, excite in the mind? How natural and delightful must it be to one whose heart is open to the perception of truth, and of every thing fair, great, and wonderful in nature, to contemplate and adore him who is the first fair, the first great, and first wonderful; in whom wisdom, power, and goodness, dwell vitally, essentially, originally, and act in perfect concert? What grandeur is here to fill the most enlarged capacity, what beauty to engage the most ardent love, what a mass of wonder in such exuberance of perfection to astonish and delight the human mind through an endless duration! If the Deity is considered as our supreme Guardian and Benefactor, as the Father of Mercies, who loves his creatures with infinite tenderness; what resignation, what dependence, what generous confidence, what hope in God, and his all-wise providence, must arise in the soul that is possessed of such amiable views of him? All those exercises of piety, and above all a superlative esteem and love, are directed to God as to their natural, their ultimate, and indeed their only adequate object; and though the immense obligations we have received from him may excite in us more lively feelings of divine goodness than a general and abstracted contemplation of it, yet the affections of gratitude and love are of themselves of the generous disinterested kind, not the result of self-interest, or views of reward. A perfect character, in which we always suppose infinite goodness, guided by unerring wisdom, and supported by almighty power, is the proper object of perfect love; which, as such, we are forcibly drawn to pursue and to aspire after. In the contemplation of the divine nature and attributes, we find at last what the ancient philosophers sought in vain; the supreme and sovereign good; from which all other goods arise, and in which they are all contained. The Deity therefore challenges our supreme and sovereign love, a sentiment which, whosoever indulges, must be confirmed in the love of virtue, in a desire to imitate its all-perfect pattern, and in a cheerful security that all his great concerns, those of his friends and of the universe, shall be absolutely safe under the conduct of unerring wisdom and unbounded goodness. It is in his care and providence alone that the good man, who is anxious for the happiness of all, finds perfect serenity; a serenity neither ruffled by partial ill, nor soured by private disappointment. We must farther observe, that all those affections which we supposed to regard the Deity as their immediate and primary object, are vital energies of the soul, and consequently exert themselves into act, and, like all other energies, gain strength or greater activity by that exertion. It is therefore our duty as well as highest interest, often at stated times, and by decent and solemn acts, to contemplate and adore the great Original of our existence, the Parent of all beauty and of all good; to express our veneration and love by an awful and devout recognition of his perfections; and to evidence our gratitude by celebrating his goodness, and thankfully acknowledging all his benefits. It is likewise our duty, by proper exercises of sorrow and humiliation, to confess our ingratitude and folly; to signify our dependence on God, and our confidence in his goodness, by imploring his blessing and gracious concurrence in assisting the weakness, and curing the corruptions, of our nature; and finally to testify our sense of his authority, and our faith in his government,

government, by devoting ourselves to do his will, and resigning ourselves to his disposal. External worship is founded on the same principles as internal, and of as strict moral obligation. It is either private or public. Devotion that is inward, or purely intellectual, is too spiritual and abstracted an operation for the bulk of mankind. The operations of their minds, such especially as are employed on the most sublime, immaterial objects, must be assisted by their outward organs, or by some help from the imagination; otherwise they will soon be dissipated by sensible impressions, or grow tiresome if too long continued. Ideas are such fleeting things, that they must be fixed; and so subtle, that they must be expressed and delineated, as it were, by sensible marks and images; otherwise we cannot attend to them, nor be much affected by them: Therefore verbal adoration, prayer, praise, thanksgiving, and confession, are admirable aids to inward devotion, fix our attention, compose and enliven our thoughts, impress us more deeply with a sense of the awful presence in which we are, and by a natural and mechanical sort of influence, tend to heighten those devout feelings and affections which we ought to entertain, and after this manner reduce into formal and explicit act. This holds true in a higher degree in the case of public worship, where the presence of our fellow-creatures, and the powerful communication of the social affections, conspire to kindle and spread the devout flame with greater warmth and energy. To conclude: as God is the parent and head of the social system, as he has formed us for a social state, as by the one we find the best security against the ills of life, and in the other enjoy its greatest comforts, and as, by means of both, our nature attains its highest improvement and perfection; and as there are public blessings and crimes in which we all share in some degree, and public wants and dangers to which all are exposed—it is therefore evident, that the various and solemn offices of public religion are duties of indispensable moral obligation, among the best cements of society, the firmest prop of government, and the fairest ornament of both.

OF PRACTICAL ETHICS, OR THE CULTURE OF THE MIND.

No kind of objects make so powerful an impression on us as those which are immediately impressed on our senses, or strongly painted on our imaginations. Whatever is purely intellectual, as abstracted or scientific truths, the subtle relations and differences of things, has a fainter sort of existence in the mind; and though it may exercise and whet the memory, the judgement, or the reasoning power, gives hardly any impulse at all to the active powers, the passions, which are the mainsprings of motion. On the other hand, were the mind entirely under the direction of sense, and impressible only by such objects as are present, and strike some of the outward organs, we should then be precisely in the state of the brute creation, and be governed solely by instinct or appetite, and have no power to controul whatever impressions are made upon us: the Author of our nature has therefore endued us with a middle faculty, wonderfully adapted to our mixed state, which holds partly of sense and partly of reason, being strongly allied to the former, and the common receptacle in which all the notices that come from that quarter are treasured up; and yet greatly subservient and ministerial to the latter, by giving a body, a coherence, and beauty, to its conceptions. This middle faculty is called the imagination, one of the most busy and fruitful powers of the mind. Into this common storehouse are likewise carried all those moral forms which are derived from our moral faculties of perception; and there they often undergo new changes and appearances, by being mixed and wrought up with the ideas and forms of sensible or natural things. By this coalition of imagery, natural beauty is dignified and heightened by moral qualities and perfections, and moral qualities are at once exhibited and set off by natural beauty. The sensible beauty, or good, is refined from its dross by partaking of the moral; and the moral receives a stamp, a visible character and currency, from the sensible. As we are first of all accustomed to sensible impressions and sensible enjoyments, we contract early a sensual relish or love of pleasure, in the lower sense of the word. In order, however, to justify this relish, the mind as it becomes open to higher perceptions of beauty and good, borrows from thence a noble set of images, as fine taste, generosity, social affections, friendship, good fellowship, and the like; and, by dressing out the old pursuits with these new ornaments, gives them an additional dignity and lustre. By these ways the

desire of a good table, love of finery, intrigue, and pleasure, are vastly increased beyond their natural pitch, having an impulse combined of the force of the natural appetites, and of the super-added strength of those passions which tend to the moral species. When the mind becomes more sensible to those objects or appearances in which it perceives beauty, uniformity, grandeur, and harmony, as fine cloaths, elegant furniture, plate, pictures, gardens, houses, equipage, the beauty of animals, and particularly the attractions of the sex; to these objects the mind is led by nature, or custom, or taught by the opinion and example of others, to annex certain ideas of moral character, dignity, decorum, honour, liberality, tenderness, and active or social enjoyment. The consequence of this association is, that the objects to which these are annexed must rise in their value, and be pursued with proportionable ardour. The enjoyment of them is often attended with pleasure; and the mere possession of them, where that is wanting, frequently draws respect from one's fellow-creatures. This respect is, by many, thought equivalent to the pleasure of enjoyment. Hence it happens that the idea of happiness is connected with the mere possession, which is therefore eagerly sought after, without any regard to the generous use or honourable enjoyment. Thus the passion, resting on the means, not the end, *i. e.* losing sight of its natural object, becomes wild and extravagant. In fine, any object, or external denomination, a staff, a garter, a cup, a crown, a title, may become a moral badge or emblem of merit, magnificence, or honour, according as these have been found or thought, by the possessors or admirers of them, to accompany them; yet, by the deception formerly mentioned, the merit or the conduct which entitled, or should entitle, to those marks of distinction, shall be forgot or neglected, and the badges themselves be passionately affected or pursued, as including every excellency. If these are attained by any means, all the concomitants which nature, custom, or accidents, have joined to them, will be supposed to follow of course. Thus, moral ends, with which the unhappy admirer is apt to colour over his passion and views, will, in his opinion, justify the most immoral means, as prostitution, adulation, fraud, treachery, and every species of knavery, whether more open or more disguised. When men are once engaged in active life, and find that wealth and power, generally called interest, are the great avenues to every kind of enjoyment, they are apt to throw in many engaging moral forms to the object of their pursuit, to justify their passion, and varnish over the measures they take to gratify it, as independency on the vices or passions of others, provision and security to themselves and friends, prudent œconomy, or well placed charity, social communication, superiority to their enemies, who are all villains, honourable service, and many other ingredients of merit. To attain such capacities of usefulness or enjoyment, what arts, nay what meannesses, can be thought blameable by those cool pursuers of interest?—Nor have they whom the gay world is pleased to indulge with the title of men of pleasure, their imaginations less pregnant with moral images, with which they never fail to ennoble, or, if they cannot do that, to palliate their gross pursuits. Thus admiration of wit, of sentiments and merit, friendship, love, generous sympathy, mutual confidence, giving and receiving pleasure, are the ordinary ingredients with which they season their gallantry and pleasurable entertainments; and by which they impose on themselves, and endeavour to impose on others that their amours are the joint issue of good sense and virtue. These associations, variously combined and proportioned by the imagination, form the chief private passions, which govern the lives of the generality, as the love of action, of pleasure, power, wealth, and fame; they influence the defensive, and affect the public passions, and raise joy or sorrow as they are gratified or disappointed. So that in effect these associations of good and evil, beauty and deformity, and the passions they raise, are the main hinges of life and manners, and the great sources of happiness or misery. It is evident, therefore, that the whole of moral culture must depend on giving a right direction to the leading passions, and duly proportioning them to the value of the objects or goods pursued, under what name soever they may appear. To give them this right direction and due proportion, it appears, from the foregoing detail, that those associations of ideas, upon which the passions depend, must be duly regulated: that is to say, as an exorbitant passion for wealth, pleasure, or power, flows from an asso-

ciation or opinion that more beauty and good, whether natural or moral, enters into the enjoyment or possession of them, than really belongs to either; therefore in restoring those passions to their just proportion, we must begin with correcting the opinion, or breaking the false association, or, in other words, we must decompound the complex phantom of happiness or good, which we fondly admire; disunite those ideas that have no natural alliance; and separate the original idea of wealth, power, or pleasure, from the foreign mixtures incorporated with it, which enhance its value, or give it its chief power to enchant and seduce the mind. For instance, let it be considered how poor and inconsiderable a thing wealth is, if it be disjoined from real use, or from ideas of capacity in the possessor to do good, from independency, generosity, provision for a family or friends, and social communication with others. By this standard let its true value be fixed; let its misapplication, or unbenevolent enjoyment, be accounted sordid and infamous; and nothing worthy or estimable be ascribed to the mere possession of it, which is not borrowed from its generous use. If that complex form of good which is called pleasure engage us, let it be analysed into its constituent principles, or those allurements it draws from the heart and imagination, in order to heighten the low part of the indulgence; let the separate and comparative moment of each be distinctly ascertained and deduced from that gross part, and this remainder of the accumulated enjoyment will dwindle down into a poor, insipid, transitory thing. In proportion as the opinion of the good pursued abates, the admiration must decay, and the passions lose strength. One effectual way to lower the opinion, and consequently to weaken the habit founded upon it, is to practise less pieces of self-denial, or to abstain, to a certain pitch, from the pursuit or enjoyment of the favourite object; and, that this may be the more easily accomplished, one must avoid those occasions, that company, those places, and other circumstances, that enlamed one and endeared the other. And, as a counter-process, let higher or even different enjoyments be brought in view, other passions played upon the former, different places frequented, other exercises tried, company kept with persons of a different or more correct way of thinking, both in natural and moral subjects. As much depends on our setting out well in life, let the youthful fancy, which is apt to be very florid and luxuriant, be early accustomed by instruction, example, and significant moral exercises, nay, by looks, gestures, and every other testimony of just approbation or blame, to annex ideas of merit, honour, and happiness, not to birth, dress, rank, beauty, fortune, power, popularity, and the like outward things, but to moral and truly virtuous qualities, and to those enjoyments which spring from a well-informed judgement and a regular conduct of the affections, especially those of the social and disinterested kind. Such dignified forms of beauty and good, often suggested, and, by moving pictures and examples, warmly recommended to the imagination, enforced by the authority of conscience, and demonstrated by reason to be the surest means of enjoyment, and the only independent, undeprivable, and durable goods, will be the best counterbalance to meaner passions, and the firmest foundation and security to virtue. It is of great importance to the forming a just taste, or pure and large conceptions of happiness, to study and understand human nature well, to remember what a complicated system it is, particularly to have deeply imprinted on our mind that Gradation of senses, faculties, and powers of enjoyment formerly mentioned, and the subordination of goods resulting from thence, which nature points out, and the experience of mankind confirms. Who, when they think seriously, and are not under the immediate influence of some violent prejudice or passion, prefer not the pleasures of action, contemplation, society, and most exercises and joys of the moral kind, as friendship, natural affection, and the like, to all sensual gratifications whatsoever? Where the different species of pleasure are blended into one complex form; let them be accurately distinguished, and be referred each to its proper faculty and sense, and examined apart what they have peculiar, what common with others, and what foreign and adventitious. Let wealth, grandeur, luxury, love, fame, and the like, be tried by this test, and their true alloy will be found out. Let it be farther considered, whether the mind may not be easy and enjoy itself greatly, though it want many of those elegancies and superfluities of life which some possess; or that load of wealth and power which others eagerly pursue, and under which they groan. Let the difficulty of attaining, the

precariousness of possessing, and the many abatements in enjoying, overgrown wealth and envied greatness, of which the weary possessors so frequently complain, as the hurry of business, the burden of company, of paying attendance to the few, and giving it to the many, the cares of keeping, the fears of losing, and the desires of increasing, what they have, and the other troubles which accompany this pitiful drudgery and pompous servitude; let these and the like circumstances be often considered, that are conducive to the removing or lessening the opinion of such goods, and the attendant passion or set of passions will decay of course. Especially let it be often recollected, that things of this kind are transitory and fleeting as the wind, and by no means calculated to afford that satisfaction which they seem to promise.

OF THE MOTIVES TO VIRTUE FROM PERSONAL HAPPINESS.

We have already considered our obligations to the practice of virtue, arising from the constitution of our nature, by which we are led to approve a certain order and economy of affections, and a certain course of action correspondent to it. But, besides this, there are several motives which strengthen and secure virtue, though not themselves of a moral kind. These are, its tendency to personal happiness, and the contrary tendency of vice. "Personal happiness arises either from the state of a man's own mind, or from the state and disposition of external causes towards him. We shall first examine the tendency of virtue to happiness with respect to the state of a man's own mind." This is a point of the utmost consequence in morals; because, unless we can convince ourselves, or shew to others, that, by doing our duty, or fulfilling our moral obligations, we consult the greatest satisfaction of our own mind, or our highest interest on the whole, it will raise strong and often unsurmountable prejudices against the practice of virtue, especially whenever there arise any appearances of opposition between our duty and our satisfaction or interest. To creatures so desirous of happiness, and averse to misery, as we are, and often so oddly situated amidst contending passions and interests, it is necessary that virtue appear not only in an honourable but a pleasing and beneficent form. And to justify our choice to ourselves as well as others, we must feel and be able to avow in the face of the world, that her ways are ways of pleasantness, and her paths the paths of peace. Let any man in a cool hour, when disengaged from business, and undisturbed by passion, seriously reflect what state or temper of mind he would choose to feel and indulge, in order to be easy and enjoy himself. Would he choose, for that purpose, to be in a constant dissipation and hurry of thought; to be disturbed in the exercise of his reason; to have various and often interfering phantoms of good playing before his imagination, soliciting and distracting him by turns, now soothing him with amusing hopes, then torturing him with anxious fears; and to approve this minute what he shall condemn the next? Would he choose to have a strong and painful sense of every petty injury; quick apprehensions of every impending evil; incessant and insatiable desires of power, wealth, honour, pleasure; an irreconcilable antipathy against all competitors and rivals; insolent and tyrannical dispositions to all below him; fawning, and at the same time envious, dispositions to all above him; with dark suspicions and jealousies of every mortal? Would he choose neither to love nor be beloved of any; to have no friend in whom to confide, or with whom to interchange his sentiments or designs; no favourite, on whom to bestow his kindness, or vent his passions; in fine, to be conscious of no merit with mankind, no esteem from any creature, no good affection to his Maker, no concern for, nor hopes of, his approbation; but, instead of all these, to hate, and know that he is hated, to condemn, and know that he is condemned, by all; by the good, because he is so unlike; and by the bad, because he is so like themselves; to hate or to dread the very Being that made him; and, in short, to have his breast the seat of pride and passion, petulance and revenge, deep melancholy, cool malignity, and all the other furies that ever possessed and tortured mankind?—Would our calm inquirer after happiness pitch on such a state, and such a temper of mind, as the most likely means to put him in possession of his desired ease and self-enjoyment? Or would he rather choose a serene and easy flow of thought; a reason clear and composed; a judgement unbiased by prejudice, and undistracted by passion; a sober and well-governed fancy, which presents the images of things true, and unmingled with delusive and

unnatural charms, and therefore administers no improper or dangerous fuel to the passions, but leaves the mind free to choose or reject, as becomes a reasonable creature; a sweet and sedate temper, not easily ruffled by hopes or fears, prone neither to suspicion nor revenge, apt to view men and things in the fairest lights, and to bend gently to the humours of others rather than obstinately to contend with them? Would he choose such moderation and continence of mind, as neither to be ambitious of power, fond of honours, covetous of wealth, nor a slave to pleasure; a mind of course neither elated with success, nor dejected with disappointment; such a modest and noble spirit as supports power without insolence, wears honour without pride, uses wealth without profusion or parsimony; and rejoices more in giving than in receiving pleasure; such fortitude and equanimity as rises above misfortunes, or turns them into blessings, such integrity and greatness of mind, as neither flatters the vices, nor triumphs over the follies, of men; as equally spurns servitude and tyranny, and will neither engage in low designs, nor abet them in others? Would he choose, in fine, such mildness and benignity of heart as takes part in all the joys, and refuses none of the sorrows, of others; stands well-affected to all mankind: is conscious of meriting the esteem of all, and of being beloved by the best; a mind which delights in doing good without any shew, and yet arrogates nothing on that account; rejoices in loving and being beloved by its Maker, acts ever under his eye, resigns itself to his providence, and triumphs in his approbation?—Which of these dispositions would be his choice, in order to be contented, serene, and happy? The former temper is vice, the latter virtue. Where one prevails, there Misery prevails, and by the generality is acknowledged to prevail. Where the other reigns, there happiness reigns, and by the confession of mankind is acknowledged to reign. Every approach to either extreme is an approach to misery or to happiness; *i. e.* every degree of vice or virtue is accompanied with a proportionable degree of misery or happiness. It is evident on the slightest view of this subject that the honest and good man has eminently the advantage of the knavish and selfish wretch in every respect. The pleasures which the last enjoys flow chiefly from external advantages and gratifications; are superficial and transitory; dashed with long intervals of satiety, and frequent returns of remorse and fear; dependent on favourable accidents and conjunctures; and subjected to the humours of men. But the good man is satisfied from himself; his principal possessions lie within, and therefore beyond the reach of the caprice of men or fortune; his enjoyments are exquisite and permanent; accompanied with no inward checks to damp them, and always with ideas of dignity and self-approbation; and may be tasted at any time, and in any place. The gratifications of vice are turbulent and unnatural, generally arising from the relief of passions in themselves intolerable, and issuing in tormenting reflections; often irritated by disappointment, always inflamed by enjoyment, and yet ever cloyed with repetition. The pleasures of virtue are calm and natural; flowing from the exercise of kind affections, or delightful reflections in consequence of them; not only agreeable in the prospect, but in the present feeling; they never satiate nor lose their relish; nay, rather the admiration of virtue grows stronger every day; and not only is the desire, but the enjoyment, heightened by every new gratification; and, unlike to most others, it is increased, not diminished, by sympathy, and communication. In fine, the satisfaction of virtue may be purchased without a bribe, and possessed in the humblest as well as the most triumphant fortune; they can bear the strictest review, do not change with circumstances, nor grow old with time. Force cannot rob, nor fraud cheat us, of them; and, to crown all, instead of abating they enhance every other pleasure. But the happy consequences of virtue are seen not only in the internal enjoyments it affords a man, but “in the favourable disposition of external causes towards him, to which it contributes.”

OF MOTIVES TO VIRTUE FROM THE BEING AND PROVIDENCE OF GOD: AND THE IMMORTALITY OF THE SOUL.

Besides the interesting motive abovementioned, there are two great motives to virtue, strictly connected with human life, and resulting from the very constitution of the human mind. The first is the Being and Providence of God; the second is the Immortality of the Soul, with future rewards and punishments. From our connection with, and dependence on, the Creator, result various ob-

ligations and duties, without the fulfilling of which, some of his sublimest powers and affections would be incomplete and abortive. If he be likewise an immortal creature, and if his present conduct shall affect his future happiness in another state as well as in the present, it is evident that we take only a partial view of the creature if we leave out this important property of his nature, and make a partial estimate of human life; if we strike out of the account, or overlook, that part of his duration which runs out into eternity. To have a respect to the Deity in our temper and conduct, to venerate and love his character, to adore his goodness, to depend upon and resign ourselves to his providence, to seek his approbation, and act under a sense of his authority, is a fundamental part of moral virtue, and the completion of the highest destination of our nature.” But as piety is an essential part of virtue, so likewise it is a great support and enforcement to the practice of it. To contemplate and admire a Being of such transcendent dignity and perfection as God, must naturally and necessarily enlarge the mind, give a freedom and amplex to its powers, and a grandeur and elevation to its aims. For, as an excellent divine observes, the greatness of an object, and the excellency of the act of any agent about a transcendent object, doth mightily tend to the enlargement and improvement of his faculties.” Little objects, mean company, mean cares, and mean business, cramp the mind, contract its views, and give it a creeping air and deportment. But when it soars above mortal cares and pursuits into the regions of divinity, and converses with the greatest and best of Beings, it spreads itself into a wider compass, takes higher flights in reason and goodness, becomes godlike in its air and manners. Virtue is both the effect and cause of greatness of mind. It requires that one think freely and act nobly. Now what can conduce more to freedom of thought and dignity of action, than to conceive worthily of God, to reverence and adore his unrivalled excellency, to imitate and transcribe that excellency into our own nature, to remember our relation to him, and that we are the images and representatives of his glory to the rest of the creation? Such feelings and exercises must and will make us scorn all actions that are base, unhandsome, or unworthy our state; and the relation we stand in to God will irradiate the mind with the light of wisdom, and ennoble it with the liberty and dominion of virtue. The influence and efficacy of Religion may be considered in another light. We all know that the presence of a friend, a neighbour, or any number of spectators, but especially an august assembly of them, uses to be a considerable check upon the conduct of one who is not lost to all sense of honour and shame, and contributes to restrain many irregular sallies of passion. In the same manner the awe of some superior mind, who is supposed privy to our secret conduct, and armed with full power to reward or punish it, will impose a restraint on us in such actions as fall not under the controul or animadversion of others. If we go still higher, and suppose our inmost thoughts and darkest designs, as well as our most secret actions, to lie open to the notice of the supreme and universal mind, who is both the spectator and judge of human actions, it is evident that the belief of so august a presence, and such awful inspection, must carry a restraint and weight with it proportioned to the strength of that belief, and be an additional motive to the practice of many duties which would not have been performed without it. “To live, therefore, under an habitual sense of the Deity and his great administration, is to be conversant with wisdom, order, and beauty, in the highest subjects, and to receive the delightful reflections and benign feelings which these excite while they irradiate from every scene of nature and providence.” How improving must such views be to the mind, in dilating and exalting it above those puny interests and competitions which agitate and inflame the bulk of mankind against each other! The other motive mentioned was the immortality of the soul, with future rewards and punishments. The metaphysical proofs of the soul’s immortality are commonly drawn from—its simple, uncompounded, and indivisible nature; whence it is concluded, that it cannot be corrupted or extinguished by a dissolution or destruction of its parts: from its having a beginning of motion within itself; whence it is inferred, that it cannot discontinue and lose its motion: from the different properties of matter and mind, the sluggishness and inactivity of one, and the immense activity of the other; its prodigious flight of thought and imagination; its penetration, memory, foresight, and anticipations of futurity; whence it is concluded, that

that a being of so divine a nature cannot be extinguished. But as these metaphysical proofs depend on intricate reasonings concerning the nature, properties, and distinctions, of body and mind, they are not obvious to ordinary understandings, and are seldom so convincing even to those of higher reach, as not to leave some doubts behind them. Therefore perhaps it is not so safe to rest the proof of such an important article on what many may call the subtleties of school-learning. The indubitable truths which we find in divine revelation, plainly declare the immortality of the soul, and afford the clearest evidence of its reality; next to these are those proofs which are brought from analogy, from the moral constitution and phenomena of the human mind, the moral attributes of God, and the present course of things, and which therefore are called the moral arguments, are the plainest, and generally the most satisfying. We shall select only one or two. In tracing the nature and destination of any being, we form the surest judgement from his powers of action, and the scope and limits of these, compared with his state, or with that field in which they are exercised. If this being passes through different states, or fields of action, and we find a succession of powers adapted to the different periods of his progress, we conclude that he was destined for those successive states, and reckon his nature progressive. If, besides the immediate set of powers which fit him for action in his present state, we observe another set which appear superfluous if he were to be confined to it, and which point to another or higher one, we conclude, that he is not designed to remain in his present state, but to advance to that for which those supernumerary powers are adapted. Thus we argue, that the insect, which has wings forming or formed, and all the apparatus proper for flight, is not destined always to creep on the ground, or to continue in the torpid state of adhering to a wall, but is designed in its season to take its flight in air. Without this farther destination, the admirable mechanism of wings and the other apparatus would be useless and absurd. The same kind of reasoning may be applied to man, while he lives only a sort of vegetative life in the womb. He is furnished even there with a beautiful apparatus of organs, eyes, ears, and other delicate senses, which receive nourishment indeed, but are in a manner folded up, and have no proper exercise or use in their confined state. But soon the babe throws off his fetters, breaks loose from his dark prison, and emerges into open day, then unfolding his recluse and dormant powers, breathes in air, gazing at light, admiring colours, sounds, and all the fair variety of nature; and thus the whole mystery of the first period is unravelled by the opening of this new scene. Though in this second period the creature lives chiefly a kind of animal-life, *i. e.* of sense and appetite, yet by various trials and observations he gains experience, and by the gradual evolution of the powers of imagination he ripens apace for an higher life, for exercising the arts of design and imitation, and of those in which strength or dexterity are more requisite than acuteness or reach of judgement. In the succeeding rational or intellectual period, his understanding, which formerly crept in a lower, mounts into an higher sphere, canvasses the natures, judges of the relations of things, forms schemes, deduces consequences from what is past, and from present as well as past collects future events. By this succession of states, and of correspondent culture, he grows up at length into a moral, a social, and a political creature. This is the last period at which we perceive him to arrive in this his mortal career. Each period is introductory to the next succeeding one; each life is a field of exercise and improvement for the next higher one; the life of the fœtus for that of the infant, the life of the infant for that of the child, and all the lower for those that are highest and best. (See Butler's Analogy, Part I.) But is this the last period of nature's progression? Is this the utmost extent of her plot, where she winds up the drama, and dismisses the actor into eternal oblivion? Or does he appear to be invested with supernumerary powers, which have not full exercise and scope even in the last scene, and reach not that maturity or perfection of which they are capable; and therefore point to some higher scene where he is to sustain another and more important character than he has yet sustained? If such there are, (and that there are such every man who thinks must be convinced) may we not conclude, by analogy, that he is destined for that after-part, and is to be produced upon a more august and solemn stage, where his sublimer powers shall have proportioned action, and his nature attain its completion? If we attend to that curiosity, or prodigious thirst of

knowledge, which is natural to the mind in every period of its progress, and consider withal the endless round of business and care, and the various hardships to which the bulk of mankind are chained down: it is evident, that in this present state it is impossible to expect the gratification of an appetite at once so insatiable and so noble. Our senses, the ordinary organs by which knowledge is let into the mind, are always imperfect, and often fallacious; the advantages of assisting or correcting them are possessed by few; the difficulties of finding out truth amidst the various and contradictory opinions, interests, and passions, of mankind, are many; and the wants of the creature, and of those with whom he is connected, numerous and urgent; so that it may be said of most men, that their intellectual organs are as much shut up and secluded from proper nourishment and exercise in that little circle to which they are confined, as the bodily organs of a child are in the womb. Nay, those who to an aspiring genius have added all the assistances of art, leisure, and the most liberal education, what narrow prospects can even they take of this unbounded scene of things from that little eminence on which they stand? and how eagerly do they still grasp at new discoveries, without any satisfaction or limit to their ambition? But should it be said, that man is made for action, and not for speculation, or fruitless searches after knowledge, we ask, For what kind of action? Is it only for bodily exercises, or for moral, political, and religious ones? Of all these he is capable; yet, by the unavoidable circumstances of his lot, he is tied down to the former, and has hardly any leisure to think of the latter, or, if he has, wants the proper means and opportunities of exerting them. The love of virtue, of one's friends and country, the generous sympathy with mankind, and heroic zeal of doing good, which are all so natural to great and good minds, and some traces of which are found in the lowest, are seldom united with proportioned means or opportunities of exercising them: so that the moral spring, the noble energies and impulses of the mind, can hardly find proper scope even in the most fortunate condition: but are much depressed in some, and almost entirely restrained in the generality, by the numerous clogs of an indigent, sickly, or embarrassed life. Were such mighty powers, such god-like affections, planted in the human breast to be folded up in the narrow womb of our present existence, never to be produced into a more perfect life, nor to expatiate in the ample career of immortality? Let it be considered, at the same time, that no possession, no enjoyment, within the round of mortal things, is commensurate to the desires, or adequate to the capacities, of the mind. The most exalted condition has its abatements; the happiest conjuncture of fortune leaves many wishes behind; and, after the highest gratifications, the mind is carried forward in pursuit of new ones without end. Add to all, the fond desire of immortality, the secret dread of non-existence, and the high unremitting pulse of the soul beating for perfection; and then judge whether this elaborate structure, this magnificent apparatus of inward powers and organs, does not "plainly point out a hereafter, and intimate eternity to man?" Does the Author of nature give the finishing touches to the less and ignoble instances of his skill, and raise every other creature to the maturity and perfection of his being; and shall he leave his principal workmanship unfinished? Does he carry the vegetative and animal life in man to their full vigour and highest destination; and shall he suffer his intellectual, his moral, his divine life, to fade away, and be for ever extinguished? Would such abortions in the moral world be congruous to that perfection of wisdom and goodness which upholds and adorns the natural? We must, therefore, conclude from this detail, that the present state, even at its best, is only the womb of man's being, in which the noblest principles of his nature are fettered, or secluded from a correspondent sphere of action; and therefore destined for a future and unbounded state, where they shall exert the fulness of their strength. The most accomplished mortal, in this low and dark state of existence is only the rudiments of what he shall be when he takes his ethereal flight, and puts on immortality. Without a reference to that state, man were a mere abortion, a rude unfinished embryo, a monster in nature. But this being once supposed, he still maintains his rank of the master-piece of the creation; his latent powers are all suitable to the harmony and progression of his nature; his noble aspirations, and the pains of dissolution, are his efforts towards a second birth, the pangs of his delivery into light, liberty, and perfection; and death his discharge from gaol, his separation from his fellow-prisoners,

prisoners, and introduction into the assembly of those heroic spirits who are gone before him, and of their great eternal parent. The fetters of his mortal coil being loosened, and his prison-walls broke down, he will be open on every side to the admission of truth and virtue, and their attendant happiness; every vital and intellectual spring will evolve itself with a divine elasticity, in the free air of heaven. He will not then peep at the universe and its glorious Author through a dark grate or a gross medium, nor receive the reflections of his glory through the straight openings of sensible organs; but will be all eye, all ear, all ethereal and divine feeling. Let one part, however, of the analogy be attended to: that as in the womb we receive our original constitution, form, and the essential stamina of our being, which we carry along with us into the light, and which greatly affect the succeeding periods of our life; so our temper and condition in the future life will depend on the conduct we have observed, and the character we have formed, in the present life. We are here in miniature what we shall be at full length hereafter. The first rude sketch or out-lines of reason and virtue must be drawn at present, to be afterwards enlarged to the stature and beauty of angels. This, if duly attended to, must prove not only a guard, but an admirable incentive, to virtue. For he who faithfully and ardently follows the light of knowledge, and pants after higher improvements in virtue, will be wonderfully animated and inflamed in that pursuit, by a full conviction that the scene does not close with life; that his struggles, arising from the weakness of nature and the strength of habit, will be turned into triumphs; that his career in the tract of wisdom and goodness will be both swifter and smoother; and those generous ardours with which he glows towards heaven, *i. e.* the perfection and immortality of virtue, will find their adequate object and exercise in a sphere proportionably enlarged, incorruptible, immortal. On the other hand, what an inexpressible damp would it be to the good man, to dread the total extinction of that light and virtue, without which life, nay, immortality itself, were not worth a single wish? Again, the immortality of the soul, and of a future state of rewards and punishments, is a natural consequence arising from the unequal distribution of these here. Wicked men often escape the outward punishment due to their crimes, and do not feel the inward in that measure their demerit seems to require, partly from the callousness induced upon their nature by the habits of vice, and partly from the dissipation of their minds abroad by pleasure or business; and sometimes good men do not reap all the natural and genuine fruits of their virtue, through the many unforeseen or unavoidable calamities in which they are involved; and the oppositions they meet with from the wicked. This being the case, we must either conclude that there will be a future state, in which all the moral obliquities of the present shall be made straight; or else admit, that the designs of infinite wisdom, goodness, and power, can be finally defeated by the perverse conduct of human weakness. But this last supposition is so extravagantly absurd, that the reality of a future state, the only other possible alternative, may be pronounced to have the evidence of perfect demonstration. Virtue has present rewards, and vice present punishments, annexed to it; such rewards and punishments as make virtue, in most cases that happen, far more eligible than vice; but, in the infinite variety of human contingencies, it sometimes falls out, that the inflexible practice of virtue deprives a man of considerable advantages to himself, his family, or friends, which he might gain by a well-timed piece of roguery; suppose by betraying his trust, voting against his conscience, selling his country, or any other crime where the security against discovery shall heighten the temptation. Or, it may happen, that a strict adherence to his honour, to his religion, to the cause of liberty and virtue, shall expose him, or his family, to the loss of every thing, nay, to poverty, slavery, death itself, or to torments far more intolerable. Now what shall secure a man's virtue in circumstances of such trial? What shall enforce the obligations of conscience against the allurements of so many interests, the dread of so many and so terrible evils, and the almost unsurmountable aversion of human nature to excessive pain? The conflict is the greater, when the circumstances of the crime are such as easily admit a variety of alleviations from necessity, natural affection, love to one's family or friends, perhaps in indigence: these will give it even the air of virtue. Add to all, that the crime may be thought to have few bad consequences, may be easily concealed, or imagined possible to be retrieved in a good measure by future good conduct. It is ob-

vious to which side most men will lean in such cases; and how much need there is of a balance in the opposite scale, from the consideration of a God, of a Providence, and of an immortal state of retribution, to keep the mind firm and uncorrupt in these, or like instances, of singular trial or distress. To sum up the detail, we may state the following observations: 1. That man is a creature furnished with a great variety of emotions, called passions, or affections, which are excited on various occasions; and that on the due and proper direction, management, and regulation, of these, our happiness in a great measure depends: if each affection be directed to its proper object or objects, guided in its due course, and governed so as neither to fall short of, nor exceed, its true pitch; happiness is insured. 2. That in order to ascertain what is the proper direction, management, and regulation, of his affections, man possesses the principle of reason and reflection, and indeed without this he must needs err in the application of so many affections, and therefore a proper use of this principle becomes essentially necessary to our felicity. 3. That man is also furnished with conscience, by which he is apprized of the goodness or badness of his actions or conduct, and which accordingly approves or disapproves of his proceedings. Hence conscience cannot strictly perform its office unless duly informed respecting the actions and circumstances of them. 4. That there are various moral obligations or duties respecting ourselves, respecting society, and respecting our Creator, the performance of which are absolutely requisite to our happiness. And that we may not fail in this important point, there are a great variety of powerful motives to influence us to the fulfilment of these duties, and to a just procedure in all our actions. To this we may add that, whatever in our actions or conduct concurs with the will of our Creator must be good, and calculated to make us happy, and on the contrary whatever opposes his will is productive of misery, and hence as far as the will of God is made known to us, we have a sure rule of conduct. Our next enquiry is concerning the ability of man to perform all his moral obligations and duties; for what avails the finest system of morals, unless there be sufficient power to perform all the exercises which that system requires. Since we know assuredly that man is the offspring of the ever-blessed God; whose bounty, wisdom, and goodness, equal his other perfections; we cannot hesitate for a moment to pronounce, that he was made capable, in every respect, of performing every obligation which God required at his hand, or his connections in society could demand, or his own nature make necessary for his happiness. Of this no one can have the shadow of a doubt. Hence his power to do right must have been complete, his understanding and judgement to distinguish what is good, clear and sound, his disposition and will ever leading him to the performance of his duty, and his affections easy to be governed and directed; to which we may add with these he possessed every other qualification and endowment essential to his nature, and calculated to afford him perfect felicity. But is man still so complete in his constitution, has he lost nothing of his native energy, nothing of his primitive perfection? To these questions we cannot answer in the affirmative, the contrary being evidently true; whether we consult individuals or communities, whether we enter the cottage or the palace, whether we inquire of the present age or of the ages past; we find that all have gone out of the way of happiness; but since happiness is so desirable to all, and all are so far from it, it is a certain argument that man has lost his original perfections, and plainly declares to our reason that his discernment of right and wrong is lost, or his power to govern his passions is defective, or his will stubborn and opposed to his judgement, or his affections themselves are deranged, and he is incapable of directing them, or that there is some other defect in his constitution: or shall we not rather say, that in every one of these particulars, in all his powers and faculties, he is fallen; for so is he constituted that we can scarcely imagine a defect in one part, without concluding the same in every part. Thus, if his power fail, evil will get the better of him, if his judgement fail, he will be carried he knows not whither, and thus likewise become a prey to evil, and of the rest in like manner. It must also be remarked that this defect, the utmost efforts of the wisest and best philosophers were not able to correct, neither in themselves nor in others; this has been clearly shewn by many excellent writers on this subject, and is plain to all who are acquainted with the history of the ancient philosophers. But what is the cause of this degeneracy, it would be wicked, and contrary to the glimmering light of reason which still remains, to say,

say, that God himself was the fountain whence issued our corruptions; it would be equally as impious and absurd as to say he created us imperfect; and to say that any created being produced our misery, by exerting upon us a force which we had no means to counteract, would be the same thing as to blame it upon God himself, or else to say that he has not power to govern and controul his creatures. Our evils then must have originated in ourselves, it must have been a wilful abuse of that power and liberty by which we were dignified, and without which we could not hold that high rank in the scale of beings in which we have been placed. This abuse of power must consist either in a breach of some part of the eternal law of our nature, or of some precept of our Creator, which he, and he alone, had a right to give as the test of our obedience, and which it was our duty, as his creatures, to perform with scrupulous exactness. But the murderous deed being done, what is now to be done; what now avails the finest system of morals; man labouring under the displeasure of God, stripped of his native energy, bewildered in his understanding, condemned by his conscience, subjected to his domineering passions, and lost to all that is good; cannot avail himself of the most wholesome advice, he can neither understand nor fulfil his duties or moral obligations. And supposing he could do this, our reason, dark as it is, tells us that it would be of no avail to clear our conscience, or wipe away the curse of God: for since it is our duty always to do right, the performance now of that which is right does not at all make amends for having done wrong before. Thus then we see that if ever man be restored to a state of happiness, to his native vigour, it is necessary that there should be unmerited mercy shewn to him; and hence we see the need of a revelation, and of the grace there manifested, and bestowed on all our race. If we attend to that book of divine inspiration which contains this revelation, we shall not only find the best system of morals, but we shall see a rational, simple, and wise, plan, laid down for our recovery; a plan worthy of God who gave it, and who stiles it the good pleasure of his will; here we find proposals of reconciliation to God, on terms the most easy for our acceptance and performance, the most glorious in displaying the goodness, love, and condescension, of God, and the most satisfactory, as affording the firmest basis on which we can build our hopes. Here is declared our disease, and here is presented our remedy; Christ, who on this occasion was incarnate, being himself the physician, performs a radical cure. He has manifested himself as the true light which enlightens every man that cometh into the world,

pointing out to all by his Spirit, that the disease of sin has invaded him altogether; "the whole head is sick, the whole heart faint: from the sole of the foot, even unto the head, there is no soundness in it; but wounds and bruises, and putrifying sores." He has given his own blood as the universal balsam, which never fails of the desired effect, and whosoever effectually receives it as an atonement for his multiplied transgressions is made free from this miserable sickness. But he who obstinately refuses the application, must remain in his loathsome state without hope of relief; for there is no other name by which we can be saved. See CHRISTIANITY, and THEOLOGY. See also FAITH. We shall here only add, respecting the Christian scheme, that it is the only true system of morality, every thing agreeing with it is right, and every thing contrary to it is wrong. When impartially weighed even in the balance of reason, how incomparably excellent does it appear, complete even without an imperfection, without a superfluity, without a deficiency. How clearly and fully does Christianity lay open the connections of our nature, both material and immaterial, and future as well as present! What an ample and beautiful detail does it present of the duties we owe to God, to society, and ourselves, promulgated in the most simple, intelligible, and popular, manner; divested of every partiality of sect or nation; and adapted to the general state of mankind! With what bright and alluring examples does it illustrate and recommend the practice of those duties; and with what mighty sanctions does it enforce that practice! How strongly does it describe the corruptions of our nature; the deviations of our life from the rule of duty, and the causes of both! How marvellous and benevolent a plan of redemption does it unfold, by which those corruptions may be remedied, and our nature restored from its deviations to transcendent heights of virtue and piety! Finally, what a fair and comprehensive prospect does it give us of the administration of God, of which it represents the present state only as a small period, and a period of warfare and trial! How solemn and unbounded are the scenes which it opens beyond it! the resurrection of the dead, the general judgement, the equitable distribution of rewards and punishments, to the good and the bad; and the full completion of divine wisdom and goodness in the final establishment of order, perfection, and happiness! How glorious then is that Scheme of Religion, and how worthy of affection as well as admiration, which, by making such discoveries, and affording such assistances, has disclosed the unfading fruits and triumphs of virtue, and secured its interests beyond the power of time and chance.

MORALS, the practice of the duties of life; behaviour with respect to others. See MORAL PHILOSOPHY.

MORAL SENSE, that whereby we perceive what is good, virtuous, and beautiful, in actions, manners, and characters. See MORAL PHILOSOPHY.

MORANT, PHILIP, F. S. A. a learned and indefatigable antiquary and biographer, son of Stephen Morant, was born at St. Saviour's in the Isle of Jersey, Oct. 6, 1700; educated at Abingdon school, and Pembroke college, Oxford: where he took the degree of B. A. June 10, 1721; and that of M. A. in 1724. Between 1733 and 1745, he obtained six benefices in Essex. And in 1748 he published his history of Colchester, of which only 200 copies were printed. In 1751 he was elected F. S. A.; and in Feb. 1786 he was appointed by the lords sub-committees of the house of peers to succeed Mr. Blyke in preparing for the press a copy of the rolls of parliament; a service to which he diligently attended till his death, on Nov. 25, 1770. Besides the above work, and many useful translations, abridgements, and compilations, &c. he wrote all the Lives in Biographia Britannica marked C; also the Life of Stillingfleet. The History of Essex, 1760, 1768, 2 vols. folio: the Life of King Edward the Confessor, and about 150 sermons. He prepared the rolls of parliament as far as the 16th of Henry IV. The continuation of the task devolved upon Thomas Astle, Esq. who had married his only daughter.

MORANT BAY, a bay of Jamaica, on the S. coast. Lon. 76. 0. W. Lat. 17. 54. N.

MORANT POINT, the most easterly promontory of Jamaica. Lon. 75. 11. W. Lat. 17. 58. N.

MORASS, a marsh, or low moist ground, which receives the waters from above without having any descent to carry them off

again. Somner derives the word from the Saxon *merse*, a calx; Salmasius from *mare*, a collection of waters; others from the German *marast*, a muddy place; and others from *maresc*, of *mariscum*, from *mariscis*. See BOG, FEN, and MARSH. For the draining of such land, see HUSBANDRY.

MORAT, a late bailiwick of Switzerland, belonging to the cantons of Berne and Friburg.

MORAT, or **MURTEN**, a rich trading, and considerable town of the Helvetic Republic, late capital of the above bailiwick, 22 miles S. S. W. of Soleure. Lon. 6. 53. E. Lat. 46. 52. N.

MORAT, a lake of the Helvetic republic, between Berne and Avenche, about six miles long and two broad, the country about it being pleasant and well cultivated. The lakes of Morat and Neufchatel are parallel to each other, but the latter is more elevated, discharging itself by the Broye into the lake of Neufchatel.

MORATA, **OLYMPIA FULVIA**, an Italian lady, distinguished for her learning, born at Ferrara, in 1526. Her father, after teaching the belles lettres in several cities of Italy, was made preceptor to the two young princes of Ferrara, the sons of Alphonsus I. The uncommon abilities he discovered in his daughter determined him to give her a very extraordinary education. Meanwhile the Princess of Ferrara studying polite literature, it was judged expedient that she should have a companion in the same pursuit; and Morata being called, she was heard by the astonished courtiers to declaim in Latin, to speak Greek, and to explain the paradoxes of Cicero. Her father dying, she was obliged to return home to superintend family-affairs, and the education of her brothers and three sisters; both which she executed with the greatest diligence and success. In the mean time Andrew Grunthler, a young German physician, who had taken his degree of M. D. at Ferrara,

Ferrara, fell in love with her, and married her. She now went with her husband to Germany, taking her little brother with her whom she instructed in Latin and Greek; and after staying a short time at Augsburg, went to Schweinfurt in Franconia, where her husband was born; but they had not been there long before that town was besieged and burnt; on which they fled in the utmost distress to Hammelburg. This place they were also obliged to quit, and were reduced to the last extremities, when the elector-palatine invited Grunthler to be professor of physic at Heidelberg, and he entered on his new office in 1554; but they no sooner began to taste the sweets of repose, than a disease, occasioned by the distresses and hardships they had suffered, seized upon Morata, who died in 1555, in the 29th year of her age; and her husband and brother did not long survive her. She composed several works, great part of which were burnt with the town of Schweinfurt; the remainder, which consist of orations, dialogues, letters, and translations, were collected and published under the title of "*Olympiæ et Fulviæ Moratæ Fœminæ Doctissimæ, et Planæ Divinæ, Opera Omnia quæ Hactenus Inveniri Potuerunt; Quibus Cæli Secundi Curionis Epistolæ ac Orationes accesserunt;*" which has gone through several editions in 4vo.

MORAU, MORAVA, or MORAVIA, a river of Turkey, in Europe, which rises in Bulgaria, runs N. through Servia by Nissa, and falls into the Danube, E. of Belgrade.

MORAVIA, a marquise of Germany, called **MAHERN**, by the Germans, and **MORAWA** by the natives, from the Moraw, which runs through the middle of it. It is bounded on the S. by Austria, on the N. by Glatz and Silesia, W. by Bohemia, and E. by Silesia and Hungary; being about 120 miles long, and 100 broad. A great part of it is overrun with woods and mountains, where the air is very cold, but much more wholesome than in the low grounds, which are full of bogs and lakes. The mountains, in general, are barren; but the more champaign parts tolerably fertile, yielding corn, with plenty of hemp and flax, good saffron, and pasture. Nor is it destitute of wine, red and white, fruits, and garden-stuff. It also abounds in horses, black cattle, sheep, and goats. In the woods, and about the lakes, there is plenty of wild fowl, game, venison, bees, honey, hares, foxes, wolves, beavers, &c. also quarries of marble, bastard diamonds, amethysts, alum, iron, sulphur, salt-petre, and vitriol, with wholesome mineral waters, and warm springs; but salt is imported. Its rivers, of which the March and Marawa are the chief, abound with trout, cray-fish, barbel, eels, perch, and many other sorts of fish. The language of the inhabitants is a dialect of the Slavonic, differing little from the Bohemian; but the nobility and citizens speak German and French.

MORAVIANS, in church-history. See **UNITED BRETHREN**.

MORAW, MORAWA, or MORAVA, a large river of Germany, which rises in the mountains of Glatz, on the confines of Bohemia and Silesia; crosses Moravia, and falls into the Danube.

MORBACH, or MURBACH, a town of France, in the department of the Lower Rhine, and late province of Alsace; 42 miles E. of Strasburg. Lon. 8. 25. E. Lat. 48. 0. N.

MORBID, among physicians, is applied either to an unsound constitution, or to those parts or humours that are affected by a disease.

MORBIHAN, a department of France, containing part of the late province of Bretagne; bounded on the N. by the department of the North Coasts; E. by that of Ille and Vilaine, 72 miles long, and 35 broad. Vannes is the chief city.

MORBIHAN, a bay of France, on the coast of the above department, between Belleisle and Vannes, containing about thirty small islands.

MORBIHAN, a river in the above department, which runs through it, and falls into the bay, giving name to both.

MORBUS COMITIALIS, a name given to the epilepsy; because if on any day when the people were assembled in comitia upon public business, any person suddenly seized with this disorder should fall down, the assembly was dissolved, and the business of the comitia, however important, was suspended. See **COMITIA**.

MORBUS REGIUS, the same with the **JAUNDICE**. See **MEDICINE**.

MORDANT, or MORDICANT, in dyeing, a basis for dyeing. When a substance to be dyed has little or no attraction to the matter on which the colour depends, so as either not to be capable of abstracting it from its solvent, or of retaining it with such

force as to form a permanent dye, then some intermediate substance is used, which acts as a bond of union between them: this substance is called a mordant. See **DYEING**.

MORDAUNT, CHARLES, Earl of Peterborough, was born about 1658, and succeeded his father, John Lord Mordaunt, in 1675. He entered into the navy, and distinguished himself at Tangier when it was besieged by the Moors. In the reign of James II. he went to Holland, and accompanied the Prince of Orange on his expedition to England in 1688. The year following he was created Earl of Monmouth, and appointed first commissioner of the treasury, from which post he was removed in 1690. In 1697, on the death of his uncle, the Earl of Peterborough, he succeeded to that title. In the reign of Queen Anne he displayed great bravery and skill as commander of the English forces in Spain, where he took Barcelona, and brought several provinces to acknowledge Charles III. as their king. He was afterwards employed in several embassies, and in 1714 appointed governor of Minorca. He died in 1735. Some of his letters are in the works of Pope, with whom he was intimate.

MORDELLA, in zoology, a genus of insects of the coleoptera order. Antennæ thread-shaped, serrated; head deflected under the neck; pappi clavated, compressed; elytra bent backwards near the apex. There are six species, all natives of Europe.

MORE, HENRY, D. D. an eminent English divine and philosopher, in the seventeenth century, was educated at Eton school, and Christ's College, Cambridge, of which he became a fellow, and spent his life in a retired way, publishing a great number of excellent works. He refused bishoprics both in Ireland and England. He was an open-hearted sincere Christian philosopher, who studied to establish men in the belief of Providence against atheism. Mr. Hobbes was used to say, that if his own philosophy was not true, there was none that he should sooner like than More's. His writings have been published in Latin and English, folio.

MORE, SIR THOMAS, lord high chancellor of England, son of Sir John More, one of the judges of the King's Bench, was born in 1480, at London; where he received the rudiments of his education. He was afterwards introduced to Cardinal Moreton, who, in 1497, sent him to Canterbury College, in Oxford, where he attended the lectures of Linacre and Grocynus, on Greek and Latin. In 1499 he came to New Inn in London, to study the law; whence he removed to Lincoln's Inn, of which his father was a member. Notwithstanding his application to the law, however, now about twenty years old, he was so bigotted to monkish discipline, that he wore a hair-shirt next his skin, and often fasted and slept on a bare plank. In 1503, being then a Burgess in parliament, he distinguished himself in the house, in opposition to the motion for granting a subsidy and three-fifteenths for the marriage of Henry VII.'s eldest daughter, Margaret, to King James V. of Scotland. The motion was rejected; and the king was so highly offended at this opposition from a beardless boy, that he revenged himself on Mr. More's father, by sending him to the Tower, and obliging him to pay 100*l.* for his liberty. Being now called to the bar, he was appointed law-reader at Furnival's Inn, which he held about three years. About this time he also read a public lecture in St. Lawrence's Church, Old Jewry, upon St. Austin's treatise *De Civitate Dei*, with great applause. He had intended to become a Franciscan friar, but was dissuaded from it; and, by the advice of D. Colet, married Jane, daughter of John Colt, Esq. of Newhall in Essex. In 1508 he was appointed judge of the sheriff's court in London, was made a justice of the peace, and became very eminent at the bar. In 1516 he went to Flanders with Bishop Tonsal, and Dr. Koight, who were sent by Henry VIII. to renew the alliance with the archduke of Austria, afterwards Charles V. On his return, Cardinal Wolsey would have engaged him in the service of the crown, and offered him a pension which he refused. But he soon after accepted the place of master of the requests, was created a knight, and a privy-counsellor, and in 1520 made treasurer of the exchequer. About this time he built a house at Chelsea, and married a second wife, whose name was Middleton, a widow, old, ill-tempered, and covetous; yet Erasmus says he was as fond of her as if she had been a young maid. In 1523, he was made speaker of the house of commons; in which capacity he had the courage to oppose the then powerful minister, Wolsey, in his demand of an oppressive subsidy; yet he was, soon after, made chancellor of Lancaster, and was treated by the king with singular familiarity. The king having once dined with

Sir Thomas at Chelsea, walked with him near an hour in the garden, with his arm round his neck. After he was gone, Mr. Roper, Sir Thomas's son-in-law, observed how happy he was to be so familiarly treated by the king: to which Sir Thomas replied, "I must tell thee, I have no cause to be proud thereof; for if my head would win him a castle in France, it would not fail to go off." In 1526 he was sent, with Cardinal Wolsey and others, on a joint embassy to France, and in 1529 with Bishop Tonstal to Cambrai. The king, it seems, was so well pleased with his services on these occasions, that in 1530 he made him chancellor; which seems the more extraordinary, when Sir Thomas had repeatedly declared his disapprobation of the king's divorce. Having executed that office about three years, with wisdom and integrity, he resigned the seals in 1533, probably to avoid the danger of his refusing to confirm the king's divorce. He now retired to his house at Chelsea; dismissed many of his servants; sent his children with their respective families to their own houses; for hitherto he had maintained all his children, with their families, in his own house, in the true style of an ancient patriarch, and spent his time in study and devotion; but the capricious tyrant would not suffer him to enjoy this tranquillity. Though now reduced to a private station, his opinion of the legality of the king's marriage with Anne Boleyn was deemed of so much importance, that various means were tried to obtain his approbation; but all persuasion proving ineffectual, he was, with some others, attainted in the house of lords of misprision of treason, for encouraging Elizabeth Barton in her treasonable practices. See BARTON. His innocence appeared so clear, that they were obliged to strike his name out of the bill. He was then accused of other crimes, but with the same effect; till, refusing to take the oath enjoined by the act of supremacy, he was committed to the Tower, and after thirteen months imprisonment, was tried at the king's bench for high treason, in denying the king's supremacy. The proof rested on the sole evidence of Rich the solicitor-general, whom Sir Thomas, in his defence, sufficiently discredited; nevertheless the jury brought him in guilty, and he was condemned to suffer as a traitor. The merciful Harry, however, indulged him with simple decollation; and he was beheaded on Tower-hill, on the 5th July, 1535. His body, which was first interred in the Tower, was begged by his daughter Margaret, and deposited in the chancel of the church at Chelsea, where a monument, with an inscription written by himself, had been erected, and is still to be seen. She also procured his head after it had remained fourteen days upon London bridge, and placed it in a vault belonging to the Roper's family, under a chapel near St. Dunstan's church in Canterbury. Sir Thomas More was a man of some learning, and an upright judge; a very priest in religion, yet cheerful, and even witty on many occasions, particularly at his execution. He wanted not sagacity, where religion was out of the question; but in that his faculties were so enveloped, as to render him a weak and credulous enthusiast. He left one son and three daughters. Sir Thomas was the author of various works, though his *Utopia* is the only performance that has survived in the esteem of the world; owing to the rest being chiefly of a polemic nature: his answer to Luther has only gained him the credit of having the best knack of any man in Europe, at giving bad names in good Latin. His English works were collected and published by order of Queen Mary I. in 1557; his Latin, at Basil, in 1563, and at Louvain in 1566.

MOREA, anciently called **PELOPONNESUS**, a peninsula S. of Greece, to which it is joined by the isthmus of Corinth. Its form resembles a mulberry-leaf, and its modern name is derived from its abounding with mulberry-trees. It is about 180 miles long, and 130 broad. The air is temperate, and the land fertile, except in the middle, where it is full of mountains, and is watered by many rivers. It is divided into three provinces; Scania, Belvedera, and Brazzo di Maina.

MOREL, **ANDREW**, a very eminent antiquary, born at Berne in Switzerland. Having a strong passion for the study of medals, he travelled through several countries, and made large collections. In 1683 he published, at Paris, in 8vo. *Specimen Universæ Rei Nummarie Antiquæ*. The great work of which this was the specimen was to be a complete collection of all ancient medals, of which he had then 20,000 exactly designed. Soon after this essay appeared, Lewis XIV. gave him a place in his cabinet of antiques, in which capacity he brought himself into great danger by speak-

ing too freely of M. Louvois on some private account, and he was committed to the Bastille, for three years; nor was he released until the death of Louvois, when the canton of Berne interceded in his favour. He afterward accepted an invitation from the count of Schwartzburg in Germany by whom he was furnished with every thing necessary for carrying on his grand work. In 1703 he died; and in 1734 came out at Amsterdam part of this collection, in 2 vols. folio, under the title of *Thesaurus Morellianus, sive Familiarum Romanorum Numismata Omnia, Diligentissime Undique Conquisita, &c.* Nunc Primum Edidit et Commentaria Perpetuò Illustravit Sigibertus Havercampus. These volumes contain an explication of 3539 medals, engraved, with their reverses.

MOREL, the phallus esculentus of Linnæus, a plant, of which there are several species: when the flower sheds there succeeds a spherical fruit, pretty hard, at first green, like an olive, then black, full of a limpid juice and a great number of seeds.

MORENA, in ancient geography, a district of Mysia, in the Hither Asia.

MORENGO, a town of Italy, in the department of the Serio, district and late province of Bergamo, 10 miles S. S. E. of Bergamo.

MORERI, **LEWIS**, compiler of the *Historical Dictionary*, was born at Barge-mont, in Provence, 1643. He studied rhetoric and philosophy at Aix, and divinity at Lyons. At eighteen years of age he wrote a small piece, intitled *Le Pays d'Amours* and a collection of fine French poems, intitled *Doux Plaisir de la Poesie*. He learned Spanish and Italian; and translated out of Spanish into French the book intitled *La Perfection Chretienne de Rodriguez*. He then refined the *Saints' Lives* to the purity of the French tongue. Being ordained priest, he preached at Lyons, and undertook, when thirty years of age, a new *Historical Dictionary*, printed at Lyons in one volume folio, 1673. But his continual labour impaired his health; he died in 1680, aged 37. His second volume was published after his death, and four more have since been added. He left also some other works.

MORES, **EDWARD ROWE**, a learned English antiquary, born at Tunstall, in Kent, in 1730, and educated at London, and Queen's College, Oxford. He published a curious relic of antiquity, intitled, *Nomina et Insignia Gentilitia Nobilium, Equitumque, sub Eduardo I. Rege militantium*. Oxon. 1748, 4to. In 1752, he was elected a fellow of the Society of Antiquaries; and projected the Equitable Society for Insurance on Lives and Survivorship, by Annuities. He wrote, 1. *The History and Antiquities of Tunstall, in Kent*. 2. *A Dissertation on Founders and Foundries*: and other works. He died in 1778.

MORESK, **MORESQUE**, or **MORISKO**, a kind of painting, carving, &c. done after the manner of the Moors, consisting of several grotesque pieces and compartments promiscuously intermingled, containing a wild resemblance of birds, beasts, trees, &c. These are also called arabesques, and are particularly used in embroideries, damask-work, &c.

MORESQUE DANCES, or **MORICE DANCES**, are those altogether in imitation of the Moors, as sarabands, chacons, &c. and are usually performed with castanets, tambours, &c.

MÔRET, an ancient town of France, in the department of the Seine and Marne, and late province of the Isle of France, 12 miles S. E. of Melun, and 35 of Paris. Lon. 2. 52. E. Lat. 48. 35. N.

MORETON, a large town of Devonshire, 14 miles S. W. of Exeter. Lon. 3. 46. W. Lat. 50. 39. N.

MORETON, a town in Gloucestershire, 29 miles S. S. E. of Worcester, and 83 W. N. W. of London. Lon. 1. 36. W. Lat. 52. 0. N.

MORGAGNI, **JOHN BAPTIST**, M.D. and F.R.S. first professor of anatomy in the university of Padua, and member of several of the most eminent societies in Europe, was born in 1682, at Forlì, in Romagna. He studied at Bologna, where he obtained the degree of M.D. when he had but just reached his 16th year. His peculiar taste for anatomy found an able preceptor in Valsalva, and such was the progress he made under him, that at twenty he himself taught anatomy with high reputation. Soon, however, the fame of his prelections, and the number of his pupils, excited the jealousy of the professors, and gave rise to invidious persecutions. But his abilities and prudence gained him a complete triumph; and all opposition was finally terminated on his being appointed by the senate of Bologna to fill a medical chair. He soon communicated

communicated the fruits of his labours to the public in his *Adversaria Anatomica*, the first volume of which was published in 1706, the second and third in 1717, and the three last in 1719. This excellent work spread his fame far beyond the limits of Bologna. The republic of Venice offered him the second medical chair in the university of Padua, and doubled the emoluments. While in this department, he published his *Nova Institutionum Medicarum Idea*, at Padua, in 1712. And soon after he rose to be first professor of anatomy in that celebrated university. And a little after was admitted a member of the royal societies of London and Paris, who received him among their number. Not long after, he began his *Epistolæ Anatomicae*, the first of which is dated Padua, 1726. He was not more eminent as an anatomist, than as a successful physician. In 1760, when he was near eighty years of age, he published his large and valuable work "*De Causis et Sedibus Morborum per Anatomen Indagatis*." This last and most important of all his productions will afford convincing evidence of his industry and abilities to the latest posterity. He also published, at different periods, several miscellaneous pieces, which were afterwards collected into one volume, and printed under his own eye at Padua, in 1765. He intended to have published a complete edition of all his works, and was engaged in this, when, after he had arrived at nearly the ninetyeth year of his age, death put a period to his long and glorious career, on the 5th of Dec. 1771.

MORGAN, or **MORGAN-TOWN**, a town of Virginia, capital of Monogalia county, 329 miles from Philadelphia. Lon. 79. 58. W. Lat. 39. 39. N.

MORGANA FATA. See **FATA MORGANA**.

MORGES, a handsome and rich town of the Helvetic republic, in the canton of Bern, 5 miles from Lausanne. Lon. 6. 42. E. Lat. 46. 29. N.

MORGO, an island in the Archipelago, anciently called *Amorgos*, fertile in wine, oil, and corn. It is 30 miles in circumference. Lon. 26. 15. E. Lat. 36. 30. N.

MORHANGE, a town of France, in the department of Moselle, and late duchy of Lorraine, 24 miles N.E. of Nancy. Lon. 6. 42. E. Lat. 48. 56. N.

MORIAH, an eminence in Jerusalem, on which Abraham went to offer his son, and David intended to build the temple. The threshing floor of Araunah was upon it originally narrow, so as scarcely to contain the temple, but enlarged by ramparts; and surrounded with a triple wall, so as to add great strength to the temple. It may be considered as a part of Mount Sion, to which it was joined by a bridge and gallery.

MORILLES, a kind of mushroom, about the bigness of a walnut, pierced with holes like a honey-comb, and said to be good for creating an appetite. They are accounted restorative, and frequently used in sauces and ragouts.

MORINA, in botany, a genus of the monogynia order, and diandria class of plants; natural order, *Aggregatæ*. Corolla unequal; calyx of the fruit one-leaved, dented; that of the flower bifid; there is one seed under the latter. It affords but one species, a native of Persia.

MORINDA, in botany, a genus of the monogynia order, and pentandria class of plants; natural order, *Aggregatæ*. Flowers aggregate, one-petaled; stigma bifid; fruit plums aggregate, or in clusters. It has three species, natives of the West Indies.

MORINI, an ancient nation of Gallia Belgica, who lived on the coast of the British Ocean. They were styled *extremi hominum* by the Romans, from their situation on the extremities of Gaul.

MORINORUM CASTELLUM, in ancient geography, or simply *Castellum*, (*Antonine*), a city of Gallia Belgica, belonging to the Morini, situated on an eminence, with a spring of water on its top; now called *Mont Cassel*, in Flanders.

MORINORUM CIVITAS, a city of the Morini, in Gallia Belgica, now called *Terouenne*, seated on the Lis.

MORISCO. See **MORESK**.

MORISON, ROBERT, M.D. physician and professor of botany at Oxford, was born at Aberdeen in 1620, bred at the university there, and taught philosophy for some time in it; but became chiefly famous for his skill in botany. The civil wars obliged him to leave his country, having first signalized his zeal for the king. He went over into France; and, fixing at Paris, he applied assiduously

to botany and anatomy, and took his doctor's degree, and was appointed director of the royal garden at Blois. In 1660 he returned to England, and was nominated physician to Charles II. and regius professor of botany at Oxford. Doctor Morison died in 1683. He read botanical lectures in the garden at Oxford. His works are, *Preludia Botanica*, 2 vols. 8vo.; *Plantarum umbelliferarum Distributio*, folio; and *Historia Plantarum*, folio. He finished only the second part of this last, which is a performance that does him great honour. It was continued by Jacob Bobart.

MORISONIA, in botany, a genus of the polyandria order, and monadelphia class of plants; natural order, *Putamineæ*. Calyx single, bifid; corolla three-petaled; berry with a hard bark, unilocular, polyspermous, and pedicelled. There is only one species, a native of South America.

MORLACHIA, a mountainous country of Maritime Austria, in Dalmatia; bounded on the north and south by Croatia and Bosnia, and on the east and west by the Adriatic Sea, and the Morazza. It is watered by the Kirka, Cettina, and Narenta.

MORLACHIANS, **MORLACKS**, or **MORLACCHI**, the inhabitants of Morlachia. They chiefly inhabit the pleasant valleys of Koter, along the rivers of Kerha, Cettina, Narenta, and among the inland mountains of Dalmatia. They are by some said to be of Walachian extraction, as is indicated by their name; Morlachia being a contraction of Mauro-Walachia, that is, Black Walachia: and the Walachians are said to be descendants of the ancient Roman colonies planted in these countries.

MORLAIS, or **MORLAIX**, a town of France, in the department of Finisterre, and late province of Bretagne, 30 miles N.E. of Brest, and 45 W. of St. Brieux. Lon. 3. 46. W. Lat. 48. 34. N.

MORLAIX, a navigable river of France, in the department of Finisterre, which runs into the English Channel at Morlaix.

MORMYRUS, a genus of fishes of the branchiostegous order. Head smooth; teeth numerous, notched; aperture of the gills linear, without a cover; gill membrane, with one ray; body scaly. There are nine species.

MORMORA, a town of France, in the department of the Stura, and late marquise of Saluzzo, in the late Piedmontese, seated on the Maira, 14 miles S.W. of Saluzzo.

MORNEAU DIABLE, a cape on the W. coast of Hispaniola. Lon. 72. 47. W. Lat. 19. 12. N.

MORNING, the time of sun-rising. The astronomers reckon morning, *mane*, from midnight to mid-day. Thus an eclipse is said to begin at 11 o'clock in the morning, &c.

MORNING-STAR. Venus is so denominated when a little to the W. of the sun; that is, when she rises a little before him. In this situation she is called by the Greeks *Phosphorus*; by the Latins *Lucifer*, &c. See **ASTRONOMY**.

MOROCCO, an empire of Africa, comprehending a considerable part of the ancient Mauritania, is bounded on the W. by the Atlantic Ocean; on the E. by the river Mulvia, which separates it from Algiers; on the N. by the Mediterranean; and on the S. by mount Atlas, or rather by the river Sus, which divides it from the kingdom of Taflet. Its greatest length is from the N. E. to the S. W. amounting to above 590 miles; its breadth is not above 260 where broadest, and in the most narrow places is not above half that breadth. This empire has three capitals: viz. Morocco, Fez, and Mequinez; to which may be added Mogadore. See these articles. The climate is in general sufficiently temperate, healthy, and not so hot as its situation might lead us to suppose. The chain of mountains which form Atlas on the E. side, defends it from the E. winds, that would scorch up the earth were they frequent. The summit of these mountains is always covered with snow; and their abundant descending streams spread verdure through the neighbourhood, make the winter more cold, and temper the heats of summer. The sea on the W. side, which extends along the coast from N. to S. also refreshes the land with regular breezes, that seldom vary according to their seasons. At a distance from the sea, within land, the heat is so great, that the rivulets become dry in summer; but as in hot countries dews are plentiful, the nights are always cool. The rains are tolerably regular in winter; and are even abundant, though the atmosphere is not loaded with clouds as in northern latitudes. Nothing can be conceived more unjust and despotic than the government of Morocco, and nothing more degenerated than the character of the people. The emperor is allowed to have not only an uncontrollable

ble power over the lives and fortunes of his subjects, but in a great measure over their consciences, such as they are; as he is the only person who, as the successor of the prophet, has a right to interpret the Koran; and appoints all the judges under him, of whom those of Morocco and Fez are the chief, whose business it is to explain and dispense all matters relating to their religion; and who, being his creatures and dependents, dare not steer otherwise than as he directs. Here, as in all other Mohammedan countries, the Koran and their comments upon it are their only written laws; and though in some instances their cadis and other civil magistrates are controlled by the arbitrary determinations of their princes, bashaws, generals, and military officers, yet the latter have generally a very great deference and regard for their laws. Murder, theft, and adultery, are commonly punished with death; and their punishments for other crimes, particularly those against the state, are very cruel; as impaling, dragging the prisoners through the streets at a mule's heels till all his flesh is torn off; throwing him from a high tower upon iron-hooks; hanging him upon hooks till he die; crucifying him against the wall; and, indeed, the punishment and condemnation of criminals is in a manner arbitrary. The emperor, or his bashaws, frequently turn executioners; shoot the offender, or cut him to pieces with their own hands, or command others to do it in their presence. Unacquainted with the sources of wealth of which their ancestors were possessed, the Moors pretend there are gold and silver mines in the empire, which the emperors will not permit to be worked, lest their subjects should thus find means to shake off their yoke. There are iron-mines in the south, but the working of them has been found so expensive, that the natives rather use imported iron, notwithstanding the heavy duty it pays, by which its price is doubled. There are copper-mines in the neighbourhood of Santa Cruz, which are not only sufficient for the small consumption of the empire, where copper is little used, but are also an object of exportation, and would become much more so were the duties less immoderate. The coins of this empire are a fluce, a blanquil, and ducat. The fluce is a small copper-coin, twenty whereof make a blanquil, of the value of twopence Sterling. The blanquil is of silver, and the ducat of gold, not unlike that of Hungary, and worth about 9s. Both these pieces are so liable to be clipped and filed by the Jews, that the Moors always carry scales to weigh them; and when found to be much diminished in their weight, they are recoined by the Jews, who are masters of the mint, by which they gain a considerable profit; as they do also by exchanging the light pieces for those that are full weight. Merchants' accounts are kept in ounces, ten of which make a ducat; but in payments to the government, it is said they reckon 17½ for a ducat. The chief mountains are that chain which goes under the name of Mount Atlas, and runs the whole length of Barbary from E. to W. passing through Morocco, and abutting upon that ocean which separates the eastern from the western continent, and is from this mountain called the Atlantic Ocean. See ATLAS. The principal rivers, besides the Malva or Mulvia which rises in the deserts, and running from S. to N. divides Morocco from the kingdom of Algiers, are the Suz, Ommirabih, Rabbata, Larache, Darodt, Sebon, Gueron, and Tansit, which rise in Mount Atlas, and fall into the Atlantic Ocean. The chief capes are Cape Threeforks on the Mediterranean, Cape Spartel at the entrance of the Straits, Cape Cantin, Cape None, and Cape Rajadore, on the Atlantic Ocean. Of the bays the most considerable are, the bay of Tetuan in the Mediterranean, and the bay of Tangier in the straits of Gibraltar. The deserts abound with lions, tigers, leopards, hyenas, and monstrous serpents; but have neither elephants nor rhinoceroses. The Barbary horses were formerly very valuable, and thought equal to the Arabian. Though their breed is now said to be decayed, yet some very fine ones are occasionally imported into England. Camels and dromedaries, asses, mules, and kumrahs, (a most servicable kind of mule, begot by an ass upon a cow), are their beasts of burthen. Their cows are but small, and barren of milk. Their sheep yield but indifferent fleeces, but are very large, as are their goats. Bears, porcupines, foxes, apes, hares, rabbits, ferrets, weasels, moles, cameleons, and all kinds of reptiles, are found here. Partridges and quails, eagles, hawks, and all kinds of wildfowl, are frequent upon the coast. The soil of Morocco is exceedingly fertile. It is most so in the inland provinces. On the W. coast it is in general light

and stony, and is better adapted to the vine and olive than the culture of wheat. They annually burn, before the September rains, the stubble which is left rather long; and this and the dung of cattle, every day turned to pasture, form the sole manure the land receives. The soil requires but little labour, and the plowing is so light that the furrows are scarcely six inches deep; for which reason, in some provinces, wooden plough-shares are used for cheapness. In January the country is covered with verdure, and enameled with flowers. Barley is cut in March, but the wheat-harvest is in June. All fruits are early in this climate; and in forward years the vintage is over in the beginning of September. Heavy rains often impede the harvest; and drought has still greater inconveniences, for it ensures the propagation of locusts. These fatal insects, which have so often laid desolate hot countries, sometimes commit the most dreadful ravages in the empire of Morocco. They come from the south, spread themselves over the lands, and increase to infinity when the rains of spring are not sufficiently heavy to destroy the eggs they deposit on the earth. The large locusts, which are near three inches long, are not the most destructive: as they fly they yield to the current of wind, which hurries them into the sea, or into sandy deserts, where they perish with hunger or fatigue. The young locusts that cannot fly, are the most ruinous; they creep over the country in such multitudes, that they leave not a blade of grass behind; and the noise of their feeding announces their approach at some distance. The devastations of locusts increase the price of provisions, and often occasion famines; but the Moors find a kind of compensation in making food of these insects; prodigious quantities of which they bring to market salted, and dried like red herrings. They have an oily and rancid taste, which habit only can render agreeable: they are eat here however with pleasure. The empire of Morocco might supply itself with all necessities, as well from the abundance and nature of its products, as from the few natural or artificial wants of the Moors occasioned by climate or education. Its wealth consists in the fruitfulness of its soil: its corn, fruits, flocks, flax, salt, gums, and wax, would not only supply its necessities, but yield a superflux, which might become an object of immense trade and barter with other nations. Such numerous exports might return an inexhaustible treasure, were its government fixed and secure, and did subjects enjoy the fruits of their labour and their property in safety. The increase of corn in Morocco is often 60 to one, and 30 is held to be but an indifferent harvest. The Moors, naturally indolent, take little care of the culture of their fruits. Oranges, lemons, and thick-skinned fruits, the trees of which require little nurture, grow in the open fields; and there are very large plantations of them found, which they water to increase their product. Their vines, which yield excellent grapes, are planted as far as the 33d degree. But at Morocco, where they yield a large and delicious grape, they are supported by vine-poles, five or six feet above ground; and as they are obliged to be watered, the little wine made there is seldom preserved. Figs are very good in some parts of the empire; but towards the south they are scarcely ripe before they are full of worms, from the heats and night-dews. Melons, for the same reasons, are rarely eatable; they have but a moment of maturity; which passes so rapidly that it is with difficulty seized. Water-melons are every where reared, and in some provinces are excellent. Apricots, apples and pears, are in tolerable plenty in the neighbourhood of Fez and Mequinez, where water is less scarce and the climate more temperate. But in the plain, which extends along the W. coast, these delicate fruits are very indifferent. The prickly pear, or Barbary fig, is plentifully found in Morocco; and is planted round vineyards and gardens, because its thick and thorny leaves, which are wonderfully prolific, form impenetrable hedges.

Morocco, a city of the above kingdom, about 120 miles N. of Taradant, 90 E. of Mogodore, and 350 S. of Tangier. It is situated in a beautiful valley, formed by a chain of mountains on the N. side, and those of the Atlas, from which it is distant about 20 miles, on the S. and E.

MOROCCO-LEATHER, MARROQUIN, the skins of goats tanned and dyed in a peculiar manner by the Turks; but which processes were originally invented in the kingdom of Morocco. The skins are prepared in parcels, consisting of 36, divided into six bundles, which are folded in the middle, lengthwise, and thrown

into a pit full of lime, whence they are taken out, rinsed in pure water, drained, and suspended in the shade to dry, till the hair becomes loose. After carefully taking off the latter, the skins are returned to the lime-pit, for two or three weeks, when they are again rinsed, and passed repeatedly through a decoction prepared of thirty pounds of dog's-dung, and an equal quantity of water. As soon as the skins are thus gradually impregnated, they are thrown into a large vessel for the space of twelve hours, after which they are cleaned with pure water, and immersed for seven or eight days in a watery decoction made of bran. The skins are now wrung, and thoroughly washed in clear water, to render them soft and pliable: next, they are cured, by spreading a thick layer of common sea-salt, in the proportion of about half a pound to each skin, and piling them up, till they are rendered sufficiently supple. The last process which the skins undergo previously to being dyed, is immersion in a liquor prepared by boiling 24 ounces of dried figs, for each skin, in a copper (we believe, treacle would answer the same purpose,) in which they remain till they are about to be suspended in the air for drying: lastly, they are dipped in a solution of alum, that disposes them for the immediate reception of the dye. The chief colours communicated to Morocco leather, are red and yellow, for the preparation of which, the Turks have long been celebrated. The red colour is prepared by mixing together various articles, in the following proportions, which are required for a parcel of thirty-six skins:

Cochineal	130 drachms.
Round suchet (crocus indicus).....	45
Gutta-gamba	15
Gum-arabic.....	10
White alum, pulverized.....	10
Bark of the pomegranate-tree.....	10
Citron-juice.....	2
Common water	120 lbs.

The alum is gradually added to the other articles, which are thrown into a copper, where they should be boiled for about two hours, till one-tenth part of the water be consumed. In this mixture the skins are repeatedly immersed; and, when sufficiently imbued with the colour, they are dried, and again steeped in a vessel, containing three pounds of hot water (for every two skins) together with one pound of sumach, and a similar quantity of gall-nuts, pulverized and sifted. As soon as the skins are completely impregnated with this liquor, they are slightly rubbed over with a sponge dipped in pure water, and suspended, without being folded, on a wooden frame, for about three quarters of an hour, to drain. They are now carried to a river, or running water, where they are repeatedly rinsed, then pressed with weights, in order to extract the moisture, and hung up in a warm room to dry. The last process which red Morocco-leather undergoes, is that of polishing: this is effected by means of various wooden instruments, that contribute at the same time to remove such of the particles of gall and sumach as may adhere to the skins. The yellow colour is prepared in a manner nearly similar to that just described; the common Avignon or yellow berries (*Graine d'Avignon*) being substituted for cochineal, and employed in similar proportions. The only variation between the two processes of dyeing red and yellow, is, that the former is tinged with the colouring matter, before it is worked, or polished with the wooden instruments; whereas this operation is performed on the latter, previously to its being dyed. But these two are not the only colours dyed by the Turks, who likewise manufacture black, green, and blue leather; which last three, however, are not only destitute of lustre, but are extremely perishable. The Turks, indeed, are as inferior to Europeans in preparing the more common species, as they excel them in manufacturing and dyeing the red and yellow moroceos. See TANNING.

MOROKINNEE, one of the Sandwich Islands. Lon. 156. 27. W. Lat. 20. 39. N.

MORON, a town of Spain, in Andalusia, 30 miles S. E. of Seville. Lon. 5. 20. W. Lat. 37. 0. N.

MOROTOI, one of the large Sandwich Islands, in the North Pacific Ocean, 7 miles W. N. W. of Mowee. Lon. 157. 14. W. Lat. 21. 10. N.

MORPETH, a town of Northumberland, 28 miles N. of Durham, and 91 S. of Edinburgh. Lon. 1. 28. W. Lat. 55. 15. N.

MORPHEUS, in the mythology, the god of sleep, or, according to others, one of the ministers of Somnus. He caused sleepiness, and represented the forms of dreams. Ovid styles him the kindest of the deities; and he is usually described in a recumbent posture, and crowned with poppies.

MORS, or **DEATH**, one of the infernal deities, born of Night without a father. She was worshipped by the ancients with great solemnity. She was not represented as an actually existing power, but as an imaginary being. Euripides introduces her in one of his tragedies on the stage. The moderns represent her as a skeleton armed with a scythe and a scymetar.

MORTAGNE, a town of France, in the department of the North, and late province of French Flanders, at the confluence of the Scarpe and the Scheldt; 8 miles S. E. of Tournay. Lon. 3. 30. E. Lat. 50. 29. N.

MORTAIN, a town of France, in the department of the Channel, 30 miles S. E. of Coutance. Lon. 0. 54. W. Lat. 48. 37. N.

MORTALITY, **BILLS OF**, are accounts or registers specifying the numbers born, married, and buried, in any parish, town, or district. In general they contain only these numbers; and, even when thus limited, are of great use, by shewing the degrees of healthiness and profligence, and the progress of population, in the places where they are kept. It is therefore much to be wished, that such accounts had been always correctly kept in every kingdom, and regularly published at the end of every year. We should then have had under our inspection the comparative strength of every kingdom, as far as it depends on the number of inhabitants, and its increase or decrease at different periods. But such accounts are rendered more useful, when they include the ages of the dead, and the distempers of which they have died. In this case they convey some of the most important instructions, by furnishing us with the means of ascertaining the law which governs the waste of human life, the values of annuities dependent on the continuance of any lives, or any survivorships between them, and the favourableness or unfavourableness of different situations to the duration of human life. There are but few registers of this kind; nor has this subject, though so interesting to mankind, ever engaged much attention till lately. The first bills containing the ages of the dead were those for the town of Breslaw in Silesia. It is well known what use has been made of these by Dr. Halley, and after him by De Moivre. A table of the probabilities of the duration of human life at every age, deduced from them by Dr. Halley, has been published in the *Philos. Trans.* (see the *Abridgment*, vol. iii. p. 669,) and is the first table of this sort that has been ever published. See **ANNUITIES**. Since the publication of this table, similar bills have been established in a few towns of this kingdom; and particularly in London, in 1728, and in Northampton, in 1735. Two improvements of these registers have been proposed: the first is, that the sexes of all that die in every period of life should be specified in them, under the denomination of boys, married men, widowers, and bachelors; and of girls, married women, widows, and virgins. The second is, that they should specify the numbers of both sexes dying of every distemper in every month, and at every age. A third improvement is suggested under the article **LONGEVITY**. Registers of mortality thus improved, when compared with the records of the seasons, and with the circumstances that discriminate different situations, might contribute greatly to the increase of medical knowledge; and they would afford the necessary data for determining the difference between the duration of human life among males and females; for such a difference there certainly is much in favour of females, as will appear from the following facts: at Northampton, though more males are born than females, and nearly the same number die; yet the number of living females appeared, by an account taken in 1746, to be greater than the number of males, in the proportion of 2391 to 1770, or 39 to 30. At Berlin it appeared, from an accurate account which was taken of the inhabitants in 1747, that the number of female citizens exceeded the number of male citizens in the proportion of 459 to 391, or nearly as 47 to 40. And yet out of this smaller number of males, more had died for twenty years preceding 1751, in the proportion of 19 to 17. At Edinburgh, in 1793, the number of females was to the number of males as 44 to 37. (See Sir J. Sinclair's *Stat. Acc.* Vol. VI. p. 563.) But the females that died annually were to the males in no higher proportion

proportion than 16 to 15. Whoever will take the trouble to examine the accounts in Philos. Trans. Abr. vol. vii. part iv. p. 46, &c. will find, that though in the towns there enumerated the proportion of males to females born is no higher than 19 to 18, yet the proportion of boys and girls that die is as 8 to 7; and that in particular, the still-born and chrysom males are to the still-born and chrysom females as 3 to 2. In 39 parishes of the district of Vaud in Switzerland, the number of males that died during ten years before 1766 was 8170; of the females 8167; of whom the numbers that died under one year of age were 1817 males and 1305 females, and under ten years of age, 3099 males and 2598 females. In the beginning of life, therefore, and before any emigrations can take place, the rate of mortality among males appears to be greater than among females. And this is rendered yet more certain by the following accounts: At Vevey, in the district of Vaud, there died in twenty years, ended at 1764, in the first month after birth, of males 135 to 89 females; and in the first year 225 to 162. It appears from a table given by Susmilch, in his *Göttliche Ordnung*, vol. ii. p. 317, that in Berlin 208 males die in the first month, and but 168 females; and in the first year, 489 to 395; and also, from a table of Struys, that in Holland 396 males die in the first year to 306 females. The authorities for these facts, and much more on this subject, may be found in the fourth essay in Dr. Price's *Treatise on Reversionary Payments*, and in the Supplement. We shall here only had the following table, taken from a memoir of Mr. Wargentin's, published in the collection of the *Memoirs of the Royal Academy of Sciences at Stockholm*, printed at Paris in 1772. In all Sweden for nine years, ended in 1763, the proportion of females to males that died out of a given number living, was

Under the age of one year,.....	1000 to 1099
From 1 to 3 years of age	1000 1022
3 5	1042
5 10	1074
10 15	1080
15 20	1097
20 25	1283
25 30	1161
30 35	993
35 40	1159
40 45	1115
45 50	1340
50 55	1339
55 60	1292
60 65	1115
65 70	1080
70 80	1022
80 90	1046
Above 90	1044

Registers of mortality on the improved plan above mentioned, were established in 1772 at Chester, and also, in 1773, at Warrington in Lancashire; and they are so comprehensive and correct, that there is reason to expect they will afford much instruction on the subject of human mortality, and the values of lives. But the country most distinguished in this respect is Sweden; for in that kingdom exact accounts are taken of the births, marriages, and burials, and of the numbers of both sexes that die at all ages in every town and district, and also at the end of every period of five years, of the numbers living at every age: and at Stockholm a society is established, whose business it is to superintend and regulate the enumerations, and to collect from the different parts of the kingdom the registers, in order to digest them into tables of observation. These regulations were begun in Sweden in 1755; and tables, containing the result of them from 1755 to 1763, have been published in Mr. Wargentin's memoirs just referred to; and the most material parts of them may be found in an essay by Dr. Price on the Difference between the Duration of Human Life in Towns and in Country Parishes, printed in the 65th volume of the *Philos. Trans.* part ii. In the fourth essay in Dr. Price's *Treatise on Reversionary Payments and Life Annuities*, the following account is given of the principles on which tables of observation are formed from registers of mortality; and of the proper method of forming them, so as to render them just representations of the number of inhabitants, and the probabilities of the duration of hu-

man life in a town or country. In every place which just supports itself in the number of its inhabitants, without any recruits from other places; or where, for a course of years, there has been no increase or decrease; the number of persons dying every year at any particular age, and above it, must be equal to the number of the living at that age. The number, for example, dying every year at all ages from the beginning to the utmost extremity of life, must, in such a situation, be just equal to the whole number born every year. And for the same reason, the number dying every year at one year of age and upwards, at two years of age and upwards, and so on, must be equal to the numbers that attain to those ages every year; or, to the numbers of the living at those ages. It is obvious, that unless this happens, the number of inhabitants cannot remain the same. If the former number is greater than the latter, the inhabitants must decrease; if less, they must increase. From this observation it follows, that in town or country where there is no increase or decrease, bills of mortality which give the ages at which all die, will shew the exact number of inhabitants, and also the exact law according to which human life wastes in that town or country. To find the number of inhabitants, the mean numbers dying annually at every particular age and upwards must be taken as given by the bills, and placed under one another in the order of the second column of the following tables. These numbers will, it has appeared, be the numbers of the living at 1, 2, 3, &c. years of age; and consequently the sum diminished by half the number born annually will be the whole number of inhabitants. This subtraction is necessary for the following reason: in a table formed in the manner here directed, it is supposed that the numbers in the second column are all living together at the beginning of every year. Thus the number in the second column opposite to 0 in the first column, the table supposes to be all just born together on the first day of the year. The number, likewise, opposite to 1, it supposes to attain to one year of age just at the same time that the former number is born. And the like is true of every number in the second column. During the course of the year, as many will die at all ages as were born at the beginning of the year; and consequently, there will be an excess of the number alive at the beginning of the year above the number alive at the end of the year, equal to the whole number of the annual births; and the true number constantly alive together, is the arithmetical mean between these two numbers: or agreeably to the rule here given, the sum of the numbers in the second column of the table lessened by half the number of annual births. In such a series of numbers, the excess of each number above that which immediately follows it will be the number dying every year out of the particular number alive at the beginning of the year; and these excesses set down regularly as in the third column of the table to which we have referred, will shew the different rates at which human life wastes through all its different periods, and the different probability of life at all particular ages. What has been now said goes on the supposition, that the place whose bills of mortality are given, supports itself, by procreation only, in the number of its inhabitants. In towns this very seldom happens on account of the luxury and debauchery which generally prevail in them. They are, therefore, commonly kept up by a constant succession of strangers, who remove to them from country-parishes and villages. In these circumstances, in order to find the true number of inhabitants, and probabilities of life, from bills of mortality containing an account of the ages at which all die, it is necessary that the proportion of the annual births to the annual settlers should be known, and also the period of life at which the latter remove. Both these particulars may be discovered by the following method: If for a course of years there has been no sensible increase or decrease in a place, the number of annual settlers will be equal to the excess of the annual burials above the annual births. If there is an increase, it will be greater than this excess: if there is a decrease, it will be less. The period of life at which these settlers remove, will appear in the bills by an increase in the number of deaths at that period and beyond it. Thus in the London bills the number of deaths between 20 and 30 is generally above double, and between 30 and 40 near triple, the number of deaths between 10 and 20; and the true account of this is, that from the age of 18 or 20 to 35 or 50, there is an influx of people every year to London from the country, which occasions a great increase in the number of inhabitants.

habitants at these ages; and consequently raises the deaths for all ages above 20 considerably above their due proportion, when compared with the number of deaths before 20. This is observable in all the bills of mortality for towns with which we are acquainted, not excepting even the Breslaw bills. Dr. Halley takes notice, that these bills gave the number of deaths between 10 and 20 too small. This he considered as an irregularity in them owing to chance; and, therefore, in forming his table of observations, he took the liberty so far to correct it, as to render the proportion of those who die to the living in this division of life nearly the same with the proportion which, he says, he had been informed die annually of the young lads in Christ-Church Hospital. But the truth is, that this irregularity in the bills was derived from the cause we have just assigned. During the five years for which the Breslaw bills are given by Dr. Halley, the births did indeed a little exceed the burials; but it appears that this was the effect of some peculiar causes that happened to operate just at that time: for during a complete century from 1633 to 1734, the annual medium of births was 1089, and of burials 1256. This town, therefore, must have been all along kept up by a number of yearly recruits from other places, equal to about a seventh part of the yearly births. It appears from the account in the *Philos. Trans. Abr.* vol. vii. no. 380, p. 46, &c. that from 1717 to 1725, the annual medium of births at Breslaw was 1252, of burials 1507; and that the greatest part of the births died under 10 years of age. From a table in *Susmyleh's works*, vol. i. p. 38, it appears that in reality the greater part of all that die in this town are children under five years of age. What has been now observed concerning the period of life at which people remove from the country to settle in towns, would appear sufficiently probable were there no such evidence for it as has been mentioned; for it might be well reckoned that these people in general must be single persons in the beginning of mature life, who, not having yet obtained settlements in the places where they were born, migrate to towns in quest of employments. It is proper next to endeavour to explain distinctly the effect which these accessions to towns must have on tables of observation formed from their bills of mortality. This is a subject proper to be insisted on, because mistakes have been committed about it; and because also the discussion of it is necessary to shew how near to truth the values of lives come as deduced from such tables. The following general rule may be given on this subject: if a place has for a course of years been maintained in a state nearly stationary, as to number of inhabitants, by recruits coming in every year, to prevent the decrease that would arise from the excess of burials above the births, a table formed on the principle, "that the number dying annually after every particular age, is equal to the number of living at that age," will give the number of inhabitants, and the probabilities of life, too great, for all ages preceding that at which the recruits cease; and after this it will give them right. If the accessions are so great as to cause an increase in the place, such a table will give the number of inhabitants and the probabilities of life too little after the age at which the accessions cease; and too great if there is a decrease. Before that age it will in both cases give them too great; but most considerably so in the former case, or when there is an increase. Agreeably to these observations, if a place increases not in consequence of accessions from other places, but of a constant excess of the births above the deaths, a table constructed on the principle that has been mentioned will give the probabilities of life too low through the whole extent of life; because in such circumstances the number of deaths in the first stages of life must be too great, in comparison of the number of deaths in the latter stages; and more or less so as the increase is more or less rapid. The contrary in all respects takes place where there is a decrease arising from the excess of the deaths above the births. For example: Let us suppose that 244 of those born in a town attain annually to 20 years of age, and that 250 more, all likewise 20 years of age, come into it annually from other places, in consequence of which it has for a course of years been just maintained in the number of its inhabitants, without any sensible increase or decrease: in these circumstances, the number of the living in the town at the age of 20 will be always 244 natives and 250 settlers, or 494 in all; and since these are supposed all to die in the town, and no more recruits are supposed to come in, 494 will be likewise the number dying annually at 20 and upwards. In the same manner it will

appear, on these suppositions, that the number of the living, at every age subsequent to 20, will be equal to the number dying annually at that age and above it; and consequently, that the number of inhabitants and the decrements of life, for every such age will be given exactly by the table. But for all ages before 20, they will be given much too great. For let 250 of all born in the town reach 10; in this case 280 will be the true number of the living in the town at the age of 10; and the recruits not coming in till 20, the number given by the bills as dying between 10 and 20 will be the true number dying annually of the living in this division of life. Let this number be 36; and it will follow that the table ought to make the numbers of the living at the ages between 10 and 20, a series of decreasing means between 280 and (280 diminished by 36, or) 244. But in forming the table on the principle just mentioned, 250 (the number above 20 dying annually in the town who were not born in it) will be added to each number in this series; and therefore the table will give the numbers of the living, and the probabilities of life in this division of life, almost twice as great as they really are. This observation, it is manifest, may be applied to all the ages under 20. Such a table will give the number of inhabitants and the probabilities of life, equally wrong before 20, whether the recruits all come in at 20, agreeably to the supposition just made, or only begin then to come in. In this last case, the table will give the number of inhabitants and probabilities of life too great throughout the whole extent of life, if the recruits come in at all ages above 20. But if they cease at any particular age, it will give them right only from that age; and before, it will err all along on the side of excess; but less considerably between 20 and that age than before 20. For example: if, of the 250 supposed to be in at 20, only 150 then come in, and the rest at 30; the number of the living will be given 100 too high at every age between 20 and 30; but, as just shewn, they will be given 250 too high at every age before 20. In general, therefore, the number of the living at any particular age must be given by the supposed table as many too great as there are annual settlers after that age; and if these settlers come in at all ages indiscriminately, during any certain interval of life, the number of inhabitants and the probabilities of life will be continually growing less and less wrong the nearer any age is to the end of that interval. These observations prove, that tables of observation formed in the common way, from bills of mortality for places where there is an excess of the burials above the births, must be erroneous for a great part of the duration of life, in proportion to the degree of that excess. They shew likewise at what parts of life the errors in such tables are most considerable, and how they may be in a great measure corrected. All this shall be exemplified in the particular case of London. The number of deaths between the ages of 10 and 20 is always so small in the London bills, that it seems certain few recruits come to London under 20, or at least not so many as before this age are sent out for education to schools and universities. After 20 great numbers come in till 30, and some perhaps till 40 or 50: but at every age after 50, it is probable that more retire from London than come to it. The London tables of observation, therefore, being formed on the principle already mentioned, cannot give the probabilities of life right till 40. Between 30 and 40 they must be a little too high; but more so between 20 and 30, and most of all so before 20. It follows also, that these tables must give the number of inhabitants in London much too great. The first of the following tables is formed in the manner here explained, from the London bills for 10 years, from 1759 to 1768, and adapted to 1000 born as a radix. The sum of the numbers in the second column, diminished by half the number born, is 25,757. According to this table then, for every 1000 deaths in London there are 25½ as many inhabitants; or, in other words, the expectation of a child just born is 25½; and the inhabitants are to the annual burials as 25½ to 1. But it has appeared, that the numbers in the second column, being given on the supposition that all those who die in London were born there, must be too great; and we have hence a demonstration, that the probabilities of life are given in the common tables of London observations too high for at least the first 30 years of life; and also, that the number of inhabitants in London must be less than 25½ multiplied by the annual burials. The common tables, therefore, of London observations undoubtedly need correction, as Mr. Simpson suggested, and in some measure performed; though too

imperfectly, and without going upon any fixed principles, or shewing particularly how tables of observation ought to be formed, and how far in different circumstances, and at different ages, they are to be depended on. The way of doing this, and in general the right method of forming genuine tables of observation for towns, may be learned from the following rule: "From the sum of all that die annually, after any given age, subtract the number of annual settlers after that age; and the remainder will be the number of the living at the given time." If, therefore, the number of annual settlers in a town at every age could be ascertained, a perfect table of observations might be formed for that town from the bills of mortality, containing an account of the ages at which all die in it. But no more can be learned in this instance, from any bills, than the whole number of annual settlers, and the general division of life in which they enter. This, however, may be sufficient to enable us to form tables that shall be tolerably exact. For instance; Suppose the annual deaths in a town which has not increased or decreased, to have been for many years in the proportion of 4 to 3 to the annual births. It will hence follow, that $\frac{1}{3}$ of the persons who die in such a town are settlers, or emigrants from other places, and not natives; and the sudden increase in the deaths after 20 will also shew, agreeably to what was before observed, that they enter after this age. In forming, therefore, a table for such a town, a quarter of all that die at all ages throughout the whole extent of life must be deducted from the sum of all that die after every given age before 20; and the remainder will be the true number living at that given age. And if at 20, and every age above it, this deduction is omitted, or the number of the living at every such age is taken the same with the sum of all that die after it, the result will be (supposing most of the settlers to come in before 30, and all before 40) a table exact till 20; too high between 20 and 30; but nearly right for some years before 40; and after 40 exact again. Such a table, it is evident, will be the same with the table last described at all ages above 20, and different from it only under 20. It is evident also, that on account of its giving the probabilities of life too great for some years after 20, the number of inhabitants deduced from it may be depended on as somewhat greater than the truth; and more or less so, as the annual recruits enter in general later or sooner after 20. Let us now consider what the result of these remarks will be, when applied particularly to the London bills. It must be here first observed, that at least one-quarter of all that die in London are suppliers or settlers from the country, and not natives. The medium of annual burials for 10 years, from 1759 to 1768, was 22,956; of births 15710. The excess is 7246, or near a third of the burials. The same excess during 10 years before 1750 was 10,500, or near half the burials. London was then decreasing. For the last 12 or 15 years it has been increasing. This excess, therefore, agreeably to the foregoing observations, was then greater than the number of annual settlers, and it is now less. It is however here supposed, that the number of annual settlers is now no more than a quarter of the annual burials, in order to allow for more omissions in the births than the burials; and also in order to be more sure of obtaining results that shall not exceed the truth. Of every 1000 then who die in London only 750 are natives, and 250 are recruits, who come to it after 18 or 20 years of age; and, consequently, to obtain from the bills a more correct table than the first of the following tables, 250 must be subtracted from every one of the number in the second column till 20; and the numbers in the third column must be kept the same, the bills always giving these right. After 20, the table is to be continued unaltered; and the result will be, a table which will give the numbers of the living at all ages in London much nearer the truth, but still somewhat too high. Such is the second of the following tables. The sum of all the numbers in the second column of this table, diminished by 500, is 20,750. For every 1000 deaths, therefore, in London, there are, according to this table, 20,750 living persons in it; or for every single death $20\frac{1}{4}$ inhabitants. It was before shewn, that the number of inhabitants in London could not be so great as 25 times $\frac{1}{4}$ the deaths. It now appears (since the numbers in the second column of this table are too high) that the number of inhabitants in London cannot be so great as 20 times $\frac{1}{4}$ the deaths. And this is a conclusion which every one, who will bestow due attention on what has been said, will find himself forced to receive.

It will not be amiss, however, to confirm it by the following fact, the knowledge of which is derived from the particular enquiry and information of Mr. Harris, the late ingenious master of the royal mathematical school in Christ-Church hospital. The average of lads in this school has, for 30 years past, been 831. They are admitted at all ages between seven and 11; and few stay beyond 16: they are therefore, in general, lads between the ages of eight and 16. They have better accommodations than children commonly have; and about 300 of them have the advantage of being educated in the country. In such circumstances, it may be well reckoned, that the proportion of children dying annually must be less than the general proportion of children dying annually at the same ages in London. The fact is, that for the last 30 years 124 have died annually, or one in 70 $\frac{1}{2}$. According to Table II. one in 73 dies between 10 and 20, and one in 70 between eight and 16. That table, therefore, probably gives the decrements of life in London, at these ages, too little, and the numbers of the living too great: and if this is true of these ages, it must be true of all other ages under 20; and it follows demonstrably, in conformity to what was before shewn, that more people settle in London after 20 than the fourth above supposed; and that from 20 to at least 30 or 35, the numbers of the living are given too great, in proportion to the decrements of life. In this table the numbers in the second column are doubled at 20, agreeably to what really happens in London; and the sum of the numbers in this column diminished by half the whole number of deaths, gives the expectation of life, not of a child just born, as in other tables, but of all the inhabitants of London at the time they enter it, whether that be at birth or at 20 years of age. The expectations, therefore, and the values of London lives under 20, cannot be calculated from this table. But it may be very easily fitted for this purpose, by finding the number of births which, according to the given decrements of life, will leave 494 alive at 20; and then adapting the intermediate numbers in such a manner to this radix, as to preserve all along the number of the living in the same proportion to the numbers of the dead. This is done in the third of the following tables, and this table may be recommended as better adapted to the present state of London than any other table. The values of lives, however, deduced from it, are in general nearly the same with those deduced by Mr. Simpson from the London bills as they stood 60 years ago; (See ANNUITIES.) The main difference is, that after 52, and in old age, this table gives them somewhat lower than Mr. Simpson's table. The difference between the rate of human mortality in great towns and in country parishes and villages, may be found from various tables in Sir J. Sinclair's Statistical Account of Scotland; as well as from the Rev. D. Wilkie's table and calculations for the county of Fife, inserted under the article Annuities. But after all, the bills of mortality in many parts of Great Britain must be acknowledged to be materially defective; the deficiencies are ascribed chiefly to the following circumstances: 1. Many congregations of dissenters inhabiting towns have their own peculiar burying grounds; as have likewise the Jews, and the Roman Catholics who reside in London. 2. Some persons, from motives of poverty or convenience, inter their dead without any religious ceremony; this is known to happen in the Metropolis, in Bristol, and Newcastle-upon-Tyne, and may happen in a few other large towns. 3. Children who die before baptism are interred without any religious ceremony, and consequently are not registered. 4. Many persons employed in the army and in navigation die abroad, and consequently their burials remain unregistered. 5. Negligence may be supposed to cause some omissions in the registers, especially in those small parishes where the officiating minister is not resident. Whatever may be the total number of deaths and burials, which from these several circumstances are not brought to account, it has been estimated that about 3000 of them may be attributed to the metropolis, and a large portion of the rest may be ascribed to the other great towns, and to Wales, where the registers are less carefully kept than in England. In Scotland the registers of mortality have not yet been so generally established as in England, and those which are kept are subject to still greater inaccuracies. The following are the tables alluded to in the foregoing dissertation upon the bills of mortality, and are allowed to be as accurate as the circumstances under which they were constructed could possibly admit.

MORTALITY.—TABLE I.

Shewing the probabilities of life in London, on the supposition that all who die in London were born there. Formed from the bills for ten years, from 1759 to 1768.

Ages.	Persons living.	Decr. of Life.	Ages.	Persons living.	Decr. of Life.	Ages.	Persons living.	Decr. of Life.
0	1000	240	31	404	9	62	132	7
1	760	99	32	395	9	63	125	7
2	661	42	33	386	9	64	118	7
3	619	29	34	377	9	65	111	7
4	590	21	35	368	9	66	104	7
5	569	11	36	359	9	67	97	7
6	558	10	37	350	9	68	90	7
7	548	7	38	341	9	69	83	7
8	541	6	39	332	10	70	76	6
9	535	5	40	322	10	71	70	6
10	530	4	41	312	10	72	64	6
11	526	4	42	302	10	73	58	5
12	522	4	43	292	10	74	53	5
13	518	3	44	282	10	75	48	5
14	515	3	45	272	10	76	43	5
15	512	3	46	262	10	77	38	5
16	509	3	47	252	10	78	33	4
17	506	3	48	242	9	79	29	4
18	503	4	49	233	9	80	25	3
19	499	5	50	224	9	81	22	3
20	494	7	51	215	9	82	19	3
21	487	8	52	206	8	83	16	3
22	479	8	53	198	8	84	13	2
23	471	8	54	190	7	85	11	2
24	463	8	55	183	7	86	9	2
25	455	8	56	176	7	87	7	2
26	447	8	57	169	7	88	5	1
27	439	8	58	162	7	89	4	1
28	431	9	59	155	8	90	3	1
29	422	9	60	147	8			
30	413	9	61	139	7			

MORTALITY.—TABLE II.

Shewing the true probabilities of life in London till the age of nineteen.

Ages.	Persons living.	Decr. of Life.	Ages.	Persons living.	Decr. of Life.
0	750	240	12	272	4
1	510	99	13	268	3
2	411	42	14	265	3
3	369	29	15	262	3
4	340	21	16	259	3
5	319	11	17	256	4
6	308	10	18	253	
7	298	7	19	249	
8	291	6	20	494	
9	285	5	21	487	
10	280	4	&c.	&c.	
11	276	4			

The numbers in the second column to be continued as in the last table.

MORTALITY.—TABLE III.

Shewing the true probabilities of life in London for all ages. Formed from the bills for ten years, from 1759 to 1768.

Ages.	Persons living.	Decr. of Life.	Ages.	Persons living.	Decr. of Life.	Ages.	Persons living.	Decr. of Life.
0	1518	486	31	404	9	62	132	7
1	1032	200	32	395	9	63	125	7
2	832	85	33	386	9	64	118	7
3	747	59	34	377	9	65	111	7
4	688	42	35	368	9	66	104	7
5	646	23	36	359	9	67	97	7
6	623	20	37	350	9	68	90	7
7	603	14	38	341	9	69	83	7
8	589	12	39	332	10	70	76	6
9	577	10	40	322	10	71	70	6
10	567	9	41	312	10	72	64	6
11	558	9	42	302	10	73	58	5
12	549	8	43	292	10	74	53	5
13	541	7	44	282	10	75	48	5
14	534	6	45	272	10	76	43	5
15	528	6	46	262	10	77	38	5
16	522	7	47	252	10	78	33	4
17	515	7	48	242	9	79	29	4
18	508	7	49	233	9	80	25	3
19	501	7	50	224	9	81	22	3
20	494	7	51	215	9	82	19	3
21	487	8	52	206	8	83	16	3
22	479	8	53	198	8	84	13	2
23	471	8	54	190	7	85	11	2
24	463	8	55	183	7	86	9	2
25	455	8	56	176	7	87	7	2
26	447	8	57	169	7	88	5	1
27	439	8	58	162	7	89	4	1
28	431	9	59	155	8	90	3	1
29	422	9	60	147	8			
30	413	9	61	139	7			

MORTANCESTRY, in Scots law, dead ancestors.

MORTANCESTRY, BRIEF OF, in Scots law, anciently the ground of an action at the instance of an heir, in the special case where he had been excluded from the possession of his ancestor's estate by the superior, or other person pretending right.

MORTAR, [*morter*, Dutch; *mortier*, French,] cement made of lime and sand with water, and used to join stones or bricks. See CEMENT.

MORTAR, [*mortarium*, Lat.] a chemical utensil very useful for the division of bodies, partly by percussion and partly by grinding. Mortars have the form of an inverted bell. The matter intended to be pounded is to be put into them, and is struck and bruised by a long instrument called a pestle. The motion given to the pestle ought to vary according to the nature of the substances to be pounded. Those which are easily broken, or which are apt to fly out of the mortar, or which are hardened by the stroke of the pestle, require that this instrument should be moved circularly, rather by grinding or bruising than by striking. Those substances which are softened by the heat occasioned by rubbing and percussion, require to be pounded very slowly. Those which are very hard, and which are not capable of being softened, are easily pounded by repeated strokes of the pestle. They require no bruising but when they are brought to a certain degree of fineness. But these things are better learned by habit and practice than by directions. As mortars are constantly necessary in chemistry, they ought to be kept of all sizes and materials; as of marble, copper, glass, iron, gritstone, and agate. The nature of the substance to be pounded determines the choice of the kind of

of mortar. The hardness and dissolving power of that substance are particularly to be attended to. As copper is a soft metal, soluble by almost all menstrua, and hurtful to health, good artists have some time ago proscribed the use of this metal. One of the principal inconveniences of pulverisation in a mortar proceeds from the fine powder which rises abundantly from some substances during the operation. If these substances be precious, the loss will be considerable; and if they be injurious to health, they may hurt the operator. These inconveniences may be remedied, either by covering the mortar with a skin, in the middle of which is a hole, through which the pestle passes, or by moistening the matter with a little water when this addition does not injure it; or, lastly, by covering the mouth and nose of the operator with a fine cloth, to exclude this powder. Some substances, as corrosive sublimate, arsenic, calxes of lead, cantharides, euphorbium, &c. are so noxious, that all these precautions ought to be used, particularly when a large quantity of them is pounded. Large mortars ought to be fixed upon a block of wood, so high, that the mortar shall be level with the middle of the operator. When the pestle is large and heavy, it ought to be suspended by a cord or chain fixed to a moveable pole, placed horizontally above the mortar: this pole considerably relieves the operator, because its elasticity assists the raising of the pestle.

MORTAR, or **MORTAR-PIECE**, in the military art, is a short piece of ordnance, thick and wide, proper for throwing bombs, carcasses, shells, stones, bags filled with grape-shot, &c. See **PROJECTILES**.

MORTARS, **LAND**, are those used in sieges, and of late in battles, mounted on beds made of solid timber, consisting generally of four pieces, those of the royal and cohorn excepted, which are but one single block; and both mortar and bed are transported on block-carriages.

MORTGAGE, in English law, [*mortuum radium*, Lat. or dead pledge,] is where a man borrows of another a specific sum (e. g. 200*l.*), and grants him an estate in fee, on condition that if he, the mortgager, shall pay the mortgagee the said sum of 200*l.* on a certain day mentioned in the deed, that then the mortgager may re-enter on the estate so granted in pledge; or, as is now the more usual way, that the mortgagee shall re-convey the estate to the mortgager: in this case the land which is so put in pledge, is by law, in case of nonpayment at the time limited, for ever dead and gone from the mortgager; and the mortgagee's estate in the lands is then no longer conditional, but absolute. But so long as it continues conditional, that is, between the time of lending the money and the time allotted for payment, the mortgagee is called tenant in mortgage. But as it was formerly a doubt, whether, by taking such estate in fee, it did not become liable to the wife's dower, and other memorances of the mortgage (though that doubt has been long ago over-ruled by our courts of equity,) it, therefore, became usual to grant only a long term of years, by way of mortgage; with condition to be void on repayment of the mortgage-money: which course has been since continued, principally because on the death of the mortgagee such term becomes vested in his personal representatives, who alone are intitled in equity to receive the money lent, of whatever nature the mortgage may happen to be. As soon as the estate is created, the mortgager may immediately enter on the lands; but is liable to be dispossessed, upon performance of the condition by payment of the mortgage-money at the day limited. And therefore the usual way is to agree that the mortgager shall hold the land till the day assigned for payment; when in case of failure, whereby the estate becomes absolute, the mortgagee may enter upon it and take possession, without any possibility at law of being afterwards evicted by the mortgager, to whom the land is now for ever dead. But here again the courts of equity interpose; and though a mortgage be thus forfeited, and the estate absolutely vested in the mortgagee at the common law, yet they will consider the real value of the tenements compared with the sum borrowed. And if the estate be of greater value than the sum lent thereon, they will allow the mortgager at any reasonable time to recal or redeem his estate; paying to the mortgagee his principal, interest, and expences: for otherwise, in strictness of law, an estate worth 1000*l.* might be forfeited for non-payment of 100*l.* or a less sum. This reasonable advantage allowed to mortgagers, is called the equity of redemption; and this enables a mortgager to call on the mortgagee, who

has possession of his estate, to deliver it back, and account for the rents and profits received on payment of his whole debt and interest, thereby turning the mortuum into a kind of *vivum vadum*. See **VADIUM**. But, on the other hand, the mortgagee may either compel the sale of the estate, in order to get the whole of his money immediately; or else call upon the mortgager to redeem his estate presently, or in default thereof, to be for ever foreclosed from redeeming the same; that is, to lose his equity of redemption without possibility of recall. And also, in some cases of fraudulent mortgages, the fraudulent mortgager forfeits all equity of redemption whatsoever. It is not, however, usual for mortgagees to take possession of the mortgaged estate, unless where the security is precarious, or small; or where the mortgager neglects even the payment of interest: when the mortgagee is often obliged to bring an ejectment, and take the land into his own hands, in the nature of a pledge, or the pignus of the Roman law: whereas, while it remains in the hands of the mortgager, it more resembles their hypotheca, which was where the possession of the thing pledged remained with the debtor. But by statute 7 Geo. II. c. 20, after payment or tender by the mortgager of principal, interest, and costs, the mortgagee can maintain no ejectment; but may be compelled to re-assign his securities. In Glanvil's time, when the universal method of conveyance was by livery of seisin or corporal tradition of the lands, no gage or pledge of lands was good unless possession was also delivered to the creditor; si non sequatur ipsius vadi traditio, curia domini regis hujusmodi privatas conventiones tueri non solet; for which the reason given is, to prevent subsequent and fraudulent pledges of the same land; cum in tali casu possit eadem res pluribus aliis creditoribus tum prius tum posterius invadiari. And the frauds which have arisen, since the exchange of these public and notorious conveyances for more private and secret bargains, have well evinced the wisdom of the ancient law.

MORTIER, an ensign of dignity, born by the late chancellor and grand presidents of the parliament of France. That born by the chancellor was a piece of cloth of gold, edged and turned up with ermine; and that of the first president a piece of black velvet edged with a double row of gold-lace, while those of the other presidents were only edged with a single row. These they carried on their heads, in grand ceremonies, such as the entry of the king; but ordinarily they carried them in their hands.

MORTIFICATION, in medicine and surgery, a total extinction of the natural heat of the body, or a part thereof. Some define mortification a disease, wherein the natural juices of any part quite lose their proper motion; and thus fall into a fermentative one, and corrupt and destroy the texture of the part. See **SURGERY**.

MORTIFICATION, in religion, is any severe penance observed on a religious account. The practice has been very ancient and almost universal. See **FAST**.

MORTISE, or **MORTOISE**, in carpentry, is a kind of joint wherein a hole of a certain depth is made in a piece of timber, which is to receive another piece called a tenon.

MORTMAIN, or **ALIENATION** is **MORTMAIN**, [*in mortua manu*, Lat.] is an alienation of lands or tenements to any corporation, sole or aggregate, ecclesiastical or temporal. But these purchases having been chiefly made by religious houses, in consequence whereof the lands become perpetually inherent in one dead hand, this occasioned the general appellation of the term mortmain to be applied to such alienations, and the religious houses themselves to be principally considered in forming the statutes of mortmain: in deducing the history of which statutes, it is curious to observe the great address and subtle contrivance of the ecclesiastics in eluding from time to time the laws in being, and the zeal with which successive parliaments have pursued them through all their finesses: how new remedies were still the parents of new evasions; till the legislature at last, though with difficulty, have obtained a decisive victory. By the common law any man might dispose of his lands to any other private man at his own discretion, especially when the feudal restraints of alienation were worn away. "Yet (says Blackstone,) in consequence of these it was always, and is still, necessary, for corporations to have a licence of mortmain from the crown, to enable them to purchase lands, for as the king is the ultimate lord of every fee, he ought not, unless by his own consent, to lose his privilege of escheats and other feudal profits."

profits, by the vesting of lands in tenants that can never be attained or die. And such licences of mortmain seem to have been necessary among the Saxons above 60 years before the Norman conquest. But, besides this general licence from the king as lord paramount of the kingdom, it was also requisite, whenever there was a mesne or intermediate lord between the king and the alienor, to obtain his licence also (upon the same feudal principles) for the alienation of the specific land. And if no such licence was obtained, the king or other lord might respectively enter on the lands so alienated in mortmain, as a forfeiture. The necessity of this licence from the crown was acknowledged by the constitutions of Clarendon, in respect of advowsons, which the monks always greatly coveted, as being the groundwork of subsequent appropriations. Yet such were the influence and ingenuity of the clergy, (that notwithstanding this fundamental principle) the largest and most considerable donations of religious houses happened within less than two centuries after the conquest. And (when a licence could not be obtained) their contrivance seems to have been this: that as the forfeiture for such alienations accrued in the first place to the immediate lord of the fee, the tenant who meant to alienate first conveyed his lands to the religious house, and instantly took them back again to hold as tenant to the monastery; which kind of instantaneous seisin was probably held not to occasion any forfeiture: and then, by pretext of some other forfeiture, surrender, or escheat, the society entered into those lands in right of such their newly acquired seignior, as immediate lords of the fee. But when these donations began to grow numerous, it was observed that the feudal services, ordained for the defence of the kingdom, were every day visibly withdrawn; that the circulation of landed property from man to man began to stagnate: and that the lords were curtailed of the fruits of their seigniories, their escheats, wardships, reliefs, and the like; and therefore, in order to prevent this, it was ordained by the second of King Henry III's great charters, and afterwards by that printed in our common statute-books, that all such attempts should be void, and the land forfeited to the lord of the fee. But as this prohibition extended only to religious houses, bishops and other sole corporations were not included therein; and the aggregate ecclesiastical bodies (who, Sir Edward Coke observes, in this were to be commended, that they ever had of their counsel the best learned men that they could get) found many means to creep out of this statute, by buying in lands that were bona fide holden of themselves as lords of the fee, and thereby evading the forfeiture; or by taking long leases for years, which first introduced those extensive terms for a thousand or more years, which are now so frequent in conveyances. This produced the statute de religiosis, 7 Edward I.: which provided, that no person, religious or other whatsoever, should buy, or sell, or receive, under pretence of a gift, or term of years, or any other title whatsoever, nor should by any art or ingenuity appropriate to himself, any lands or tenements in mortmain; upon pain that the immediate lord of the fee, or, on his default for one year, the lords paramount, and, in default of all of them, the king, might enter thereon as a forfeiture. This seemed to be a sufficient security against all alienations in mortmain: but as these statutes extended only to gifts and conveyances between the parties, the religious houses now began to set up a fictitious title to the land, which it was intended they should have, and to bring an action to recover it against the tenant; who by fraud and collusion, made no defence, and thereby judgement was given for the religious house, which then recovered the land by a sentence of law upon a supposed prior title. And thus they had the honour of inventing those fictitious adjudications of the right, which are since become the great assurance of the kingdom, under the name of common recoveries. But upon this the statute of Westminster the second, 13 Edw. I. c. 32, enacted, that in such cases a jury shall try the true right of the demandants or plaintiffs to the land; and if the religious house or corporation be found to have it, they shall still recover seisin: otherwise it shall be forfeited to the immediate lord of the fee, or else to the next lord, and finally to the king, upon the immediate or other lords default. And the like provision was made by the succeeding chapter, in case the tenants set up crosses upon their lands (the badges of knights templars and hospitallers) in order to protect them from the feudal demands of their lords, by virtue of the privileges of those religious and military orders. And so careful was this pro-

vident prince to prevent any future evasions, that when the statute of quia emptores, 18 Edward I. abolished all sub-infeudations, and gave liberty for all men to alienate their lands to be holden of their next immediate lord, a proviso was inserted that this should not extend to authorize any kind of alienation in mortmain. And when afterwards the method of obtaining the king's licence by writ of ad quod damnum was marked out by the statute 27 Edw. I. st. 2, it was farther provided by statute 34 Edw. I. st. 5, that no such licence should be effectual without the consent of the mesne or intermediate lords. Yet still it was difficult to set bounds to ecclesiastical ingenuity: for when they were driven out of all their former holds, they devised a new method of conveyance, by which the lands were granted, not to themselves directly, but to nominal feoffees to the use of the religious houses; thus distinguishing between the possession and the use, and receiving the actual profits, while the seisin of the land remained in the nominal feoffee; who was held by the courts of equity (then under the direction of the clergy) to be bound in conscience to account to his cestuy que use for the rents and emoluments of the estate. And it is to these inventions that our practisers are indebted for the introduction of uses and trusts, the foundation of modern conveyancing. But, unfortunately for the inventors themselves, they did not long enjoy the advantage of their new device; for the statute 15 Richard II. c. 5, enacts, that the lands which had been so purchased to uses should be admortgised by licence from the crown, or else be sold to private persons; and that for the future uses shall be subject to the statutes of mortmain, and forfeitable like the lands themselves. And whereas the statutes had been eluded by purchasing large tracts of land adjoining to churches, and consecrating them by the name of church-yards, such subtle imagination is also declared to be within the compass of the statutes of mortmain. And civil or lay corporations, as well as ecclesiastical, are also declared to be within the mischief, and of course within the remedy provided, by those salutary laws. And lastly, at during the times of popery lands were frequently given to superstitious uses, though not to any corporate bodies; or were made liable in the hands of heirs and devisees to the charge of obits, chauntries, and the like, which were equally pernicious in a well-governed state as actual alienations in mortmain; therefore at the dawn of the Reformation, the statute 23 Hen. VIII. c. 10, declares, that all future grants of lands for any of the purposes aforesaid, if granted for any longer term than twenty years, shall be void. But, during all this time, it was in the power of the crown, by granting a licence of mortmain, to remit the forfeiture, so far as related to its own rights; and to enable any spiritual or other corporation to purchase and hold any lands or tenements in perpetuity: which prerogative is declared and confirmed by the statute 18 Edw. III. st. 3. c. 3. But as doubts were conceived at the time of the Revolution how far such licence was valid, since the king had no power to dispense with the statutes of mortmain by a clause of non obstante, which was the usual course, though it seems to have been unnecessary; and as, by the gradual declension of mesne seigniories through the long operation of the statute of quia emptores, the rights of intermediate lords were reduced to a very small compass; it was, therefore, provided by the statute 7 and 8 W. III. c. 37, that the crown for the future at its own discretion may grant licences to alienate or take in mortmain, of whomsoever the tenements may be holden. After the dissolution of monasteries under Henry VIII. though the policy of the next popish successor affected to grant a security to the possessors of abbey-lands, yet, in order to regain so much of them as either the zeal or timidity of their owners might induce them to part with, the statutes of mortmain were suspended for twenty years by the statute of 1 and 2 P. and M. c. 8, and during that time any lands or tenements were allowed to be granted to any spiritual corporation without any licence whatsoever. And long afterwards, for a much better purpose, the augmentation of poor livings, it was enacted by the statute 17 Car. II. c. 3, that appropriators may annex the great tithes to the vicarages; and that all benefices under 100*l.* per annum may be augmented by the purchase of lands, without licence of mortmain in either case; and the like provision hath been since made in favour of the governors of Queen Anne's bounty. It hath also been held, that the statute 23 Henry VIII. before mentioned, did not extend to any thing but superstitious uses; and that, therefore, a man may give lands for the maintenance of a school, an hospital,

or any other charitable uses. But as it was apprehended from recent experience, that persons on their death-beds might make large and improvident dispositions even for these good purposes, and defeat the political ends of the statutes of mortmain; it is therefore enacted by the statute 9 Geo. II. c. 36, that no lands or tenements, or money to be laid out thereon, shall be given for, or charged with, any charitable uses whatsoever, unless by deed indented, executed in the presence of two witnesses twelve calendar-months before the death of the donor, and enrolled in the court of chancery within six months after its execution (except stocks in the public funds, which may be transferred within six months previous to the donor's death), and unless such gift be made to take effect immediately, and be without power of revocation; and that all other gifts shall be void. The two universities, their colleges and their scholars upon the foundation of the colleges of Eton, Winchester, and Westminster, are excepted out of this act; but such exemption was granted with this proviso, that no college shall be at liberty to purchase more advowsons than are equal in number to one moiety of the fellows or students upon the respective foundations.

MORTUARY, [*mortuarium*, Lat.] in law, a sort of ecclesiastical heriot, being a customary gift claimed by, and due to, the minister in very many parishes on the death of his parishioners. See **HERIOT**. They seem originally to have been only a voluntary bequest to the church; being intended, as Lyndewode informs us, from a constitution of Archbishop Langham, as a kind of expiation and amends to the clergy for the personal tithes, and other ecclesiastical duties, which the laity in their life-time might have neglected or forgotten to pay. For this purpose, after the lord's heriot or best good was taken out, the second best chattel was reserved to the church as a mortuary. And therefore in the laws of king Canute, this mortuary is called soul-scot, or symbolum animæ.

MORYIEDRO, a town of Spain, in Valencia, 13 miles N. E. of Valencia. Lon. 0. 10. E. Lat. 39. 38. N.

MORUS, the **MULBERRY-TREE**; a genus of the tetrandria order, and monœcia class of plants; natural order, Scabridæ. The male calyx is quadripartite; corolla none; the female calyx tetraphyllous; no corolla; styles two; calyx becoming a berry, with one seed. There are seven species.

M. ALBA, the **WHITE MULBERRY-TREE**, rises with an upright trunk, branching twenty or thirty feet high; garnished with large, oblique, heart-shaped, smooth, light-green, shining leaves, and monœcious flowers, succeeded by pale-whitish fruit. There is a variety with purplish fruit. Mulberry-trees are noted for their leaves affording the principal food of that valuable insect the silk-worm. See **MULBERRY**. The leaves of the alba are preferred for this purpose in Europe; but in China, where the best silk is made, the worms are said to be fed with those of the *morus tartarica*. The advantages of white mulberry-trees are not confined to the nourishment of worms: they may be cut every three or four years like willows and poplar-trees, to make taggots; and the sheep eat their leaves in winter. This kind of food, of which they are extremely fond, is very nourishing; it gives a delicacy to the flesh, and a fineness and beauty to the wool. In short, in every climate, and in most fields, it might be proper, as is the case in Spain, to wait for the first hoar-frost shaking off the leaves, which are gathered and placed to dry in sheds or cart-houses, taking care always to stir them from time to time. In Spain, the sheep are fed on these leaves during the cold and frosts. By this method no injury is done to the mulberries, which produce leaves every year; and it is thought that the beauty and fineness of the Spanish wool is in a great measure owing to the use of this kind of food. From these considerations M. Bourgeois infers, that even in countries where, from the nature of the climate, the scarcity of workmen, and the high price of labour, or any other particular causes, silk-worms could not be raised to any advantage, the cultivation of mulberry-trees ought not to be neglected. The fruit of the white mulberry has a sweetish and very insipid taste. Birds, however, are very fond of it; and it is remarked that those which have been fed with such fruit afford excellent meat.

M. PAPYRIFERA, the **PAPER MULBERRY-TREE** of JAPAN, grows twenty or thirty feet high; having large palmated leaves, some trilobate, others quinquelobed: and monœcious flowers, succeeded by small black fruit. This species has its name from

the paper chiefly used by the Japanese being made of the bark of its branches. The leaves also serve for food to the silk-worm, and it is cultivated with success in France. It thrives best in sandy soils, grows faster than the common mulberry, and at the same time is not injured by the cold. M. De la Bouvière affirms that he procured a beautiful vegetable silk from the bark of the young branches of this species which he cut while the tree was in sap, and afterwards beat and steeped.

M. TARTARICA, the **TARTARIAN MULBERRY**, has ovate oblong leaves equal on both sides, and equally serrated. It abounds on the banks of the Wolga and the Tanais.

MOSAIC LAW, or the **LAW OF MOSES**, the most ancient system of law that we know of in the world. It is of three kinds; the moral law, the ceremonial law, and the judicial law. The different manner in which each of these was delivered may, perhaps, suggest a right idea of their different natures. The moral law, or ten commandments, for instance, was delivered on the top of the mountain, in the face of the world, as being of universal influence, and obligatory on all mankind. The ceremonial was received by Moses in private in the tabernacle, as being of peculiar concern, belonging to the Jews only, and destined to cease when the tabernacle was down, and the veil of the temple rent. As to the judicial law, it was neither so publicly nor so audibly given as the moral law, nor yet so privately as the ceremonial; this kind of law being of an indifferent nature, to be observed or not observed, as its rites suit with the place and government under which we live. The five books of Moses, called the Pentateuch, are frequently styled, by way of emphasis, the Law. This was held by the Jews in such veneration, that they would not allow it to be laid upon the bed of any sick person, lest it should be polluted by touching the dead.

MOSAIC LAW, HARMONY OF THE, WITH REFERENCES TO THOSE PARTS OF THE PENTATEUCH WHERE THE RESPECTIVE LAWS OCCUR.—CLASS I. The Moral Law written on the two Tables, containing the Ten Commandments, Exod. xx. 3—17. Deut. v. 7—21.—The sum of both tables, Lev. xix. 18. Deut. vi. 5.—CLASS II. The Ceremonial Law may be reduced to the following heads, viz. Of the holy place, Ex. xx. Lev. xvii. Deut. xii.—Of the matter and structure of the tabernacle, Ex. xxv. xxvi. xxvii. xxxv.—Of the instruments for it, viz. The laver of brass, Ex. xxx.—The altar of burnt-offering, Ex. xxvii.—The altar of incense, Ex. xxx.—The candlestick of pure gold, Ex. xxv.—The table of shew-bread, Ex. xxv. xxvi.—Of the priests and their vestments, Ex. xxviii.—Of the choosing of the Levites, Num. xviii. 3, 8.—Of the priest's office in general, Num. iii. xviii.—Of their office in teaching, Lev. xix. 10. Deut. xviii. 12, 17, 31.—Of their office in blessing, Num. vi.—Of their office in offering; which function largely spreading itself, is divided into these heads, viz. What the sacrifice ought to be, Lev. xxii. Deut. xv. xvii.—Of the continual fire, Lev. vi.—Of the manner of burnt-offerings, Lev. vi. vii.—Of the manner of the peace-offerings, Lev. iii. vii.—Of the manner of the sacrifices, according to their several kinds, viz. For sin committed through ignorance of the law, Lev. iv. Num. v.—Through ignorance of the fact, Lev. v. vii.—Wittingly, yet not through impiety, Lev. vi. Num. v.—The special law of sacrifices for sin, Lev. vi. vii.—Of things belonging to the sacrifices, Lev. ii. vi. vii. Num. iv. v.—Of the shew-bread, Lev. xxiv.—Of the lamps, Ex. xxvii. Lev. xxiv. Num. viii.—Of the sweet incense, Ex. xxx.—Of the consecration of the high-priests and other priests, Ex. xxix. xxx. Lev. vi. viii.—Of the consecration and office of the Levites, Num. viii.—Of the dwelling of the Levites, Num. xxxv.—Of the mounting of the altar, and all the instruments of the tabernacle, Ex. xxix. xxx.—Of the continual daily sacrifices, Ex. xxix. Num. xxviii. Of the continual Sabbath-day's sacrifice, Num. xxviii.—Of the solemn sacrifice for feast-days, which were diverse, and had particular rites, distinguished into these, viz. Of trumpets, Num. x.—Of the beginning of months, Num. xxviii.—Of the three most solemn feasts in general, Ex. xxiii. xxiv. Lev. xxiii. Deut. xvi.—Of the feast of the passover, Ex. xii. xiii. Lev. xxiii. Num. ix. xxviii. Deut. xvi.—Of pentecost, Ex. xxiii. xxiv. Lev. xxiii. Num. xxviii. Deut. xvi.—Of tabernacles, Ex. xxiii. xxiv. Lev. xxiii. Num. xxix. Deut. xvi.—Of blowing the trumpets, Lev. xxiii. Num. xxix.—Of expiation, Ex. xxx. Lev. xvi. xxi. Num. xxix.—Of the first-fruits, Ex. xxii. xxiii. xxxiv. Lev. ii. Num. xv. Deut. xxvi.—Of tythes, Lev. xxi. Num. xviii. Deut. xii.

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MOSAIC WORK, is an assemblage of little pieces of glass, marble, precious stones, &c. of various colours, cut square, and cemented on a ground of stucco, in such a manner as to imitate the colours and gradations of painting. The critics are divided as to the origin and reason of the name. Some derive it from *mosaicum*, a corruption of *musæum*, as that is of *musæum*, as it was called among the Romans. Scaliger derives it from the Greek *μωσα*, and imagines the name was given to this sort of works as being very fine and ingenious. Nebricensis is of opinion it was so called, because *ex illis picturis ornabantur musea*.

MOSAIC WORK OF GLASS, METHOD OF PERFORMING. Provide little pieces of glass, of as many different colours and sizes as possible. To apply these several pieces, and out of them to form a picture, first procure a cartoon or design to be drawn; this is transferred to the ground or plaster by calking, as in painting in fresco. See FRESKO. As this plaster is to be laid thick on the wall, and therefore will continue fresh and soft a considerable time, so there may be enough prepared at once to serve for as much work as will take up three or four days. This plaster is composed of lime made of hard stone, with brick-dust very fine, gum-tragacanth, and whites of eggs: when this plaster has been thus prepared and laid on the wall, and made the design of what is to be represented, they take out the little pieces of glass with a pair of piers, and range them one after another, still keeping strictly to the light, shadow, different tints, and colours, represented in the design before; pressing or flattening them down with a ruler, which serves both to sink them within the ground, and to render the surface even. Thus, in a long time, and with a great deal of labour, they finish the work, which is still the more beautiful, as the pieces of glass are more uniform, and ranged at an even height. Some of these pieces of mosaic work are performed with that exactness, that they appear as smooth as a table of marble, and as finished and masterly as a painting in fresco; with this advantage, that they have a fine lustre, and will last for ages. The finest works of this kind that have remained till our time, and by which the moderns have retrieved the art, which was in a manner lost, are those in the church of St. Agnes, formerly the temple of Bacchus at Rome; and some at Pisa, Florence, and other cities of Italy. The most esteemed among the works of the moderns are those of Joseph Pine and the Chevalier Lanfranc, in the church of St. Peter at Rome: there are also very good ones at Venice.

MOSAIC WORK OF GYPSUM, METHOD OF PERFORMING. Of this stone calcined in a kiln, beaten in a mortar, and sifted, the French workmen make a sort of artificial marbles, imitating precious stones; and of these they compose a kind of mosaic work, which does not come far short either of the durability or the vivacity of the natural stones; and which besides has this advantage, that it admits of continued pieces or paintings of entire compartments, without any visible joining. Some make the ground of plaster of Paris, others of free-stone. If it be of plaster of Paris, they spread it in a wooden frame, of the length and breadth of the work intended, and in thickness about an inch and a half. This frame is so contrived, that the tenons being only joined to the mortises by the single pins, they may be taken asunder, and the frame be dismounted when the plaster is dry. The frame is covered on one side with a strong linen-cloth, nailed all round; which, being placed horizontally with the linen at the bottom, is filled with plaster passed through a wide sieve. When the plaster is half dry, the frame is set up perpendicularly, and left till it is quite dry; then it is taken out, by taking the frame to pieces. In this mosaic, the ground is the most important part. Now in order to the preparation of this sifted gypsum, which is to be applied on this ground, it is dissolved and boiled in the best English glue, and mixed with the colour that it is to be of; then the whole is worked up together into the usual consistence of plaster, and then is taken and spread on the ground five or six inches thick. If the work be such, as that mouldings are required, they are formed with gougues and other instruments. It is on this plaster, thus coloured like marble or precious stone, and which is to serve as a ground to a work, either of lapis, agate, alabaster, or the like, that the design to be represented is drawn; having been first pounced or calqued. To hollow or impress the design, they use the same instruments that sculptors do; the ground whereon they are to work not being much less hard than the marble itself. The cavities being thus made in the ground, are filled with the same gypsum

sum boiled in glue, only differently coloured, and thus are the different colours of the original represented. In order that the necessary colours and tints may be ready at hand, the quantities of the gypsum are tempered with the several colours in pots. After the design has been thus filled and rendered visible, by half-polishing it with brick and soft stone, they go over it again, cutting such places as are either to be weaker or more shadowed, and filling them with gypsum; which work they repeat till all the colours being added one after the other, represent the original to the life. When the work is finished, they scour it with soft stone, sand, and water; after that, with a pumice-stone; and in the last place polish it with a wooden mullet and emery. Lastly, they gave it a lustre, by smearing it over with oil, and rubbing it a long time with the palm of the hand, which gives it a lustre no ways inferior to that of natural marble.

MOSAIC WORK OF MARBLE, METHOD OF PERFORMING. The ground of mosaic works, wholly marble, is usually a massive marble, either white or black. On this ground the design is cut with a chisel, after it has been first calked. After it has been cut of a considerable depth, *i. e.* an inch or more, the cavities are filled up with marble of a proper colour, first fashioned according to the design, and reduced to the thickness of the indentures with various instruments. To make the piece thus inserted into the indentures cleave fast, whose several colours are to imitate those of the design, they use a stucco, composed of lime and marble-dust; or a kind of mastic, which is prepared by each workman, after a manner peculiar to himself. The figures being marked out, the painter or sculptor draws with a pencil the colours of the figures not determined by the ground, and in the same manner makes strokes or hatchings in the place where shadows are to be; and after he has engraven with the chisel all the strokes thus drawn, he fills them up with a black mastic, composed partly of Burgundy pitch poured on hot; taking off afterwards what is superfluous with a piece of soft stone or brick, which, together with water and beaten cement, takes away the mastic, polishes the marble, and renders the whole so even that one would imagine it only consisted of one piece. This kind of mosaic work is used in large works, as the pavements of churches, basilises, and palaces, and in the veneering of their walls. It is seen in the pompous church of the invalids at Paris, and the fine chapel at Versailles, with which some entire apartments of the palace are incrustated.

MOSAIC WORK OF PRECIOUS STONES, METHOD OF PERFORMING. For this purpose, other and finer instruments are required than those used in marble; as drills, wheels, &c. used by lapidaries, and engravers on stone. As none but the richest marbles and stones enter this work, to make them go the farther, they are sawn into the thinnest leaves imaginable, scarcely exceeding half a line in thickness; the block to be sawn is fastened firmly with cords on the bench, and only raised a little on a piece of wood, one or two inches high. Two iron-pins, which are on one side the block; and which serve to fasten it, are put into a vice contrived for the purpose; and with a kind of saw or bow, made of fine brass-wire, bent on a piece of spongy wood, together with emery steeped in water, the leaf is gradually fashioned by following the stroke of the design, made on paper and glued on the piece. When there are pieces enough fastened to form an entire flower, or some other part of the design, they are applied to the ground. The ground which supports this mosaic work is usually of free-stone. The matter with which the stones are joined together is a mastic, or kind of stucco, laid very thin on the leaves as they are fashioned; and this being done, the leaves are applied with pliers. If any contour, or side of a leaf, be not either squared or rounded sufficiently, so as to fit the place exactly into which it is to be inserted, when it is too large, it is to be brought down with a brass-file or rasp; and if it be too little, it is managed with a drill and other instruments used by lapidaries. This kind of mosaic work is only used in small works, as ornaments for altarpieces, and tables for rich cabinets, precious stones being so very dear.

MOSAIC WORKS OF THE FEATHERS OF BIRDS, &c. In Clavigero's history of Mexico is described a curious kind of mosaic work made by the ancient Mexicans of the most delicate and beautiful feathers of birds. They raised for this purpose various species of birds of fine plumage with which that country abounds, not only the palaces of the king, where there were all sorts of animals, but

likewise in private houses: and at certain seasons they carried off their feathers to make use of them on this kind of work, or to sell them at market. They set a high value on the feathers of those wonderful little birds which they call *Huitzitzilin* and the Spaniards *Picaflores*, on account of the smallness, the fineness, and the various colours, of them. In these and other beautiful birds nature supplied them with all the colours which art can produce, and also some which art cannot imitate. At the undertaking of every mosaic work several artists assembled: After having agreed upon a design, and taken their measures and proportions, each artist charged himself with the execution of a certain part of the image, and exerted himself so diligently in it with such patience and application, that he frequently spent a whole day in adjusting a feather; first trying one, then another, viewing it sometimes one way, then another, until he found one which gave his part that ideal perfection proposed to be attained. When the part which each artist undertook was done, they assembled again to form the entire image from them. If any part was accidentally deranged, it was wrought again until it was perfectly finished. They laid hold of the feathers with small pincers, that they might not do them the least injury, and pasted them on the cloth with *tzauhtli*, or some other glutinous matter: then they united all the parts upon a little table, or a plate of copper, and flattened them softly, until they left the surface of the image so equal and smooth that it appeared to be the work of a pencil. These were the images so much celebrated by the Spaniards and other European nations. Whoever beheld them was at a loss whether to praise most the life and beauty of the natural colours, or the dexterity of the artist and the ingenious disposition of art. "These images (says Acosta) are deservedly admired; for it is wonderful how it was possible, with the feathers of birds, to execute works so fine and so equal, that they appear the performance of the pencil; and what neither the pencil nor the colours in painting can effect, they have, when viewed from a side, an appearance so lively, beautiful, and animated. Some Indians, who are able artists, copy whatever is painted with a pencil so perfectly with plumage, that they rival the best painters of Spain." These works of feathers were even so highly esteemed by the Mexicans as to be valued more than gold. Cortes, Bernal Diaz, Gomara, Torquemada, and all the other historians who saw them, were at a loss for expressions sufficient to praise their perfection. Several works of this kind, our author says, are still preserved in the museums of Europe, and many in Mexico; but few, he apprehends, belong to the 16th century, and still fewer, if any, are of those made before the conquest. The mosaic works also which the Mexicans made of broken shells were extremely curious; this art is still practised in Guatimala.

MOSAMBIQUE, a kingdom of Africa lying S. of Quiloa.

MOSAMBIQUE, the capital of the above kingdom, is situated on an island, at the mouth of a river both of the same name. The island is 30 miles in circumference, and very populous, though the air is said to be very hot, and the soil in general dry, sandy, and barren; yet they have most of the tropical fruits with black cattle, hogs, and sheep: There is a kind of fowls here, both the feathers and flesh of which are black, insomuch that, when they are boiled, the broth looks like ink; and yet their flesh is very delicate and good. The town of Mosambique is regularly fortified, and has a good harbour, defended by a citadel, with several churches and monasteries. The Portuguese shipping to and from India touch here for refreshments. Lon. 40. 10. E. Lat. 15. 5. S.

MOSCHATEL. See **ADOXIA**.

MOSCHUS, a Grecian poet of antiquity, usually coupled with Bion. They were both contemporaries with Theocritus. In the time of the latter Grecians, all the ancient Idylliums were collected and attributed to Theocritus: but the claims of Moschus and Bion have been admitted to some few little pieces. All that is known about them is collected from their own remains. Moschus, by composing his delicate elegy on Bion, has given the best memorials of Bion's life. Moschus and Theocritus have by some critics been supposed the same person; but there are irrefragable evidences against it; others will have him as well as Bion to have lived later than Theocritus, upon the authority of Suidas: while others again suppose him to have been the scholar of Bion, and probably his successor in governing the poetic school; which, from

from the elegy of Moschus, does not seem unlikely. Their remains are to be found in all the editions of the Poete Minores Græci.

MOSCHUS, in zoology, a genus of the class mammalia, and order pecora. No horns; eight small cutting teeth in the lower jaw; in the upper, no fore-teeth, but two long tusks, one on each side, projecting out of the mouth. Six species have been noticed.

M. AMERICANUS, or the **BRASILIAN MUSK**, is of a reddish brown colour, with a black muzzle and white throat, and scarcely so large as a roe-buck. The fur is soft and short; the colour of the head and upper part of the neck is dark brown; the lower part of the neck and throat are white; the body and limbs are red brown; the hind legs are longer than the fore. These animals, which inhabit Guiana and Brasil, are exceedingly timid, active, and swift. Numbers are often seen swimming the rivers, and are easily taken. The Indians hunt them, and their flesh is esteemed then very delicate.

M. MEMINNA, or the **CYLON CHEVROTIN**, is 17 inches long from the nose to the rump, and of a cinereous olive colour; the throat, breast, and belly, are white; the sides and haunches spotted, and barred transversely with white; and the ears are large and open; the tail is very short; and the feet have no spurious hoofs. They inhabit Ceylon and Java.

M. MOSCHIFERUS, the **THIBET MUSK**, has a bag or tumour on the belly near the navel, and a very short tail almost hid in the fur. The length of the male is about three feet three inches from the nose to the origin of the tail, and about two feet three inches high at the shoulder; the female is less than the male, has a sharper nose, has no tusks nor musk-bag, and is provided with two teats. The head resembles that of the roe; the fur is coarse like that of the animals of the deer-kind; but softer, very smooth, erect, plentiful, thick, and long; the colour varies according to the age of the animal and time of the year; but is chiefly blackish brown on the upper, and hoary, seldom white, on the under parts of the body; the hoofs are long, black, and much divided, and the spurious hoofs of the fore-feet are very long; the scrotum is of a bright red colour, and the penis very small. They inhabit the Asiatic Alps, especially the highest rocky mountains from the Altic chain to that which divides Thibet from India; likewise in China and Tonquin, and in eastern Siberia; and about lake Baikal, and the rivers Jenisea and Argun. They avoid mankind, dwelling solitarily in the most precipitous places of the mountains among rocks in the small narrow valleys surrounded by these snowy hills, and the pine-forests which grow in their interstices. They are very gentle and timid animals, except in rutting time, when the males fight violently with their tusks for the females; they are exceedingly active in leaping, running, climbing, and swimming, and very difficultly tamed; the flesh is eatable, and that of the younger animals delicate. See Plate C.

MOSCOW, the chief province of the empire of Russia, deriving its name from the river Moscova, or Moskva, on which the capital is situated. It was from this duchy that the czars of old took the title of dukes of Muscovy. The province is bounded on the N. by the duchies of Twere, Ro-tow, Susdal, and Wolodmer; on the S. by Razan, from which it is separated by the Occa; on the E. by the principality of Cachine, and the Occa parting it from Nisi-novogorod; and on the W. by the duchies of Rzeva, Biela, and Smolensko. It extends about 200 miles in length, and about 100 in breadth; and is watered by the Moskva, Occa, and Clesna, which fall into the Wolga; yet the soil is not very fertile. The air, however, though sharp, is salubrious; and this consideration, with the advantage of its being situated in the midst of the best provinces in the empire, induced the czars to make it their chief residence. In the W. part of Moscow is a large forest, whence flows the celebrated river Nieper, or Boristhenes.

Moscow, the capital of the above province, and till the beginning of the 18th century the metropolis of all Russia, is situated in a spacious plain on the banks of the river Moscova.

MOSELLA, a department of France, comprehending part of the late province of Lorraine. When first erected, this department was bounded on the N. by the late duchy of Luxemburg. Metz is the capital.

MOSSELLE, a river of Germany, now of France, which rises in the mountains of Vauge in the late province of Lorraine, and, running through the departments of the Vosges, Meurthe, Me-

selle, Forets, and Rhine and Moselle, falls into the Rhone at Colblentz.

MOSES, [מֹשֶׁה, Heb. i. e. drawn up,] the son of Amram, and great-grandson of Levi, was born in the year 1571 before Christ. Pharaoh king of Egypt, perceiving that the Hebrews were become a formidable nation, had issued an edict commanding all the male-children to be put to death. Jochebed the mother of Moses, having, to avoid this cruel edict, concealed her son for three months, at length made an ark of bulrushes, daubed it with pitch, laid the child in it, and exposed him on the banks of the Nile. Tharmuthis, the king's daughter, walking by the river's side, perceived the floating cradle, commanded it to be brought to her, and, struck with the beauty of the child, determined to preserve his life. In three years afterwards she adopted him for her son, called his name Moses, and caused him to be instructed in all the learning of the Egyptians. But his father and mother, to whom he was restored by a fortunate accident, were at still greater pains to teach him the history and religion of his fathers. Many things are related by historians concerning the first period of Moses's life, which are not recorded in the Old Testament. According to Josephus and Eusebius, he made war on the Ethiopians, and completely defeated them. They add, that the city Saba, in which the enemy had been forced to take refuge, was betrayed into his hands by the king's daughter, who became deeply enamoured of him, when she beheld from the top of the walls his valorous exploits at the head of the Egyptian army. But the truth of this expedition has been doubted. But from the sacred records we learn events of much greater importance, which commenced in the fortieth year of Moses's age. His leaving the court of Pharaoh, and visiting his oppressed brethren; his killing one of their oppressors and consequent flight to Midian; his forty years residence with Jethro, marriage with his daughter Zipporah, and birth of his son Gershom; his vision of the burning but unconsumed bush; his mission by the Almighty to Pharaoh; his hesitation, and the miracles wrought with his rod to encourage him; his meeting with his brother Aaron; their reception by the Egyptian tyrant, and consequent increase of the Hebrews' tasks; their miracles wrought to convince him without effect; the threatenings and execution of the ten plagues; 1. by the change of the waters of Egypt into blood; 2. by swarms of frogs; 3. of lice, and 4. of flies; 5. by pestilence among the cattle; 6. by ulcers and fiery bites; 7. by a dreadful storm of thunder, lightning, and hail; 8. by swarms of locusts; 9. by thick darkness; and 10. by the death of the first-born; with Pharaoh's reluctant consent to liberate the Hebrews, his pursuit of them and destruction in the Red Sea, are particularly recorded in Exod. ii.—xx. Profane authors, who have written of Moses, seem to have been partly acquainted with these mighty wonders. That he performed miracles, has been allowed by many, by whom he was considered as a famous magician; and he could scarcely appear in any other light to men who did not acknowledge him for the messenger of the Almighty. Both Diodorus and Herodotus mention the distressed state to which Egypt was reduced by these terrible calamities. The subsequent history of Moses and the Israelites we have from the same authentic records. Their journeyings and various encampments in the wilderness; their battles with the Amalekites; their arrival at Mount Sinai; Moses's reception of the Law from the Almighty; the idolatry of the people while he was on the Mount, which made him break the tables; their punishment, his receipt of the two tables a second time; his illuminated appearance on his return; his erection and consecration of the tabernacle, which served instead of a temple till the building of the famous one by Solomon; his consecration of Aaron and his sons, and the Levites, to the priesthood; his theocratic government of the Hebrews, under the immediate authority and direction of the Almighty, with their repeated murmurings; his dying blessing upon them, with his prophecy of our Saviour; his distant view of the promised land from Mount Pisgah, and his death, are recorded, with other important particulars, in the four last books of the Pentateuch. He died without sickness or pain, in the 120th year of his age, and 1451 years before the incarnation of Jesus Christ. Moses is incontestably the author of the Pentateuch which is acknowledged to be inspired, by the Jews and by Christians of every persuasion. Thomas Paine and others, however, have denied that Moses was the author of these books, because he always speaks of himself in the third person. But this manner of writing is not peculiar

cular to Moses; it occurs in several celebrated ancient historians; such as Xenophon, Caesar, Josephus, &c. who have thus evidenced more modesty and good sense, than some modern historians, whose egotism is altogether disgusting.

MOSHEIM, JOHN LAURENCE, an illustrious German divine, born in 1695, of a noble family, which might have opened to his ambition a fair path to civil promotion; but his zeal for religion, his thirst after knowledge, and his taste for sacred literature, induced him to devote his talents to the church. The German universities loaded him with literary honours; the king of Denmark invited him to Copenhagen; the duke of Brunswick called him thence to Helmstadt, where he filled the academical chair of divinity; was made ecclesiastical counsellor to the court; and presided over the seminaries of learning in Wolfenbuttle and Blankenburgh. To give an uncommon degree of lustre to the university of Göttingen, Dr. Mosheim was placed at the head of it, as chancellor; and he died there, universally lamented, in 1755. In judgement, taste, eloquence, erudition, and philosophy, he had certainly very few superiors. His principal work is his "Ecclesiastical History," from the birth of Christ to the beginning of the 18th century, written in Latin. It was translated into English, and accompanied with notes and chronological tables by Archibald MacLaine, D. D. 1758, in five vols. 8vo.

MOSKVA, a river of Moscow, which gives name to the capital, and flows through it in a winding channel; but, excepting in spring, is only navigable for rafts. It receives the Yama in the Semlainogorod, and the Neglina at the western extremity of the Kremlin; the beds of both these last-mentioned rivulets are in summer little better than dry channels. See Moscow.

MOSQUE, [*moschit*, Turkish,] a Mohammedan temple. Mosques are square buildings, generally constructed of stone. Before the chief gate there is a square court paved with white marble; and low galleries round it, whose roof is supported by marble-pillars. In these galleries the Turks wash themselves before they go into the mosque. In each mosque there is a great number of lamps; and between these hang many crystal rings, ostrich's eggs, and other curiosities, which, when the lamps are lighted, make a fine show. As it is not lawful to enter the mosque with stockings or shoes on, the pavements are covered with pieces of stuff sewed together, each being wide enough to hold a row of men kneeling, sitting, or prostrate. The women are not allowed to enter the mosque, but stay in the porches without. About every mosque there are six high towers, called minarets, each of which has three little open galleries one above another: these towers, as well as the mosques, are covered with lead, and adorned with gilding and other ornaments; and thence, instead of a bell, the people are called to prayers by certain officers appointed for that purpose. Most of the mosques have a kind of hospital belonging to them, in which travellers of what religion soever are entertained three days. Each mosque has also a place called *tarbe*, which is the burying-place of its founders; within which is a tomb six or seven feet long, covered with green velvet or satin; at the ends of which are two tapers, and round it several seats for those who read the koran and pray for the souls of the deceased.

MOSQUITO, or **MOSKITO COUNTRY**, or **MOSQUITO SHORE**, is situated in North America, between 85° and 88° lon. W. and between 13° and 15° lat. N. having the North Sea on the N. and E. Nicaragua on the S. and Honduras on the W.

Mosquitos, a nation of North American Indians, who inhabit the above country, and are so situated between morasses and inaccessible mountains, and a coast full of rocks and shoals; that no attempts against them by the Spaniards, whom they mortally hate, could ever succeed. Nevertheless, they are a mild inoffensive people, of great morality and virtue, and will never trust a man who has once deceived them. They have so great a veneration for the English, that they have spontaneously put themselves and their lands under the protection and dominion of the crown of England. This was first done when the duke of Albemarle was governor of Jamaica, and the king of the Moskitos received a commission from his grace, under the seal of that island; since which time they have not only been steady in their alliance with the English, but warm in their affections, and very useful to them on many occasions. When their king dies, the male heir goes to Jamaica, to certify that he is next in blood, and receives a commission in form from the governor of Jamaica to be king of the

Moskitos, till which he is not acknowledged as such by his countrymen. So fond are these people of every thing that is English, that they are proud of every Christian name or surname given them by our seamen, who honour their chief men with the titles of some of our nobility.

MOSS, or **MOSESSES**, in botany. See *Muscic*.

Moss, in horticulture, a disease which greatly impedes the growth of trees, and at the same time very materially injures the fruit of orchards. The remedy usually employed is, to scrape off the moss with a kind of wooden knife, that will not wound the bark or branches; or to rub them with a strong hair-cloth, immediately after the heavy shower of rain. But the most effectual method, in Mr. Bucknall's opinion, consists in washing all the branches with soap-suds, and a hard brush, every spring and autumn. The action of rubbing, he observes, will so far invigorate the tree, as amply to compensate both the labour and expence: the plant will not be injured by this operation, which he directs to be performed in the same manner as a groom curries or scrubs the legs of a horse. The most efficacious preventive, however, is to remove the cause, by draining all superfluous moisture from the roots; and, when the trees are first planted, by placing them on the surface of the ground, and raising a small mound of good fresh mould around them. The moss, vegetating on shrubs, &c. is of various kinds, according to the nature and situation of the soil. If the young branches of trees be covered with long and shaggy moss, they will speedily perish; and can only be preserved by cutting them off near the trunk; or by lopping the head of the shrub, &c. if it be found necessary; as it will sprout again with increased luxuriance. In thick plantations, however, and in a cold ground, the trees will always be covered with moss: in such cases, they must be thinned, and the land drained, or well stirred. Where shrubs, fruit-trees, &c. are covered with moss, in consequence of the soil being too dry, it will be useful to spread large quantities of river or pond-mud about the root, and to open the ground for the admission of the manure: such expedient will not only cool the land, and greatly suppress the future growth of moss, but at the same time prevent the fruit from falling off too early—a circumstance that frequently happens in orchards planted in very dry soils. But, though moss be in general destructive to the vegetation of shrubs and trees, yet, if growing only on the north side of their trunks, it is attended with considerable advantage; inasmuch, that it serves both to shelter them from the severity of the north winds, and also to direct the wandering traveller in his course; because it always points out that quarter of the compass.

Moss is also a name given by some to the boggy ground in many parts of England, otherwise called a *Bog*, or *Fen*. See these articles. In many of these grounds, as well in Britain and Ireland as in other parts of the world, there are found vast numbers of trees standing with their stumps erect, and their roots piercing the ground in a natural posture as when growing. Many of these trees are broken or cut off near the roots, and lie along, and this usually in a N. E. direction. To account for this many authors have resolved it into the effect of the deluge in the days of Noah; but this conjecture is proved false by many decisive arguments. The waters of this deluge might indeed have washed together a great number of trees, and buried them under loads of earth; but then they would have lain irregularly and at random; whereas they all lie lengthwise from S. W. to N. E. and the roots all stand in their natural perpendicular posture, as close as the roots of trees in a forest. Besides, these trees are not all in their natural state, but many of them have evident marks of human workmanship upon them, some being cut down with an axe, some split, and the wedges still remaining in them; some burnt in different parts, and some bored through with holes. These things are also proved to be of a later date than the deluge, by other matters found among them, such as utensils of ancient people, and coins of the Roman emperors. It appears from the whole, that all the trees, which we find in this fossil state, originally grew in the very places where we now find them, and have only been thrown down and buried there, not brought from other places. It may appear indeed an objection to this opinion, that most of these fossil trees are of the fir-kind; and that Caesar says expressly, that no firs grew in Britain in his time: but this is easily answered by observing, that these trees, though of the fir-kind, yet are not the species usually called the fir, but pitch-tree; and Caesar has no where said that pitch-trees

did not grow in England. Norway and Sweden still abound with these trees; and there are at this time whole forests of them in many parts of Scotland, and a great number of them wild upon a hill at Wareton in Staffordshire. In Hatfield marsh, where such vast numbers of the fossile-trees are now found, there has evidently once been a whole forest of them growing. The last of these was found alive, and growing in that place within these last eighty years, and cut down for some common use. It is also objected by some to the system of the firs growing where they are found fossile, that these countries are all bogs and moors, whereas these trees grow only in mountainous places. But this is a mistake, for though in Norway, in Sweden, and some other cold countries, the fir-kinds all grow upon barren and dry rocky mountains, yet in warmer places they are found to thrive as well on wet plains. Such are found plentifully in Pomerania, Livonia, and Courland, &c. and in the W. parts of New England there are vast numbers of fine stately trees; of them in low grounds. The truth seems to be, that these trees love a sandy soil; and such is found at the bottoms of all the mosses where these trees are found fossile. The roots of the fir-kind are always found fixed in these; and those of oaks, where they are found fossile in this manner, are usually found fixed in clay: so that each kind of tree is always found rooted in the places where they stand in their proper soil; and there is no doubt but that they originally grew there. When we have thus found that all fossile-trees we meet with once grew in the places where they are now buried, it is plain that in these places there were once noble forests, which have been destroyed at some time; and the question only remains how and by whom they were destroyed. This we have reason to believe, from the Roman coins found among them, was done by the people of that empire, when they were established in Britain. Caesar tells, that when their armies pursued the wild Britons, these people always sheltered themselves in the myr woods and low watery forests: and that Cassibelan and his Britons, after their defeat, passed the Thames, and fled into such low morasses and woods, that there was no pursuing them. We find that the Silures secured themselves in the same manner when attacked by Ostorius and Agricola. The same thing is recorded of Venutius king of the Brigantes, who fled to secure himself into the boggy forests of the midland part of this kingdom: and Herodian expressly says, that while the Romans were pushing their conquests in these islands, it was the custom of the Britons to secure themselves in the thick forests which grew in their boggy and wet places, and when opportunity offered, to issue out thence and fall upon the Romans. The consequence of all this was the destroying of these forests; the Romans finding themselves so plagued with parties of the natives issuing out upon them at times from these forests, that they gave orders for the cutting down and destroying all the forests in Britain which grew on boggy and wet grounds. These orders were punctually executed; and to this it is owing, that we can now hardly believe that such forests ever grew in Britain as are now found buried in mosses. The Roman historians all agree, that when Suetonius Paulinus conquered Anglesea, he ordered all the woods to be cut down there, in the manner of the Roman generals in England: and Galen tells us, that the Romans, after their conquest in Britain, kept their soldiers constantly employed in cutting down forests, draining marshes, and paving bogs. Not only the Roman soldiers were employed in this manner, but all the native Britons, made captives in the wars, were obliged to assist in it: and Dion Cassius says, that the emperor Severus lost no less than 50,000 men, in a few years, in cutting down the woods and draining the bogs of this island. It is not then to be wondered at, that such numbers executed the immense destruction which we find in these buried forests. One of the greatest subterranean treasures of wood is that near Hatfield; and it is easy to prove, that these people, to whom this havoc is thus attributed, were upon the spot where these trees now lie buried. The common road of the Romans out of the south into the north, was formerly from Lindum, (now Lincoln,) to Segelochum, (Little Burrow upon Trent,) and thence to Danum, (now Doncaster,) where they kept a standing garrison of Crispinian horse. A little off on the E. and N. E. of their road, between the two last named towns, lay the borders of the greatest forest, which swarmed with wild Britons, who were continually making their sallies out, and their retreats into it again, intercepting their provisions, taking and de-

stroying their carriages, killing their allies and passengers, and disturbing their garrisons. This at length so exasperated the Romans, that they were determined to destroy it; and to do this safely and effectually, they marched against it with a great army, and encamped on a great moor near Flinchingly: this is evident from the fortifications yet remaining. There is a small town in the neighbourhood called Osterfield; and as the termination-field seems to have been given chiefly in remembrance of battles fought near the towns, whose names end with it, it is probable that a battle was fought here between all the Britons who inhabited this forest and the Roman troops under Ostorius. The Romans slew many of the Britons, and drove the rest back into this forest, which at that time overspread all this low country. On this the conquerors taking advantage of a strong S. W. wind, set fire to the pitch-trees, of which this forest was principally composed; and when the greater part of the trees were thus destroyed, the Roman soldiers and captive Britons cut down the remainder, except a few large ones which they left standing as memorials of the destruction of the rest. These single trees, however, could not stand long against the winds, and these falling into the rivers which ran through the country, interrupted their currents; and the water then overspreading the level country, made one great lake, and gave origin to the mosses or moory bogs, which were afterwards formed there, by the workings of the waters, the precipitation of earthy matter from them, and the putrefaction of rotten boughs and branches of trees, and the vast increase of water-moss and other such plants which grow in prodigious abundance in all these places. Thus were these burnt and felled trees buried under a new-formed spongy and watery earth, and afterwards found on the draining and digging through this earth again. Hence Roman weapons and Roman coins are found among these buried trees; and hence among the buried trees some are found burnt, some chopped and hewn; and hence it is that the bodies of the trees all lie by their proper roots, and with their tops lying N. E. that is, in that direction in which a S. W. wind would blow them down: hence also it is, that some of the trees are found with their roots lying flat, these being not cut or burnt down, but blown up by the roots afterwards when left single; and it is not wonderful, that such trees as these should have continued to grow even after their fall, and shoot up branches from their sides which might easily grow into high trees, Phil. Trans. No. 275. Upon this hypothesis it is also easily explained, why the moor-soil in the country is in some places two or three yards thicker than in others, or higher than it was formerly, since the growing up of peat, earth, or bog-ground, is well known, and the soil added by overflowing of waters is not a little. As the Romans were the destroyers of this great and noble forest, so they were probably also of the several other ancient forests; the ruins of which furnish us with the bog-wood of Staffordshire, Lancashire, Yorkshire, and other counties. But as the Romans were not much in Wales, in the Isle of Man, or in Ireland, it is not to be supposed that forests cut down by these people gave origin to the fossile wood found there; but though they did not cut down these forests others did; and the origin of the bog-wood is the same with them and with us. Hollingshed informs us, that Edward I. being not able to get to the Welsh, because of their hiding themselves in boggy woods, gave orders at length that they should all be destroyed by fire and by the axe; and doubtless the roots and bodies of trees, found in Pembrokeshire under ground, are the remains of the execution of this order. The fossile-wood in the bogs of the Isle of Man is doubtless of the same origin, though we have not any accounts extant of the time or occasion of the forests there being destroyed; but as to the fossile trees of the bogs of Ireland, we are expressly told, that when Henry II. conquered that country, he ordered all the woods to be cut down that grew in the low parts of it, to secure his conquests, by destroying the places of resort to the rebels.

MOSS-TROOPERS, a rebellious sort of people in the North of England, who lived by robbery and rapine, not unlike the torries in Ireland, the buccaniers in Jamaica, or banditti of Italy.

MOSTICK, a painter's staff on which he leans his hand when he paints.

MOSTRA, in the Italian Music, a mark at the end of a line or space, to shew that the first note of the next line is in that place: and if this note be accompanied with a sharp or flat, it is proper to place these characters along with the mostra.

MOSUL,

MOSUL, or MOUSUL. See MOUSUL.

MOTACILLA, in ornithology, the WAGTAIL and WARBLER, a genus of birds of the order passerines; distinguished by a straight weak bill of a subulated figure, a tongue lacerated at the end, and very slender legs. There are nearly 200 species besides varieties. The most remarkable are the following:

M. ALBA, the WHITE WAGTAIL, frequents the sides of the ponds and small streams, and feeds on insects and worms. The head, back, and upper and lower side of the neck, as far as the breast, are black; in some the chin is white, and the throat marked with a black crescent; the breast and belly are white; the quill-feathers are dusky; the coverts black, tipped and edged with white. The tail is very long, and always in motion. Mr. Willoughby observes, that this species shifts its quarters in the winter, moving from the N. to the S. of England. In spring and autumn it is a constant attendant on the plough, for the sake of the worms thrown up by that instrument.

M. ATRICAPILLA, the BLACK-CAP, is smaller than the linnet. The bill is brown; the top of the head is black; and the upper parts of the body are of a greenish ash-colour; the sides of the head and under parts are grey, changing to very light grey, or almost white, towards the vent; the quills and tail are cinereous brown, margined with the same colours as the upper parts; legs are lead-coloured, and the claws black. This species is pretty common in England, and elsewhere in Europe, as far as Italy; in all which places it breeds, coming in spring, and retiring in September.

M. CYANE, the SUPERB WARBLER, a most beautiful species, is 5½ inches long. The bill is black; the feathers of the head are long, and stand erect like a full crest; from the forehead to the crown they are of a bright blue; thence to the nape, black like velvet; through the eyes from the bill there runs a line of black; and beneath the eye springs a tuft of the same blue feathers; beneath which, and on the chin, it is of a deep blue almost black, and feeling like velvet; on the ears is another patch of blue, and across the back part of the head a band of the same; the whole giving the head a greater appearance of bulk than is natural: the hind part of the neck, and upper parts of the body and tail, are of a deep blue black; the under parts white; the wings are dusky; the shafts of the quills chestnut; the legs dusky brown; the claws black. This species inhabits Van Diemen's Land, the most southern part of New Holland. The female is entirely destitute of all the fine blue colours, both pale and dark, by which the male is adorned, except that there is a very narrow circle of azure round each eye, apparently on the skin only.

M. LUCINIA, the NIGHTINGALE, exceeds in size the hedge-sparrow. The bill is brown; the irides are hazel; the head and back pale tawny, dashed with olive; the tail of a deep tawny red; the under parts are pale ash-colour, growing white towards the vent; the quills cinereous brown, with the outer margins reddish brown; the legs cinereous brown. The male and female are very similar. This bird, the most famed of the feathered tribe for the variety, length, and sweetness, of its notes, is migratory, and supposed to be an inhabitant of the Asiatic regions during such times as it is not to be found in Europe. It is met with in Siberia, Sweden, Germany, France, Italy, and Greece; but in all those places it is migratory, as in England. Hasselquist speaks of it as being in Palestine; and Fryer ascertains its being found about Chulminor in Persia: it is also spoken of as a bird of China, Kamtschatka, and Japan; at which last place they are much esteemed, and sell dearer; as they are also at Aleppo, where they are "in great abundance kept tame in houses, and let out at a small rate to such as choose it in the city, so that no entertainment is made in the spring without a concert of these birds." They are not found in America, though several of their birds improperly bear that name; and it is uncertain whether they are found in Africa. These birds visit Britain in the beginning of April, and migrate in August; and during their continuance their range is confined to but a part of the island; they are not found in Scotland, Ireland, or North Wales, nor in any of the northern counties except Yorkshire; and do not migrate so far to the west as Devonshire and Cornwall. They are solitary birds, never uniting even into small flocks; and in respect to the nests, it is very seldom that two are found near each other. The female builds in some low bush or quickset hedge well covered with foliage, for such only this bird frequents; and lays four or five eggs of a greenish brown. The

nest is composed of dry leaves on the outside, mixed with grass and fibres, lined with hair or down within, though not always alike. The female alone sits on and hatches the eggs, while the male not far off regales her with his delightful song; but as soon as the young are hatched, he commonly leaves off singing, and joins the female in the task of providing for and feeding them. After the young can provide for themselves, the old female provides for a second brood, and the song of the male recommences. They have been known to have three broods in a year, and in the hot countries even four. These birds are often brought up from the nest for the sake of their song. They are likewise caught at their first coming over; and though old birds, yet by management can be made to bear confinement, and to sing equally with those brought up from the nest. None but the vilest epicure, as Mr. Latham remarks, would think of eating these charming songsters; yet we are told that their flesh is equal to that of the ortolan, and they are fattened in Gascony for the table. Every school-boy must have read of Heliogabalus's eating of nightingales' tongues; and that famous dish of the Roman tragedian Æsop, which was composed of those of every singing or talking bird, and is said to have cost about 6843*l.* of our money. See plate CXX.

M. SUTORIA, the TAYLOR-BIRD, is a native of the East-Indies. It is remarkable for the art with which it makes its nest, to secure itself and its young in the most perfect manner possible against all danger from voracious animals. It picks up a dead leaf, and sews it to the side of a living one: its slender bill is the needle, and its thread is formed of some fine fibres; the lining is composed of feathers, gossamer, and down. The colour of the bird is light-yellow; its length three inches; and its weight only 3-16ths of an ounce; so that the materials of the nest and its own size are not likely to draw down a habitation depending on so slight a tenure. See plate CXX.

M. TROGLODYTES, the WREN, is a very small species, in length only 3½ inches, though some have measured four inches. The bill is very slender, and of a dusky brown colour: the head, neck, and back, are of a reddish brown; and over each eye a pale reddish white streak: the under parts, as far as the breast, are of this last colour; the rest more inclined to brown, crossed with brown lines: the legs are pale brown. It generally carries the tail erect. The nest is almost oval, and has only one small entrance: it is chiefly composed of moss, well lined with feathers. In this the female lays from 10 to 16 or 18 eggs, which are almost white, with reddish marks at the large end. For a representation of the M. Sylvia see plate CXX.

MOTE, in law-books, signifies court or convention; as a ward-mote, burgh-mote, swain-mote, &c.

MOTE was also used for a fortress or castle; as mota de Windsor, &c.

MOTE also denoted a standing water to keep fish in; and sometimes a large ditch encompassing a castle or dwelling-house.

MOTE-BELL, or MOT-BELL, the bell used by the Anglo-Saxons to call people together to the court.

MOTH, in zoology. See PHALENA.

MOTHER-IN-LAW. See AFFINITY.

MOTHER OF PEARL is that beautiful natural white enamel, which forms the greater part of the substance of the oyster-shell, particularly of the pearl-oyster. See MYTILUS.

MOTHER-WATER in chemistry, is the uncrystallizable residue of a compound saline solution: thus the liquor left in a salt-pan after the salt is taken out, is the mother-water.

MOTHERWORT. See LEONURUS.

MOTION, [*motio*, Lat.] the act of changing place. See MECHANICS, and PHYSICS.

MOTION, in astronomy, peculiarly denotes the ordinary courses of the heavenly bodies. See ASTRONOMY.

MOTION, ANIMAL, that which is performed by animals at the command of the mind or will. Various conjectures have been broached with a view to account for the origin of this important function in the animal economy: but, like most other springs of action, arising from a first cause, it is only in a slight degree cognizable to our senses, by its evident mechanical effects. Anatomists have, indeed, in their dissections demonstrated, that the contraction of the muscles causes motion; but by what peculiar process, or how produced, remains still doubtful, and involved in obscurity. Among other hypotheses advanced concerning animal motion,

motion, there prevails an opinion that it is occasioned by an impulse or irritation of the nerves; which, communicating with all parts of the body, produce muscular contraction, and consequent motion, either to a part or to the whole of the frame, in proportion to the force or frequency of the impression. The difficulty of comprehending, how mere impulse, or irritability of the nervous system, should alone be sufficient to produce such powerful effects, as often follow muscular contraction, has induced others, while they admit this principle as a first cause of animal motion, to believe in the intervention of some other matter, which is the more immediate agent, in effecting a closer contact of the muscular fibres, and greater energy during the time of their contraction. The existence of such a subtle matter, as may be capable of performing these wonderful phenomena, has been considered as highly probable; and is supposed to reside in the medullary substance of the nerves. This opinion has, lately, been in a great measure corroborated by the discovery of valves of various sizes attached to the nerves, which valves are found in greater or smaller numbers, accordingly as the animal is either of a quicker or slower motion. See ANATOMY.

MOTION, MUSCULAR. See ANATOMY, GALVANISM, and MUSCLE.

MOTION, PERPETUAL, in mechanics, a motion which is supplied and renewed from itself, without the intervention of any external cause; or an uninterrupted communication of the same degree of motion from one part of matter to another, in a circle or other curve returning into itself, so that the same momentum still returns undiminished upon the first mover. The celebrated problem of a perpetual motion consists in the inventing of a machine, which has the principle of its motion within itself. M. de la Hire has demonstrated the impossibility of any such machine, and finds that it amounts to this, viz. to find a body which is both heavier and lighter at the same time, or to find a body which is heavier than itself. To find a perpetual motion, or to construct an engine, &c. which shall have such a motion, is a famous problem that has employed the mathematicians for 2000 years; though none perhaps have prosecuted it with attention and earnestness equal to those of the present age. Infinite are the schemes, plans, engines, wheels, &c. to which this problem has given birth: it were endless to give a detail of them all. In fact, there seems but little in nature to countenance all this assiduity and expectation; among all the laws of matter and motion, we know of none which seem to furnish any principle or foundation for such an effect. The pursuit seems, therefore, to be as idle and fruitless as those which employed chemists for so many ages, in search of the Philosopher's Stone and an universal Panacea. See MECHANICS.

MOTION, VEGETABLE. Though vegetables have not the power of moving from one place to another like animals, they are nevertheless capable of moving their different parts in such a manner as would lead us to suspect that they are actuated by a sort of instinct. Hence many have been induced to suppose, that the animal and vegetable kingdoms are in a manner indistinguishable from one another; and that the highest degree of vegetable life can hardly be known from the lowest degree of animal life. The essential and insuperable distinction, however, between the two, is the faculty of sensation, and locomotion in consequence of it. Were it not, indeed, for the manifestation of sense by moving from one place to another, we should not be able to tell whether vegetables were possessed of sensation or not; but whatever motions they may be possessed of, it is certain that no vegetable has the faculty of moving from one place to another. Some have endeavoured to distinguish the two kingdoms by the digestion of food; alledging that plants have no proper organs, such as a stomach, &c. for taking in and digesting their aliment. But to this it has been replied, that the whole body of a vegetable is a stomach, and absorbs its food at every pore. This, however, seems not to be a sufficient answer. All animals take in their food at intervals, and there is not a single instance of one which eats perpetually. The food is also taken into the body of the animal, and application of the parts made by means of the internal organization of the viscous; but in vegetables, their whole bodies are immersed in their food, and absorb it by the surface, as animal bodies will sometimes absorb liquids when put into them. The roots of a tree indeed will change their direction when they meet with a stone, and will turn from barren into fertile ground; but this is evidently mere me-

chanism, without any proof of will or sensation; for the nourishment of the root comes not from the stone, but from the earth around it: and the increase in size is not owing to any expansion of the matter which the root already contains, but to the opposition of new matter; whence the increase of size must always take place in the direction whence the nourishment proceeds. On this principle also may we explain the reason why the roots of a tree, after having arrived at the edge of a ditch, instead of shooting out into the air, will creep down one side, along the bottom, and up the other. In their movements vegetables discover nothing like sensation or design. They will, indeed, uniformly bend towards light, or towards water; but in the one case we must attribute the phenomenon to the action of the light and air upon them; and in the latter the property seems to be the same with what in other cases we call attraction. Thus, if a root be uncovered, and a wet sponge placed near it in a direction different from that in which the root was proceeding, it will soon alter its position, and turn towards the sponge; and thus we may vary the direction of the root as often as we please. The efforts of a plant to turn from darkness or shade into sunshine are very remarkable, as, to accomplish this, not only the leaves will be inclined, but even the stems and branches twisted. When a wet sponge is held under the leaves of a tree they bend down in order to touch it. If a vessel of water be put within six inches of a growing cucumber in less than 24 hours the latter will alter its direction; the branches will bend towards the water, and never alter their course until they come in contact with it. The most remarkable instance of this kind of motion however, is, that when a pole is brought near a vine, the latter will turn towards it, and never cease extending its branches till it lays hold of the support. The motions of the sensitive plant and others of the same kind, have been considered as very wonderful; but it is doubtful if any of them be really more so than that of the vine. None of those shew any kind of propensity to move without an actual touch. A very slight one, indeed, makes the sensitive plant contract, and the whole branch, together with the leaves, bend down towards the earth. See MIMOSA. This is so similar to some phenomena of electricity, that few will hesitate to ascribe both to the same cause. Even the motions of the *hedyasum gyrans*, which at first sight seem so much more surprising than those of the sensitive plant, may be explained upon the same principle. The American plant called *Diomea muscipula*, or Venus's fly-trap, is another example of very wonderful mechanism in vegetables, though even this does not argue any degree of sensation in this plant more than in others. The leaves of the *dionæa* are jointed, and furnished with two rows of prickles. A number of small glands upon the surface secrete a sweet juice which entices flies to come and settle upon it; but the moment these insects touch the fatal spot, the leaves fold up, and squeeze them to death between the prickles. The leaves fold up in the same manner when the plant is touched with a straw or pin. See DIONÆA. The folding up of the leaves of certain plants in the absence of the sun's light, called their sleep, affords another very curious instance of vegetable motion. Almost all vegetables, indeed, undergo such a remarkable change in the night, that it is difficult to know exactly how many kinds do really sleep. They fold up their leaves in many different ways; but all agree in disposing of them in such a manner as to afford the best protection to the young stems, flower-buds, or fruit. The leaves of the tamarind-tree contract round the young fruit, to protect it from nocturnal cold; and those of senna, glycina, and many other papilionaceous plants, dispose of their leaves in the same manner. The leaves of the chickweed, *asclepias*, *artiplex*, &c. are disposed in opposite pairs. In the night-time they arise perpendicularly, and join so close at the top that the flowers are concealed by them. In like manner do the leaves protect the flowers of the *sida*, or *althæa theophrasti*, the *ayenia*, and *enothera*, the *solanum*, and the Egyptian vetch. All these are erected during the night; but those of the white lupine, in the time of sleep, hang down. The flowers of plants also have motions peculiar to themselves. Many of them during the night are closed in their calyxes. Some, particularly those of the German spruce, *geranium striatum*, and common Whitlow grass, when asleep, bend towards the earth; by which means the noxious effects of rain or dew are prevented. All these motions have been commonly ascribed to the sun's rays; and Mr. Smellie informs us, that in some of the examples above-mentioned the

he effects were evidently to be ascribed to heat; but plants kept in a hothouse, where the temperature of the day and night are alike, contract their leaves, and sleep in the same manner as if they were exposed to the open air; "whence it appears (says he), that the sleep of plants is owing rather to a peculiar law, than to a quicker or slower motion of the juices." He suspects, therefore, that as the sleep of plants is not owing to the mere absence of heat, it may be occasioned by the want of light; and to ascertain this he proposes an experiment of throwing upon them a strong artificial light. On this, however, we most remark, that the throwing of artificial light upon plants cannot be attended with the same effects as that of the light of the sun unless the former were as strong as the latter, and thrown on the plant in rays nearly parallel, which is impossible. See *Milne's Botanical Dictionary*.

MOTIVE, a term sometimes applied to that faculty of the human mind, by which we pursue good and avoid evil. Thus Hobbes distinguishes the faculties of the mind into two sorts, the cognitive and motive.

MOTTA, a town of Italy, in Trevisano; at the conflux of the Mottegano and Livenza; 18 miles E. N. E. of Treviso.

MOÏTE, ANTHONY HOUDART DE LA, an ingenious Frenchman, greatly distinguished by his writings in prose and verse, and by his literary contests with many eminent persons, was born at Paris in 1672. He wrote with very various success, having been much praised and much censured. His literary paradoxes, his singular systems, in all branches of polite learning, and above all his judgement upon the ancients, raised him up formidable adversaries. Racine, Boileau, Rousseau, Madam Dacier, &c. avenged antiquity on a man who, with more wit than learning, assumed a dictatorial authority in the belles lettres. He became blind in the latter years of his life, and died in 1731. He wrote many poems, tragedies, comedies, pastorals, and fables; besides a vast variety of discourses, critical and academical, in prose. A complete edition of all his works was published in 11 vols 8vo, in 1754.

MOTTO, in heraldry, a short sentence or phrase, carried in a scroll, generally under, but sometimes over, the arms; sometimes alluding to the bearing, sometimes to the name of the bearer, and sometimes containing whatever pleases the fancy of the deviser. See *HERALDRY*.

MOVEABLE FEASTS are such as are not always held on the same day of the year or month; though they be on the same day of the week. See *FEASTS*. Thus, Easter is a moveable feast, being always held on the Sunday which falls upon or next after the first full moon following the 21st of March. All the other moveable feasts are regulated by Easter, and keep their distance from it; such are SEPTUAGESIMA, SEXAGESIMA, ASH-WEDNESDAY, &c. which see under their proper articles.

MOVEABLE SUBJECT, in law, any thing that moves itself, or can be moved; in contradistinction to immoveable or heritable subjects, as lands, houses, &c.

MOVEMENT is often used in the same sense with automaton. The most usual movements for keeping time are watches and clocks: the first are such as shew the parts of time, and are portable in the pocket; the second such as publish it by sounds, and are fixed as furniture. See *CLOCK*, and *WATCH*.

MOVEMENT, in its popular use among us, signifies all the inner work of a watch, clock, or other engine, which move, and by that motion carry on the design of, the machine. The movement of a clock or watch is the inside, or that part which measures the time, strikes, &c. exclusive of the frame, case, dial-plate, &c. The parts common to both these movements are, the main-spring, with its appurtenances; lying in the spring-box, and in the middle thereof lapping about the spring-arbor, to which one end of it is fastened. A-top of the spring-arbor is the endless screw and its wheel; but in spring-clocks, this is a ratchet-wheel with its click, that stops it. That which the main-spring draws, and round which the chain or string is wrapped, is called the fusee; this is ordinarily taper; in large works, going with weights, it is cylindrical, and called the barrel. The small teeth at the bottom of the fusee or barrel, which stops it in winding up, is called the ratchet; and that which stops it when wound up, and is for that end driven up by the spring, the garde-gut. The wheels are various: the parts of a wheel are, the hoop or rim; the teeth, the cross, and the collet or piece of brass soldered on the arbor or spindle whereon the

wheel is rivetted. The little wheels playing in the teeth of the larger are called pinions; and their teeth, which are four, five, six, eight, &c. are called leaves; the ends of the spindle are called pivots; and the guttered wheel, with iron-spikes at bottom, wherein the line of ordinary clocks runs, the pulley. See *CLOCK*, *FUSEE*, *WATCH-WHEEL*, &c.

MOUFET, THOMAS, M. D. a celebrated English physician, born at London, in the 16th century. He practised medicine with great reputation at Ipswich; but spent the latter part of his life near Wilton; and died about 1600. He published a work at London, in 1634, folio, intitled "Theatrum Insectorum." A translation of it was published at London in 1658, folio. Martin Lister gives a very unfavourable opinion of this book, and censures him for quoting Aldrovandus, without naming him; but Ray vindicates Moufet; and maintains that he has rendered an essential service to the republic of letters. Moufet was the first who introduced chemical medicines into England.

MOUG-DEN, or **CHEN-YANG**, a city of Chinese Tartary, and capital of the country of the Manchews, or Eastern Tartars. They have ornamented it with several public edifices, and provided it with magazines of arms and storehouses. Lon. 123. 45. E. Lat. 41. 55. N.

MOULA, in Turkish polity, the judge of a province, in distinction from the Cadis who are judges of towns. See *CADİ*.

MOULD, in agriculture a general name for the soft earthy substance that serves as the upper stratum of land; and in which all kinds of vegetables strike root and thrive. Mould consists of the following ingredients; viz. sand, clay, and talem, or magnesian earth; carbon derived from decayed vegetable and animal substances; the carbonic acid, and water. The good or bad qualities of the soil depend upon a proper mixture of these ingredients; though, if the carbon, the carbonic acid, and iron, be wanting, the fertility of land will depend on its capacity to retain the quantity of moisture, which is necessary for the nutriment of vegetables. The relative utility of mould, for the different purposes of the gardener, may be ascertained by the sight, smell, and touch. The best is of a light brown or hazle-colour; it cuts easily, and does not adhere to the spade, being light, friable, and crumbling into small clods. The next in quality are the dark-grey and russet-coloured moulds; but the worst are those of a very light, or very dark ash-colour, such as are generally found on barren heaths and commons, where they seldom produce any thing except furze and fern. With respect to smell, Miller observes, that the best time for judging by that sense, is immediately after rain has moistened the soil; when the mould, if it be rich and good, will emit an agreeable odour. But the most accurate criterion is the touch, as it may thus be ascertained whether the mould be too sandy, or abound with too much clay; whether it be fatty and slippery; or harsh, porous, or friable. The most fertile, by this test, holds a medium between the two extremes; being easily soluble, consisting of equal parts of sand and clay; and not adhering to the spade, after gentle showers.

MOULD, or **MOLD**, in the mechanic arts, &c. a cavity artfully cut with design to give its form or impression to some softer matter applied therein. Moulds are implements of great use in Sculpture, foundry, &c. The workmen employed in melting the mineral or metallic glebe dug out of mines, have each their several moulds to receive the melted metal as it comes out of the furnace: but these are different according to the diversity of metals and works. In gold-mines, they have moulds for ingots; in silver-mines, for bars; in copper or lead-mines, for pigs or salmons; in tin-mines, for pigs and ingots; and in iron-mines, for sows, clamney-backs, anvils, caldrons, pots, and other large utensils and merchandizes of iron; which are here cast, as it were at first hand.

MOULD, among gold-beaters, a certain number of leaves of vellum or pieces of guts cut square, of a certain size, and laid over one another, between which they put the leaves of gold and silver which they beat on the marble with the hammer. See *GOLD-LEAF*.

MOULD, among masons, is a piece of hard wood or iron, hollowed within side, answerable to the contours of the mouldings or cornices, &c. to be formed. This is otherwise called calther.

MOULD, in ship-building, a thin flexible piece of timber, used by shipwrights as a pattern whereby to form the different curves of the timbers, and other compassing pieces in a ship's frame.

MOULDS.

MOULDS of founders of large works, as statues, bells, guns, and other brazen works, are of wax, supported within-side by what we call a core, and covered without-side with a cape or case. It is in the space which the wax took up, which is afterwards melted away to leave it free, that the liquid metal runs, and the work is formed; being carried thither by a great number of little canals, which cover the whole mould.

MOULDS of founders of small works are like the frames of coins: it is in these frames, which are likewise filled with sand, that their several works are fashioned; into which, when the two frames, whereof the mould is composed, are rejoined, the melted brass is run.

MOULDS for leaden bullets are little iron-pincers, each of whose branches terminates in a hemispherical concave, which when shut form an entire sphere. In the lips or sides where the branches meet, is a little jet or hole, through which the melted lead is conveyed.

MOULDS of letter-founders are partly of steel and partly of wood. The wood, properly speaking, serves only to cover the real mould which is within, and to prevent the workman, who holds it in his hand, from being incommoded by the heat of the melted metal. Only one letter or type can be formed at once in each mould. See **FOUNDRY**.

MOULDS of moneyers are frames full of sand, wherein the plates of metal are cast, that are to serve for the striking of gold and silver coin. See **COINAGE**.

MOULDINESS, a term applied to bodies which corrupt in the air, from some hidden principle of humidity therein; and whose corruption shews itself by a certain white down or lanugo on their surface, which viewed through a microscope appears like a kind of meadow, out of which arise herbs and flowers, some only in the bud, others full-blown, and others decayed; each having its root, stalk, and other parts. See **MUCOR**.

MOULDING, any thing cast in a mould, or that seems to have been so, though in reality it were cut with a chisel, or the axe. Moulding of figures in paste is done as follows: take the crumb of a new drawn white loaf, beat it, and roll it with a rolling-pin as fine and as far as it will go; then print it on the moulds; and when it has taken the suitable figure you desire, dry it in a stove, and it will be very hard; and to preserve it from vermin, you may mix a little powder of aloes with it. To mould small figures of jasper-colour: oil your moulds with a fine pencil, and diversify them with such colours as you please, with gum-tragacanth; if they spread or run, put a little of the gall of an ox, for the thicker it is, the harder it will be; then mould your paste of the colour of jasper, or the like; put it in to fill the mould: tie it with a wire, and take it out; repair and varnish it, and set it to harden.

MOULDINGS, in architecture, projectures beyond the naked wall, column, wainscot, &c. the assemblage of which forms corniches, door-cases, and other decorations of architecture. See **ARCHITECTURE**.

MOULINET, in mechanics, a roller, which, being crossed with two levers, is usually applied to cranes, cap-tans, and other sorts of engines of the like nature, to draw ropes, and heave up stones, &c.

MOULINET, also a kind of turnstile, or wooden cross, which turns horizontally upon a stake fixed in the ground: usually placed in passages to keep out cattle, and to oblige passengers to go and come one by one. Those moulins are often set near the out-works of fortified places at the sides of the barriers, through which people pass on foot.

MOULINS, a town of France, capital of the department of Allier, as it was of the late province of Bourbonnois; 30 miles S. of Nevers. Lon. 3. 25. E. Lat. 46. 34. N.

MOULINS EN GILBERT, a town of France, in the department of Nièvre, and late province of Nivernois; 5 miles S. W. of Chateau-Chinon, and 27 E. of Nevers.

MOULINS LA MARCHE, a town of France, in the department of the Orne, 9 miles S. W. of Aigle, and 18 N. E. of Alençon.

MOULTAN, a province of Hindostan, on the E. side of the Indus; bounded on the N. by Lahore: E. by Delhi and Agimere: South by Guzerat and some sandy deserts; and W. by Persia and Candahar. It belongs to the King or Scheik of Candahar. Cotton, sugar, sulphur, opium, &c. are its chief products.

MOULTAN, an ancient city of Hindostan, capital of the above province; with a famous pagoda, or Hindoo temple. It was formerly a place of great trade, in cotton-stuffs, &c. It is seated on the Chunaub, a branch of the Indus, 200 miles S. W. of Lahore, and 375 N. W. of Delhi. Lon. 70. 40. E. Lat. 29. 52. N.

MOULTING, or **MOLTING**, the falling off, or change, of hair, feathers, skins, horns, or other parts of animals, happening in some annually, in others only at certain stages of their lives. The generality of animals moult in spring. The moulting of a hawk is called mewing. The moulting of a deer is the quitting of his horns in February or March. The moulting of a serpent is the changing his skin. See **EXUVIÆ**.

MOULTON, **NORTH**, a town of Devonshire on the Moul, and the N. side of S. Moulton.

MOULTON, **SOUTH**, a town on the S. side of the Moul, 12 miles S. E. of Barnstaple. Lon. 3. 55. W. Lat. 1. 5. N.

MOUND, in heraldry, a ball or globe with a cross upon it, such as our kings are usually drawn with, holding it in their left hands, as they do the sceptre in the right.

MOUNT, an elevation of earth, called also mountain. See **MOUNTAIN**.

MOUNT OF PIETY, certain funds or establishments in Italy, where money is lent out, on some small security. We had also mounts of piety in England, raised by contribution, for the benefit of people ruined by the extortions of the Jews.

MOUNTAIN, [*montanus*, Lat.] a considerable eminence of land elevated above every thing adjoining to it, and commanding all the surrounding place: it is commonly full of inequalities, cavities more or less exposed, and strata half laid open. This name abbreviated is likewise given to a chain of mountains; as, Mount Atlas, Mount Caucasus, &c. Mountains are divided into primary, that is, of equal date with the formation of the globe, and secondary or alluvial. Among primary, those of granite hold the first place. The highest mountains and most extensive ridges throughout the globe are of that kind; as the Alps and Pyrenees in Europe; the Altuischan, Uralian, and Caucasus, in Asia, and the Andes in America. The highest of them never contain metallic ores; but some of the lower contain ores of copper and tin. The granite next the ore always abounds in mica. Petrifications are never found in these primary mountains. That the formation of these mountains preceded that of vegetables and animals, is justly inferred from their containing no organic remains, either in the form of petrification or impression. Naturalists are agreed that granites were formed by crystallization. This operation probably took place after the formation of the atmosphere, and the gradual excavation of the bed of the ocean, when the dry land appeared. For, by means of the separation of the æriform fluids which constitute the atmosphere, the evaporation of part of the water into the atmosphere, and the gradual retreat of the remainder, the various species of earths, before dissolved or diffused through this mighty mass, were disposed to coalesce: and among these the siliceous must have been the first, as it is the least soluble; but as the siliceous earth has an affinity to the other earths with which it was mixed, some of these must have united in various proportions, and thus have formed, in distinct masses, the feldspar, schorl, and mica, which compose the granite. Calcareous earth enters very sparingly into the composition of this stone; but as it is found in schorl, which is frequently a component part of granite, it follows that it must be one of the primitive earths, and not entirely derived from maritime exuvia, as some have supposed. Quartz can never be supposed to be a product of fire; for in a very low heat it bursts, cracks, and loses its transparency, and in the highest degree of heat that we can produce, is infusible, so that in every essential point it is different from glass, to which some have compared it. As granite contains earths of every genus, we may conclude, that all the simple earths are original. This, however, is no proof that they are in reality simple and uncompounded of other principles; but they must be considered as such in the present state of our knowledge. Though water undoubtedly dates from the creation, yet late experiments have shewn it to be a compound, as was formerly stated. Mountains which consist of limestone or marbles of a granular or scaly texture, and not disposed in strata, seem also to have preceded the creation of animals, for no organic traces are found in them. Some of those which consist of argillaceous stones, and some of the siliceous, contain

contain also no organic remains. These often consist of parallel strata of unequal thickness; and the lower are harder and less thick than the upper, and therefore seem to have been formed earlier than the upper. Alluvial mountains are evidently of posterior formation, as they contain petrifications and other vestiges of organic substances, and these are always stratified. Mountains, as to structure, are entire, stratified, and confused. Entire mountains are formed of huge masses of stone, without any regular fissures, and are mostly homogeneous. They consist chiefly of granite, sometimes gneiss, flag-stone, sand-stone, lime-stone, gypsum, porphyry, or trap. Some in Sweden and Norway consist of iron-ore. The stratified mountains are those whose mass is regularly divided by joints or fissures: these are called horizontal, rising, or dipping. Homogeneous stratified mountains consist chiefly of stones of the argillaceous genus, or of the fissile compound species of the siliceous genus, as metallic rock; sometimes of lime-stone of a granular or scaly texture, in which no animal vestiges appear. This limestone reposes on the argillaceous or siliceous strata: sometimes the argillaceous are covered with masses of granite, sometimes of lava. These mountains, particularly those of gneiss, metallic rock, and horn-stone, are the chief seat of metallic ores. When covered with limestone, the ore is generally between the limestone and the argillaceous stones. These ores run in veins, not in strata. Petrifications are found upon, but not in, these mountains. Heterogeneous, or compound stratified mountains, consist of alternate strata of various species of stones, earths, sands, &c. The limestone here is always of the laminar, and not of the granular or scaly, kind; and when it contains any ore it is placed between its laminae. Stones of the siliceous genus seldom form strata in these mountains, except lavas; but the strata are frequently interrupted by siliceous masses, as jasper, porphyry, &c. Coal, bitumen, petrifications, and organic impressions, are found in these mountains; also salts and calamine. There are other mountains, which cannot properly be called stratified, as they consist only of three immense masses, the lowest granite, the middle argillaceous, and the upper limestone. Metallic ores are found in the argillaceous part, or between it and the limestone. Confused mountains consist of stones heaped together without order, their interstices filled with clay, sand, and mica. They scarcely ever contain any ore. To measure the height of a mountain, the same method must be used as is done in measuring any other inaccessible height. See **MENSURATION**. The height of mountains, and the elevations, may also be ascertained by means of the barometer. See **BAROMETER**. According to M. Pontoppidan, the highest mountains in Norway are 3000 toises in height. According to M. Brovallius, the highest mountains in Sweden are 2333 toises. But these calculations are thought erroneous. From the Memoirs of the Academy of Sciences at Paris, it appears that the mountains of France most elevated above the surface of the Mediterranean are the Puy-de-Dôme, which is 817 toises, and the Mont d'Or, which is 1048 toises. Mount Cantal is 993 toises high: Mount Ventoux is 1036; the south peak of Cénigou in the Pyrenees, according to M. de Rocheblave, is 1442; and St. Barthélemi 1184. M. Nedham observes, that the highest Alps in Savoy are the Great St. Bernard, which is 1274 toises; Mount Sérené, which is 1283; and Mount Tourné, which is 1683. The peak of Argentiére is 2094 toises. Mont Blanc is 2213, or, according to M. Shuckburgh, 2447 toises one foot, above the level of the Mediterranean. See **BLANC**. The altitude of the Alps of Switzerland has been ascertained by different philosophers. See **GLACIERS**. St. Gothard is stated by some at 1630; by others, 2750 toises (see **GOTHARD**), and Lignon, near the lake of Como, N.E. is 1486 toises in height. See estimates of the heights of many other mountains in the Table comparative des hauteurs des principales montagnes, by M. Pasumont (Journ. de Physique, Sept. 1783). Throughout the globe we shall not perhaps meet with higher mountains than those of the Cordilleras, or Andes, in South America. See **ANDES**. The principal summits of these extraordinary mountains, which are situated near Quito, and are constantly covered with snow, though they lie under the equator, have the following geometrical elevations above the level of the sea: Quito-Capitate, 1707 toises; El-Corason, 2470; Cotacatche, 2570; Ek Atlas, 2730, and Noyanble-orcu, under the line, 3030. All the other mountains have been, or still are, volcanoes, viz. Pichincha, 2430; Cargavi-raso, 2450; Sinchonagon or Sin-

choulagoa, 2570; Sangai, 2680; Illinika, 2717; Kotopaxi, 2950; Antisana, 3020; Cagambeorcon, under the line, 3030; Chimborazo, 3220: which last is one of the largest, and probably the highest, in the world; being 20282 feet high. It is seen from the gulph of Guayaquil, which is more than 180 miles distant. See **ANDES**, and **CHIMBORAZO**. Other very elevated mountains are Mount Sinai, in Japan; Caucasus, in Asia; the south peak of the Pyrenees; the peak of Teneriffe in one of the Canary islands, which, according to M. Bouguer, is 2100 toises; but, according to later observations, made by Messrs. Verdun, Borda, and Pingré, in 1754, is only 1904 toises above the sea-level. In Professor Jameson's System of Mineralogy, vol. 3. the reader will find an extensive table of the heights of the principal lakes, hills, and mountains, in the world.

MOUNTAINS, IMPORTANT USES OF. Mountains evidently answer very important purposes. Some of them, vomiting out fire or smoke, lava, and sulphur, indicate that they in some measure answer the purpose of a chimney to give vent to something within the earth, which, if confined, would burst it in pieces. See **VOLCANO**. Of this kind are, Mount Hecla, in Iceland; Etna, in Sicily; Vesuvius, in Naples; Pichincha and Cotopaxi, in America, &c. Others, the summits of which reach into the clouds, attract and absorb the vapours of the sea, &c. which float in the air. Abbé Palasson observes, that storms are most frequent at the foot of those high mountains, which form extensive chains. Their enormous masses arrest and fix the different meteors as they are formed. The clouds, in like manner, driven by the winds from different points of the horizon, there meet with impenetrable barriers, are there accumulated in great quantities, and remain suspended on these bulwarks of the globe's surface, till the agitation of the atmosphere succeeding the calm, produces storms, which are so much the more terrible, that they cannot be dispersed without great difficulty. They are commonly repelled from the mountains; and then spread over whole countries, dissolve in rain with peals of thunder, or fall down in destructive showers of hail, fatal to the produce of the fields. This scourge is peculiarly dreadful during spring and summer, when a sufficient quantity of snow remains on the mountains to cool the atmosphere. Some chains of mountains have openings; in others they are wanting; of the former kind are the straits of Thermopylae, the Caspian straits, the pass of the Cordilleras, &c. Those spaces which separate the tops of mountains are so many basons destined for the reception of the condensed mists, and of the clouds precipitated into rain. The bowels of mountains appear to be great and inexhaustible reservoirs, and to contain subterraneous canals and lateral openings naturally formed, so that animals may be supplied with drink, that the earth may be fertilised, and that nourishment may be afforded for the growth of vegetables. The streams and rivers descend from the ridges of mountains, the declivities of which form so many inclined planes: thus we find the Alps give rise to the Rhine, the Danube, the Rhone, and the Po. With regard to the wonderful structure, by means of which so many advantages are obtained, see the articles **SPRINGS**, **TERRAQUEOUS GLOBE**, &c. Mountains of the first order form vast solitudes and horrid deserts, where the habitations of men are not to be seen, and their footsteps are seldom to be traced. They form the common retreat of a multitude of wild beasts, which are subservient to our use: there the bear, the lynx, the ermine, the martin, the fox, and many other animals, whose skins we employ for furs, take up their abode; and thither the eagle and the vulture resort in safety. Mountains likewise afford nourishment to rein-deer, buffaloes, fallow-deer, roe-deer, and chamois; and they are visited by birds of passage, which, under the guidance of instinct, follow the shortest road to the place of their destination. They produce medicinal plants, which seldom or never grow elsewhere. In Switzerland they are also covered with deep forests, which, by the great height of the trees, announce their antiquity. They afford both timber and fuel, and supply the inhabitants with abundance of excellent pasture for cattle during the whole summer. The most precious stones, both for brilliancy and hardness, acquire their forms and colours in the fissures of the rocks: the internal rents of the mountains are filled, and in a manner cemented by different metallic substances; while the grottos are furnished with numerous congelations, shining crystals, and substances of an extraordinary nature and figure. In short every thing concurs to shew, that the existence

existence of mountains is absolutely necessary; and that to acquire a proper knowledge of them, they must be considered in many different points of view.

MOUNTAINS, ATTRACTION OF. This is a late discovery, and a very considerable confirmation of Sir Isaac Newton's theory of universal gravity. According to the Newtonian system, an attractive power is not only exerted between those large masses of matter which constitute the sun and planets, but likewise between all comparatively smaller bodies, and even between the smallest particles of which they are composed. Agreeably to this hypothesis, a heavy body, which ought to gravitate or tend toward the centre of the earth, in a direction perpendicular to its surface, supposing the said surface to be perfectly even and spherical, ought likewise, though in a less degree, to be attracted, and tend towards a mountain placed on the earth's surface; so that a plumb-line, for instance, of a quadrant, hanging near such a mountain, ought to be drawn from a perpendicular situation, in consequence of the attractive power of the quantity of matter of which it is composed acting in a direction different from that exerted by the whole mass of matter in the earth. Though Sir Isaac Newton had long ago hinted at an experiment of this kind, and had remarked, that "a mountain of an hemispherical figure, three miles high and six broad, would not, by its attraction, draw the plumb-line two minutes out of the perpendicular," yet no attempt to ascertain this matter by actual experiment was made till about 1738; when the French academicians, particularly Messrs. Bouguer and Condamine, who were sent to Peru to measure a degree under the equator, attempted to discover the attractive power of Chimborazo, in Quito. According to their observations, Chimborazo exerted an attraction equal to eight seconds. Though this experiment was not perhaps sufficient to prove satisfactorily even the reality of an attraction, much less the precise quantity of it; yet it does not appear that any steps had been since taken to repeat it. Dr. Maskelyne, the late astronomer royal, in 1772, made a proposal to the Royal Society for this purpose, and in 1774 was chosen to conduct the experiment. The mountain Schellien, situated nearly in the centre of Scotland, was pitched upon as the most proper for the purpose that could be found in this island. The observations were made by taking the meridian zenith-distances of different fixed stars, near the zenith, by means of a zenith-sector of ten feet radius; first on the S. and afterwards on the N. side of the hill, the greatest length of which extended in an E. and W. direction. It is evident, that if the mass of matter in the hill exerted any sensible attraction, it would cause the plumb-line of the sector, through which an observer viewed a star in the meridian, to deviate from its perpendicular situation, and would attract it contrariwise at the two stations, thereby doubling the effect. On the S. side the plummet would be drawn to the northward, by the attractive power of the hill placed to the northward of it; and on the N. side, a contrary and equal deflection of the plumb-line would take place, in consequence of the attraction of the hill, now to the S. of it. The apparent zenith-distances of the stars would be affected contrariwise; those being increased at the one station which were diminished at the other; and the correspondent quantities of the deflection of the plumb-line would give the observer the sum of the contrary attractions of the hill, acting on the plummet at the two stations; the half of which will of course indicate the attractive power of the hill. The operations requisite for this experiment lasted about four months; and from them it appears, that the sum of the two contrary attractions of the mountain Schellien, in the two temporary observations which were successively fixed half-way up the hill (where the effect of its attraction would be greatest) was equal to 11". 6. From a rough computation, founded on the known law of gravitation, and on an assumption, that the density of the hill is equal to the mean density of the earth, it appears that the attraction of the hill should amount to about the double of this quantity. Thence it was inferred, that the density of the hill is only about half the mean density of the earth. It does not appear, however, that the mountain Schellien has ever been a volcano, or is hollow; as it is extremely solid and dense, and seemingly composed of an entire rock. The inferences drawn from these experiments may be reduced to the following: "1. That the mountain Schellien exerts a sensible attraction; therefore, from the rules of philosophising, we are to conclude, that every mountain, and indeed

every particle of the earth, is endued with the same property, in proportion to its quantity of matter. 2. The law of the variation of this force, in the inverse ratio of the squares of the distances, as laid down by Sir Isaac Newton, is also confirmed by this experiment. For if the force of attraction of the hill had been only to that of the earth as the matter in the hill to that of the earth, and had not been greatly increased by the near approach to its centre, the attraction thereof must have been wholly insensible. But now, by only supposing the mean density of the earth to be double to that of the hill, which seems very probable from other considerations, the attraction of the hill will be reconciled to the general law of the variation of attraction in the inverse duplicate ratio of the distances, as deduced by Sir Isaac Newton from the comparison of the motion of the heavenly bodies with the force of gravity at the surface of the earth; and the analogy of nature will be preserved. 3. We may now, therefore, be allowed to admit this law, and to acknowledge that the mean density of the earth is at least double of that at the surface; and consequently that the density of the internal parts of the earth is much greater than near the surface. Hence also, the whole quantity of matter in the earth will be at least as great again as if it had been all composed of matter of the same density with that at the surface; or about four or five times as great as if it were all composed of water. This conclusion, Mr. Maskelyne adds, is totally contrary to the hypothesis of some naturalists, who 'suppose the earth to be only a great hollow shell of matter; supporting itself from the property of an arch, with an immense vacuity in the midst of it.' But, were that the case, the attraction of mountains, and even smaller inequalities in the earth's surface, would be very great, contrary to experiment, and would affect the measures of the degrees of the meridian much more than we find they do; and the variation of gravity, in different latitudes, in going from the equator to the poles, as found by pendulums, would not be near so regular as it has been found by experiment to be. "4. As mountains are by these experiments found capable of producing sensible deflections of the plumb-lines of astronomical instruments; it is of great importance, in the mensuration of degrees in the meridian, either to choose places where the irregular attractions of the elevated parts may be small; or where, by their situation, they may compensate or counteract the effects of each other." See ASTRONOMY.

MOUNTAINS, BURNING. See **ÆTNA**, **HECLA**, **VESUVIUS**, and **VOLCANO**.

MOUNTAINS, WHITE, a range of mountains in New Hampshire, reckoned the highest in New England. They are visible on land eighty miles distant, and are the first observed at sea. Their Indian name is Agiochechook. The number of summits is unknown, but seven are visible at once. Of these the highest is called Mount Washington. The whole circuit of them is not less than fifty miles. Their height above an adjacent meadow, is reckoned to be about 5500 feet, and the meadow is 3500 feet above the level of the sea. The snow and ice cover them nine or ten months in the year; during which time they exhibit that bright appearance from which they are denominated white. From this summit in clear weather is exhibited a noble view, extending sixty or seventy miles in every direction. Although they are more than seventy miles within land, they are seen many leagues off at sea, and appear like an exceeding bright cloud in the horizon. These immense heights, being copiously replenished with water, afford a variety of beautiful cascades. Three of the largest rivers in New England receive a great part of their waters from them. The highest summit of these mountains is about lat. 44° N.

MOUNTAIN-PARSLEY. See **ATHAMANTA**.

MOUNT BLANC. See **BLANC**.

MOUNT-EDGECUMBE, a prodigious high peak, at the entrance of Cook's strait, in New Zealand, on the W. side. Its height is supposed not to be much inferior to that of the peak of Teneriffe.

MOUNT-SORREL, a town in Leicestershire, so named from a high mount or solid rock adjoining to the town, of a dusky-red or sorrel-coloured stone, extremely hard. It is twenty miles S. E. by S. of Derby, and 105 N. W. by N. of London. Lon. 1. 9. W. Lat. 52. 45. N.

MOUNTING, in the mechanic arts, something that serves to raise or set off a work: thus, the frame and its dependences make the mounting of a looking-glass; the hilt, the mounting of a sword; the fast, or but, the mounting of a carbine, musquet, &c.

and the mounting of a fan, is the sticks which serve to open and shut it.

MOUNTING, in military affairs, signifies going upon duty: thus, mounting a breach, is running up to it; mounting the guard, is going upon guard; and mounting the trenches, is going up on duty in the trenches; but mounting a cannon, mortar, &c. is the setting it on its carriage, or the raising its mouth.

MOURA, a town of Portugal, in Alentejo, 27 miles S. E. of Evora. Lon. 5. 59. W. Lat. 38. 0. N.

MOURNERS, an order of penitents in the ancient Christian church, who lay prostrate in the porches of churches, begging the prayers of the faithful, as they went in, and desiring to do public penance in the church.

MOURNING, ANCIENT MODES OF. Amongst the ancient Jews, on the death of their relations or intimate friends, mourning was expressed by weeping, tearing their clothes, smiting their breasts, or tearing them with their nails, pulling or cutting off their hair and beards, walking softly, *i. e.* bare-foot, lying upon the ground, fasting, or eating upon the ground. They kept themselves close shut up in their houses, covered their faces, and abstained from all work, even reading the law, and saying their usual prayers. They neither dressed themselves, nor made their beds, nor cut their nails, nor went into the bath, nor saluted any body. The time of mourning was generally seven days; less or more according to circumstances; but thirty days were thought sufficient upon the severest occasions. The different periods of the time of mourning required different degrees of grief, and different tokens of it. The Greeks, on the death of their friends, shewed their sorrow by secluding themselves from all gaiety, entertainments, games, public solemnities, wine, and music. They sat in gloomy and solitary places, stripped themselves of all external ornament, put on a coarse black stuff by way of mourning, tore their hair, shaved their heads, rolled themselves in the dust and mire, sprinkled ashes on their heads, smote their breasts with their palms, tore their faces, and frequently cried out with a lamentable voice and drawing tone, reiterating the interjection *ei, ei, ei*; hence funeral lamentations were called *ελεγος*; whence our word elegy. If they appeared in public during the time of mourning, they had veils over their faces and heads. During the funeral-procession, certain persons called *εταγοι* *εταγον* marched before, and sung melancholy strains called *οπιοβουκι* *ιδαμει*, *Ανσι* and *Αδμεν*. These vocal mourners sung thrice during the procession round the pile and round the grave. Flutes were also used to heighten the solemnity.

MOURZOOK, or **MOURZOUK**, a city of Africa, the capital of Fezzan, 262 miles S. of Mesurata, and 710 N. by E. of Casina. Lon. 15. 5. E. Lat. 27. 20. N.

MOUSE, in zoology. See *Mus*.

MOUSE-EAR, in botany. See *HIERACHIUM*.

MOUSE-TAIL. See *MYOSURUS*.

MOSUL, or **MOSUL**, a large city of Turkey, in Asia, and capital of a Beglerbegate, on the W. bank of the Tigris. Lon. 43. 35. E. Lat. 36. 10. N.

MOUTH, in anatomy, a part of the face, consisting of the lips, the gums, the insides of the cheeks, the palate, the salival glands, the os hyoides, the uvula, and the tonsils. See *ANATOMY*. Mr. Derham observes, that the mouth in the several species of animals is nicely adapted to the uses of such a part, and well sized and shaped for the formation of speech, the gathering and receiving of food, the catching of prey, &c. In some creatures it is wide and large, in others little and narrow; in some it is formed with a deep incisure into the head, for the better catching and holding of prey, and more easy comminution of hard, large, and troublesome food; and in others with a shorter incisure, for the gathering and holding of herbaceous food. In birds it is neatly shaped for piercing the air; hard and horny, to supply the want of teeth; hooked, in the rapacious kind, to catch and hold their prey; long and slender in those that have their food to grope for in moorish places; and broad and long in those that search for it in the mud. Nor is the mouth less remarkable in insects; in some it is forcipated, to catch, hold, and tear the prey; in others aculeated, to pierce and wound animals, and suck their blood; in others, strongly rigid, with jaws and teeth, to gnaw and scrape out their food, carry burdens, perforate the earth, nay the hardest wood, and even stones themselves, for houses and nests for their young.

MOUTH OF A HORSE, in the manege, should be moderately well cloven; for when it is too large, it is difficult to bit a horse, so as that he may not swallow it, as the horsemen term it; and if he has a small mouth, it will be difficult to get the bit rightly lodged in it. A horse is said to have a fine, sensible, tender, light, or loyal, mouth, when he is so sensible in that part where the bit is placed, as to obey the least motion of the bridle; so a false mouth is a mouth that is not at all sensible, though the parts look well, and are well formed; and a mouth is said to be fixed and certain, when a horse does not check or beat upon the hand. See the article *HAND*.

MOUTH is used in the courts of princes, for what relates to their eating and drinking: hence officers of the mouth, yeomen of the mouth.

MOUTHE, a town of France, in the department of the Doubs, 18 miles S. E. of Salins, and 13 S. W. of Pontarlier.

MOUZON, a river of France, which runs into the Meuse, at Neufchatel, in the department of Vosges.

MOUZON, a town of France in the department of Ardennes, and late province of Champagne, on the Meuse, nine miles S. E. of Sedan, and 120 N. E. of Paris. Lon. 5. 10. E. Lat. 49. 37. N.

MOWEE, one of the Sandwich islands discovered by Captain Cook, is 162 miles in circumference. A low isthmus divides it into circular peninsulas, of which the E. is double the size of the W. The mountains in both rise to an exceeding great height, and may be seen at the distance of more than 30 leagues. The number of inhabitants is about 65,000. Longitude of the east point of this island from Greenwich, 155° 55' 0" W. Lat. 20° 50' 30" N.

MOWING, the act of cutting down grass, &c. with the scythe. This method of reaping has hitherto been practised chiefly on oats, clover, and the grasses; but there is no doubt that it may, with advantage, be extended to wheat, and every other kind of grain; for the following obvious reasons: 1. Mowing is much easier, and less fatiguing, to the labourers, than reaping. 2. It is more expeditiously performed. 3. It requires a smaller number of hands. 4. It affords employment for children, aged men and women, who are almost past labour, in gathering the corn, and other lighter branches of the work. 5. The grass being mown together with the straw, the quantity of the latter is increased, while it becomes of greater value as fodder. Lastly, the grass produced on fields which have been mown, vegetates with increased luxuriance, and furnishes excellent pasture for cattle, and particularly for cows, when the harvest is closed. Hence Du Hamel infers, that a farmer may, by this practice, not only keep a larger number of cattle, but at the same time save his hay, and obtain a greater quantity of dung. It may probably be objected, that, if a wet harvest should occur, mown wheat will sprout more speedily than that which is reaped. This injury, however, may be effectually prevented, by disposing the sheaves triangularly, so that the head of one may rest upon another. The only requisite to effect this, is a little dexterity in closing the triangle, so that the basis of the third sheaf may serve to support the heads of the first and second. We cannot conclude this article, without noticing an easy method, by which the operation of mowing may be greatly facilitated. According to the present mode of cutting grass, the workmen trace two parallel lines with their feet, which they move forward alternately, after every stroke of the scythe: instead of which, Du Hamel recommends the mower's path to be traced only in a single line; because he ought to advance with one foot before the other, in such a manner that the left (which is behind,) should always forward the right foot. This simple practice deserves commendation; for the labour will not only be performed with more speed, but likewise with greater ease to the mowers, who will thus be secured from those sudden cramps in their left sides, with which they are frequently seized, in the prevailing system of using the scythe.

MOXA, the *MUGWORT* of China, is a soft lanuginous substance, prepared in Japan from the young leaves of a species of *artemisia*, by beating them together when thoroughly dried, and rubbing them betwixt the hands till only the fine fibres are left. The down on the leaves of mullein, cotton, hemp, &c. do as well as moxa. In the Eastern countries it is used by burning it on the skin; a little cone of the moxa is laid upon the part, previously moistened, and set on fire at the top: it burns down with a tempe-

rate glowing heat, and produces a dark coloured spot, the exulceration of which is promoted by applying a little garlic; the ulcer is left to discharge, or is soon healed, according to the intention in using the moxa. See ARTEMISIA.

MOZZANICA, a town of Italy in the department of Orona, and district and late duchy of Milan, 12 miles N. N. E. of Lodi, and 22 E. of Milan.

M. P. a contraction very generally used in addressing letters to Members of Parliament.

MUCILAGE, a glutinous matter obtained from vegetables, transparent and tasteless, soluble in water, but not in spirit of wine. It chiefly consists of carbon, hydrogen, and a small quantity of oxygen. See GLUTEN.

MUCILAGE, in chemistry, is contained in the roots and leaves of a great number of plants. Almost all the bulbous roots and fleshy leaves yield it. The bulbs of the hyacinth contains so much, that when dried, they may be employed as a substitute for gum-arabic. See GUM. Mucilage is sometimes found nearly pure, exuding from the bark and twigs of many vegetables, and hardening when exposed to the sun, into brittle semi-transparent lumps.

MUCILAGE, in anatomy, is the liquor which principally serves to moisten the ligaments and cartilages of the articulations, and is supplied by the mucilaginous glands.

MUCILAGE, in pharmacy, is in general any viscid or glutinous liquor.

MUCILAGINOUS GLANDS, in anatomy, a very numerous set of glands, serving to secrete the mucilage of the joints. See ANATOMY.

MUCK, or **RUNNING A MUCK**, a practice that has prevailed time immemorial in Batavia. To run a muck in the original sense of the word, is to get intoxicated with opium, and then rush into the street with a drawn weapon, and kill any one that comes in the way, till the party is himself either killed or taken prisoner. If the officer takes one of these amocks or **MOHAWKS** (as they have been called by an easy corruption) alive, he has a considerable reward; and the unhappy wretches are always broken alive on the wheel: but such is the fury of their desperation, that three out of four are necessarily destroyed in attempting to secure them.

MUCOR, in botany, a genus of the order of fungi, belonging to the cryptogamia class of plants. This fungus has vesicular heads supported by foot-stalks. There are about seventeen British species.

MUCOUS GLANDS, in anatomy, three glands, which empty themselves into the urethra; so called by their first discoverer, Mr. Cowper, from the tenacity of the liquor which they separate.

MUCUS, a mucilaginous liquor secreted by certain glands, and serving to lubricate many of the internal cavities of the body. In its natural state it is generally limpid and colourless; but, from certain causes, will often assume a thick consistence and whitish colour like pus. As it is sometimes of very great importance in medicine to distinguish these two fluids from each other, this was lately proposed as the subject of a prize disputation by the Æsculapian Society of Edinburgh. The prize was gained by Mr. Charles Darwin, student of medicine from Litchfield. The conclusions drawn from his experiments were, 1. Pus and mucus are both soluble in the vitriolic acid, though in very different proportions, pus being by far the least soluble. 2. The addition of water to either of these compounds decomposes it. The mucus thus separated either swims in the mixture or forms large flocculi in it; whereas the pus falls to the bottom, and forms, on agitation, an uniform turbid mixture. 3. Pus is diffusible through diluted vitriolic acid, though mucus is not. The same also occurs with water, or with a solution of sea-salt. 4. Nitrous acid dissolves both pus and mucus. Water added to the solution of pus produces a precipitate, and the fluid above becomes clear and green, while water and the solution of mucus form a turbid dirty-coloured fluid. 5. Alkaline lixivium dissolves, though sometimes with difficulty, mucus, and generally pus. 6. Water precipitates pus from such a mixture, but does not mucus. 7. Where alkaline lixivium does not dissolve pus, it still distinguishes it from mucus, as it then prevents its diffusion through water. 8. Coagulable lymph is neither soluble in concentrated nor diluted vitriolic acid. 9. Water pro-

duces no change on a solution of serum in alkaline lixivium, until after long standing, and then only a very slight sediment appears. 10. Corrosive sublimate coagulates mucus, but does not pus. From the above experiments it appears, that strong vitriolic acid and water, diluted vitriolic acid, and caustic alkaline lixivium and water, will serve to distinguish pus from mucus; that the vitriolic acid can separate it from coagulable lymph, and alkaline lixivium from serum. Hence, when a person has any expectorated matter, the decomposition of which he wishes to ascertain, let him dissolve it in vitriolic acid, and in caustic alkaline lixivium; and let him add pure water to both solutions. If there be a fair precipitation in each, he may be assured that some pus is present. But if there be a precipitation in neither, it is certain that the mixture is entirely mucus. If the matter cannot be made to dissolve in alkaline lixivium by time and trituration, we have also reason to believe that it is pus.

MUD, the slime or miry earth usually found at the bottom of ponds, and stagnant waters. It also signifies the dust or dirt of streets and roads, rendered fluid by rain. Mud is chiefly useful as a manure for loamy soils; though it may also be applied with advantage to any other land. The best kind is that taken from ponds which have received the draining of farm-yards. The sweepings of London streets have likewise been found of considerable service, when mixed with a little horse-dung, in order to ferment, before it is carried on the land. Thus prepared, it has been spread in the proportion of ten or twelve loads per acre, and been productive of the most beneficial effects.

MUDANIA, or **MONTAGNA**, a town of Asiatic Turkey, in Natolia, on a gulf in the S. E. part of the Sea of Marmora, 15 miles N. N. W. of Bursa. Lon. 28. 55. E. Lat. 40. 14 N.

MUFFLE, in chemistry, a vessel much used in some metallurgic operations. In figure it represents an oblong arch or vault, the hinder part of which is closed by a semicircular plane, and the lower part or floor of which is a rectangular plane. It is a little oven, placed horizontally in assay and enamelling furnaces, so that its open side corresponds with the door of the fire-place of the furnace. Under this arched oven small cupels or crucibles are placed; and the substances contained are thus exposed to heat without contact of fuel, smoke, or ashes. See CHEMISTRY.

MUFTI, the chief of the ecclesiastical order, or primate of the mussulman religion. The authority of the mufti is very great in the Ottoman empire; for even the sultan himself, if he would preserve any appearance of religion, cannot, without hearing his opinion, put any person to death, or so much as inflict any corporal punishment.

MUGGLETONIANS, a sect, which arose in England, about the year 1657; so denominated from their leader Lodowick Muggleton, a journeyman-taylor, who, with his associate Reeves, set up for great prophets, pretending, as it is said, to have an absolute power of saving and damning whom they pleased; and giving out that they were the two last witnesses of God, that should appear before the end of the world.

MUGIL, the **MULLET**, in ichthyology, a genus of fishes of the order abdominales. Lips membranaceous, interior one carinated inwards; no teeth; branchiostegic membrane with seven crooked rays; opercula smooth, round; body of a whitish colour. There are five species. The mullet is justly ranked by Aristotle among the pisces littorales, or those that prefer the shores to the full sea; they are found in great plenty on several of the sandy coasts of our island, and haunt small bays that have influxes of fresh water. They come in great shoals, and keep rooting in the sand or mud, leaving their traces in form of large round holes. They are very cunning; and when surrounded with a net, often escape by leaping over it; when one does so, the others are sure to follow. This is observed by Oppian, who adds, that if they fail to get over at the first leap, they never attempt a second, but lie without motion as if resigned to their fate. They sometimes swarm on the coasts of the Mediterranean. Near Martignes, in France, great numbers of mullets are taken in weres made of reeds placed in the shallows.

MUGWORT, in botany. See ARTEMISIA. An infusion of this plant in white wine, or a bath made of it, has been always esteemed an emmenagogue, and useful in difficult parturition. The leaves, when young and tender, are used in some parts of Scotland.

Scotland, as a pot-herb. The country people in Sweden drink a decoction of them for the ague.

MULLENBERGIA, in botany, a genus of the triandria digynia class and order. Natural order, Gramina. Calyx one-valved, minute, lateral; corolla two-valved. There is but one species, viz. *M. diffusa*, a perennial grass, a native of North America.

MUID, is also one of the nine casks, or regular vessels, formerly used in France, for wine and other liquors. The muid of wine is divided into two demi-muids, four quarter-muids, and eight half-quarter muids, containing thirty-six septiers. See **MEASURE**.

MULATTO, a term used in the Indies for those who are begotten by a negro man on an Indian woman, or by an Indian man on a negro woman.

MULBERRY, in botany. See **MORUS**.

MULBERRY CYDER, a name given by the people of Devonshire, and some other parts of England, to a sort of cyder rendered very palatable by an admixture of mulberry-juice in the making; they choose for this purpose the ripest and blackest mulberries, and pressing out their juice and mixing it with a full bodied cyder at the time of the grinding and pressing, give just so much of it as adds a perceptible flavour. It is worthy the attention of the people who live in other countries, where strong and good cyder is made, that this renders it a sort of wine much more agreeable than any other English liquor, and might be brought into general use, to the great advantage of the dealer. The colour of this liquor resembles that of the brightest red wine, and the flavour of the mulberry never goes off. Philos. Trans. No. 133.

MULCT, [*mulcta*, Lat.] a fine of money laid upon a man, who has committed some fault or misdemeanor.

MULE, in zoology, a mongrel kind of quadruped, usually generated between an ass and a mare, and sometimes between a horse and a she-ass. The mule is a sort of a monster, of a middle nature between its parents, and therefore incapable of propagating its species: for so hath God constituted the laws of animal generation. Mules are chiefly used in countries where there are rocky and stony roads, as about the Alps, Pyrenees, &c. Great numbers of them are kept in these places; they are usually black, strong, well limbed, and large, being mostly bred out of the fine Spanish mares: the mules are sometimes fifteen or sixteen hands high. No creatures are so proper for carrying large burdens, and none so sure-footed. They are much stronger for draught than our horses, and are often as thick set as our dray-horses; and they will travel several months together, with six or eight hundred weight upon their backs: they are much hardier and stronger than horses, and will live and work twice the age of a horse; and those mules which are light are fitter for riding than horses, as to the walk and trot; but they are very disagreeable to the rider when they gallop. See **EQUUS**.

MULES, OR HYBRID PLANTS, among gardeners, are a sort of vegetable monsters produced by putting the farina fecundans of one species of plant into the pistil or utricle of another. See **BOTANY**.

MULHAUSEN, a town of Upper Saxony in Thuringia, 15 miles N. E. of Eisenach. Lon. 10. 49. E. Lat. 51. 13. N.

MULIER, in English law, signifies the lawful issue born in wedlock, though begotten before. The mulier is preferred to an elder brother born out of matrimony; for instance, if a man has a son by a woman before marriage, which issue is a bastard, and afterwards marries the mother of the bastard, and they have another son this second son is mulier and lawful, and shall be heir of the father; but the other can be heir to no person. See **BASTARD**. By the civil law, where a man has issue by a woman, if after that he marries her, the issue is mulier.

MULL, one of the Western Islands of Scotland, about 25 miles long, and 25 broad. It is in general rocky and barren, producing little corn. In 1588, one of the Spanish Armada was blown up on this coast. Lon. 6. 7. W. Lat. 56. 26. N.

MULL, SOUND OF, a narrow sea of Scotland, between the isle of Mull, and Argyllshire.

MULLEN. See **VERBASCUM**.

MULLER, OR REGION MONTANUS, JOHN, a celebrated astronomer of the 15th century, born at Koningshoven in Franconia in 1436. He acquired great reputation by publishing an abridgement of Ptolemy's Almagest, which had been begun by

Purbach. He went to Rome to perfect himself in the Greek tongue, and to see Card. Bassarion; but finding some faults in the Latin translations of George de Trebizond, that translator's son assassinated him, in a second journey he made to Rome in 1476, where Pope Sixtus IV. had provided for him the archbishopric of Ratisbon, and had sent for him to reform the calendar. Others say that he died of the plague.

MULLER, OR MULLAR, a stone flat and even at bottom, but round at top: used for grinding matters on a marble. The apothecaries use mullers to prepare their testaceous powders; and painters for their colours, either dry or in oil.

MULLER is also an instrument used by glass-grinders; being a piece of wood, to one end whereof is cemented the glass to be ground, whether convex in a bason, or concave in a sphere or bowl. It is ordinarily about six inches long, turned round; the cement they use is composed of ashes and pitch. See **GLASS-MAKING**.

MULLERA, in botany, a genus of the decandria order, and diadelphica class of plants. Pericarpium elongated, fleshy, necklace-form, with one-seeded globules. There is only one species, viz. *M. moniliformis*, a native of Surinam.

MULLERAS, a town of Germany, in Upper Saxony, and marquisate of Brandenburg, 38 miles S. of Berlin. Lon. 14. 50. E. Lat. 52. 21. N.

MULLET, in ichthyology. See **MUGIL**.

MULLET, OR MOLLET, in heraldry, a bearing in form of the rowel of a spur, which it originally represented. See **HERALDRY**.

MULLINGAR, a town of Ireland, in West Meath, and the county-town. It has a barrack for two troops of horse. A few miles from it are the ruins of a church, and a castle. It is situated on the Feyle. It holds a great wool-fair, and is a place of good trade. In 1227, the priory of St. Mary, formerly known by the name of the House of God of Mullingar, was founded here by Ralph de Petyt, Bp. of Meath, for regular canons of St. Augustin's order. A Dominican friary was also founded here in 1237 by the family of Nugent; some ruins of which still remain. It has fairs on the 6th April, 4th and 5th July, 29th August, and 11th November, and lies 38 miles from Dublin. Lon. 7. 50. W. Lat. 53. 30. N.

MULLUS, the **SURMULLET**, in ichthyology, a genus of fishes of the order thoracici. Head compressed and scaly; mouth bearded; gill-membrane, with three rays; body round, long, and red, coated with large and easily deciduous scales. There are six species. The *M. rubea*, or red surmullet, is the fish which was one of the favourite delicacies of Roman epicurism, and which, when particularly scarce, might be sold for its weight in silver-coin. The capricious epicures of Rome in Horace's days valued it in proportion to its size; not that the larger were more delicious, but that they were more difficult to be got. The price that was given for one in the time of Juvenal and Pliny is a striking evidence of the luxury and extravagance of the age:

The lavish slave

Six thousand pieces for a mullet gave,

A sesterce for each pound;

Dryden.

or 48l. 8s. 9d. But Asinius Celer, a man of consular dignity, gave 8000 nummi, or 64l. 11s. 8d. for a fish of so small a size as the mullet: for, according to Horace, a mullus trilibris, or one of three pounds was a great rarity. But Seneca says, that it was not worth a farthing except it died in the very hand of the guest; that such was the luxury of the times, that there were stews even in the eating-rooms, so that the fish could at once be brought from under the table, and placed on it; and that they put the mullets in transparent vases, that they might be entertained with the various changes of its rich colours while it lay expiring. Apicius first hit upon the method of suffocating them in the exquisite Carthaginian pickle, and afterwards procured a rich sauce from their livers. This is the man whom Pliny styles *Neptum onnium altissimus gurgis*; an expression too forcible to be translated. See **PLATE LV**.

MULLUVIA, OR MULLOEIAH, a river of Africa, which divides the empire of Morocco from that of Algiers, and runs into the Mediterranean 15 leagues S. E. of Melilla.

MULTANGULAR, a term applied to a figure, or body, which has many angles.

MULTILATERAL,

+ 9 carried = 45, which being multiplied by the last figure in the multiplier, set the whole down, and the work is finished.

MULTIPLICATION, CROSS, otherwise called duodecimal arithmetic, is an expeditious method of multiplying feet, inches, and parts, &c.

Rule	Feet multiplied by Feet			produce	Feet, Inches, Parts, &c.		
	Feet	do.	Inches		Feet,	Inches,	Parts, &c.
	Feet	do.	Parts		Parts,	Seconds,	Thirds, &c.
	Inches	do.	Inches		Parts,	Seconds,	Thirds, &c.
	Inches	do.	Parts		Parts,	Seconds,	Thirds, &c.

Ex.	F.	In.	P.	F.	I.	P.
	14	6		7	3	9
	× 4	9		× 3	5	3
	58	0	P	22	5	3
	10	10	6	3	1	4
	68	10	6		1	10
				25	8	6
						2
						3

MULTIPLICATION, in algebra. See ALGEBRA.

MULTIPLICATOR, or **MULTIPLIER**, in arithmetic, a number multiplying another called the multiplicand. The multiplier and multiplicand when named together are called the factors.

MULTIPLICATUS FLOS. See BOTANY.

MULTIPLYING GLASS, in optics, one wherein objects appear increased in number. It is otherwise called a polyhedron, being ground into several planes, that make angles with each other; through which the rays of light issuing from the same point undergo different refractions, so as to enter the eye from every surface in a different direction. See OPTICS.

MULTISILIQUÆ, in botany, the name of the twenty-sixth order in Linnæus's "Fragments of a Natural Method;" consisting of plants which have more seed-vessels than one. Of this kind are aconitum, monk's hood; delphinium, larkspur; negella, or devil-in-a-bush; and many others. These plants are mostly perennial herbs. See BOTANY.

MULTISILIQUEOUS PLANTS, those which have after each flower many distinct, long, slender, siliquæ or pods, in which their seed is contained; such are bear's foot, columbine, house-leek, navel wort, orpine, &c.

MULTITUDE, an assemblage, or collection of a great number of distinct persons or things; thus we say, a multitude of men, of horses, of trees, &c. The units, or individuals, that make a multitude, may be of the same or different kinds, and natures of things; and that whether they are really separated from one another, or only distinguished by the imagination.

MULTIVALVES, in natural history, the name of a general class of shell-fish distinguished from the univalves, which consist of only one shell, and the bivalves, which consist of two, by their consisting of three or more shells.

MULTURE, in Scots' law, a certain stipulated quantity of meal given as payment to the proprietor or tacksman of a mill for grinding the corn; and all corn ground on farms thirled to the mill is obliged to pay multure, whether the corn be ground at that mill or elsewhere.

MULVIA, or **MULVYA**, a river of Barbary, which rises in the mountains of Atlas, and divides the empire of Morocco from that of Algiers, and then falls into the Mediterranean, W. of Marsalquiver.

MUM, a kind of malt-liquor much drank in Germany, and chiefly brought from Brunswick, which is the place of most note for making it. The process of brewing mum, as recorded in the town-house of that city, is as follows. Take 63 gallons of water that has been boiled till one-third part is consumed, and brew it with seven bushels of wheaten malt, one bushel of oat-meal, and one bushel of ground-beans. When it is tunned, the hoghead must not be filled too full at first: as soon as it begins to work, put into it 3lb. of the inner rind of fir, 1lb. of the tops of fir and beech, three handfuls of carduus benedictus, a handful or two of the flower of rosa solis: add burnet, betony, marjoram, avens, pennyroyal, and wild thyme, of each an handful and an half; of elder-flowers, two handfuls or more; seeds of cardamum bruised,

30 oz. barberries bruised, 1oz. when the liquor has worked a while, put the herbs and seeds into the vessel; and after they are added, let it work over as little as possible; then fill it up: lastly, when it is stopped, put into the hoghead ten new-laid eggs unbroken; stop it up close, and use it at two years end. The English brewers, instead of the inner rind of fir, use cardamum, ginger, and sassafras; and also add elecampane, madder, and red sanders.

MUMMY, a body embalmed or dried, in the manner employed by the ancient Egyptians; also the composition with which dead bodies are embalmed. See CATACOMB, and EMBALMING. Mummies are very inflammable, and yield a scent of myrrh and aromatic ingredients while burning. There are found in Poland, a kind of natural mummies, or human bodies preserved without art. These lie in considerable numbers in some of the vast caverns in that country. They are dried with the flesh and skin shrunk up almost close to the bones, and are of a blackish colour. In the wars which several ages ago laid waste that country, it was common for parties of the weaker side to retire into these caves, where their enemies, if they found them out, suffocated them by burning straw, &c. at the mouth of the cavern, and then left the bodies; which being out of the way of injuries from common accidents, have lain there ever since. Carcases dried by the heat of the sun, and thus preserved from putrefaction, are often found in the sands of Libya. Some imagine, that these are the bodies of deceased people buried there on purpose to keep them entire without embalming; others think they are the carcases of travellers who have been overwhelmed by the clouds of sand raised by the hurricanes frequent in those deserts.

MUMMY, in horticulture, signifies a kind of wax employed by gardeners, in grafting and planting the roots of trees. It is prepared as follows: take one pound of black pitch, and a quarter of a pound of turpentine; mix them in an earthenpot, and set the whole on fire in the open air: the mixture should be alternately quenched and lighted, till all the nitrous and volatile parts be evaporated, when a little common wax is to be incorporated with the composition, which is now fit for use.

MUMPS, or **CYNANCHE PAROTIDÆA**, a contagious disease, that chiefly affects the lower classes, and is often epidemic. It is distinguished by an external moveable swelling, that arises on one side of the neck, but more commonly on both, and frequently attains a considerable size; while the fauces appear red, and the patient has a sensation of straitness. The powers of respiration and of deglutition are somewhat impeded, and the disease is mostly accompanied with a slight degree of inflammatory fever. The tumour increases for three or four days; when it begins to subside, and, in a few days, totally disappears, together with the fever. See MEDICINE.

MUNCH-HAUSIA, in botany, a genus of the polyandria order, and polyadelphia class of plants. Natural order, Calycanthemæ. Calyx six-cleft, torulose; petals clawed; stamens in six bodies, four or five in each; pistil superior, with a filiform curved style. It has but one species, *M. speciosa*, a native of Java and China.

MUND, **ISLAND MUND**, or the **ISLAND OF ST. MUNGO**, an island of Argyleshire, in Loch Leven in Glenco.

MUNDA, an ancient city of Hispania Bætica, in Granada, on the declivity of a hill, at the bottom of which runs a river. Lon. 4. 13. W. Lat. 48. 15. N.

MUNDERAR, a province of Asia, in Cabul.

MUNDERKINGEN, a town of Suabia, on the Danube, 25 miles S. W. of Ulm. Lon. 9. 43. E. Lat. 48. 15. N.

MUNDIC, or **MARCASITE**. See MARCASITE, and PYRITES.

MUNDINGOES, a people who live on the sides of the river Gambia in Africa, and who are of a jet black colour, strong, and well made.

MUNDINUS, a celebrated anatomist of the 14th century, born in Florence. He was the first modern anatomist who restored the art, and introduced the dissection of human bodies. He wrote a Treatise on Anatomy, in 1315, which was printed at Paris in 1478.

MUNDU, a very ancient town of Hindostan in Malwa; formerly 22 miles in circuit; 454 miles E. of Bombay. Lon. 75. 47. E. Lat. 22. 50. N.

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MUNDUS,

MUNDUS PATENS, [*i. e.* the open world,] in Roman antiquity, a solemnly performed in a small temple, of a round form like the world, dedicated to Dis, and the rest of the infernal gods. This temple was opened thrice a year, viz. on the 24th Aug. 4th Oct. and 7th Nov.

MUNIA, or **MENIE**, an ancient town of Egypt, on the Nile, 140 miles S. of Cairo. Lon. 31. 20. E. Lat. 27. 45. N.

MUNICH, a city of Germany, capital of Bavaria, and the residence of the king, one of the most pleasant and populous in Germany. It is 200 miles W. of Vienna. Lon. 11. 36. E. Lat. 48. 8. N.

MUNICIPAL, in the Roman civil law, signifies invested with the rights and privileges of Roman citizens. See **MUNICIPIUM**.

MUNICIPAL LAWS, in England, laws that obtain in any particular city or province.

MUNICIPAL OFFICERS, officers elected to defend the interest of cities, to maintain their rights and privileges, and to preserve order and harmony among the citizens; such as mayors, sheriffs, consuls, &c.

MUNICIPALITY, the right of a citizen; a corporation or borough enjoying such rights. See **MUNICIPIUM**.

MUNICIPES, an appellation given by the Romans to the inhabitants of the municipia, or municipal cities. See **MUNICIPIUM**.

MUNICIPIUM, in Roman antiquity, a corporation, borough, or enfranchised city or town, where the inhabitants enjoyed their own laws and customs, and at the same time were honoured with the privileges of Roman citizens; but then this privilege reached no farther than the bare title. Some indeed, by particular merit obtained the liberty of votes, which occasioned that distinction of *municipium sine suffragio*, and *municipium cum suffragio*. The inhabitants of the *municipium sine suffragio*, were called barely *Romani*, but those of the *municipium cum suffragio* were called *cives Romani*. The proper citizens of Rome were, 1. Registered in the census. 2. Had the right of suffrage and of bearing honours. 3. Were assessed in the poll-tax. 4. Served in the legions. 5. Used the Roman laws and religion. 6. Were called *Quirites* and *populus Romanus*: whereas the *municipes* enjoyed the three first of these privileges, but were denied the three last.

MUNIMENTS, or **MINIMENTS**, the writings relating to a person's inheritance, by which he is enabled to defend his title to his estate; or, in a more general sense, all manner of evidences, such as charters, feoffments, releases, &c.

MUNITION, the provisions with which a place is furnished for defence: or that which follows a camp for its subsistence.

MUNITION-SHIPS, are those that have stores on board to supply a fleet of men of war at sea. In an engagement, all the munition-ships and victuallers attending the fleet take their station in the rear of all the rest: they are not to engage in the fight, but to attend to such directions as are sent them by the admiral.

MUNKACS, **MUNKATS**, or **MUNGATS**, a town, lordship, and bishop's see of Hungary, with an impregnable castle, 50 miles N. E. of Tokay. Lon. 22. 0. E. Lat. 48. 30. N.

MUNNION, in architecture, the upright posts, that divide the several lights in a window-frame.

MUNSTER, **SEBASTIAN**, a learned German writer, born at Ingleheim, in 1489. He became a Cordelier, but having embraced Luther's sentiments, he quitted that order in 1529, and retired to Heidelberg, and afterwards to Basil, where he became professor of Hebrew, and taught with reputation. He was a man of great candour, void of ambition; and so well skilled in geography, mathematics, and the Hebrew, that he was called the *Esdra* and the *Strabo* of Germany. His Latin translation of the bible is esteemed. He was the first who wrote a Chaldean grammar and lexicon; he also published a treatise on cosmography, and several other works. He died of the plague at Basil in 1552, aged 63.

MUNSTER, in Latin *Monomia*, and in Irish *Moun*, the most southerly province of Ireland; bounded on the N. by Leinster and Connaught, and on the E. W. and S. by the ocean. It contains the counties of Cork, Clare, Kerry, Limerick, Tipperary, and Waterford; 3,289,632 Irish plantation acres, 740 parishes, 63 baronies, and 26 boroughs. It is about 125 miles long, and

120 broad: Cork is the capital. It lies between 51. 15. and 53. 0. Lat. N. and 7. 10. to 10. 40. Lon. W.

MUNSTER, a territory of Germany, in the circle of Westphalia; bounded on the N. by Embden and Oldenburg, on the S. by the county of Mark and duchy of Westphalia on the W. by the county of Bentheim and Holland; and on the E. by the bishoprics of Osnaburg and Paderborn together with the county of Ravensberg. It is in length about 80 miles, and in breadth from 20 to 60. On the 22d of January, 1811, the whole of this country was incorporated with the French empire.

MUNSTER, the capital of Westphalia, is seated at the conflux of the river Aa with the Ems, 70 miles N. by E. of Cologne, and 77 N. W. of Cassel. Lon. 7. 49. E. Lat. 5. 49. N.

MUNTINGIA, in botany, a genus of the monogynia order, and polyandria class of plants; natural order, *Columbifera*. Calyx five-parted; corolla five-petaled; berry five-celled; seeds many. There is one species, a shrub of Jamaica.

MUNYCHIA, an anniversary solemnity observed at Athens, in honour of Diana, on the 16th of the month *Munychion*. Cakes were offered on the occasion called *αμύνειες*.

MUNYCHION, the tenth month of the Athenian year, containing 29 days, and answering to the latter part of our March and the beginning of April. It was so called from the festival *Munychia*, which was observed in this month. See **MONTH**, and **MUNYCHIA**.

MURENA, the **EEL**, in ichthyology, a genus of fishes, of the order *Apodes*. Head smooth: ten rays in the membrane of the gills; eyes covered with a common skin; body cylindrical, slimy. There are nine species, distinguished by their fins, tails, &c. The most remarkable are these:

M. ANGUILLA, the **COMMON EEL**, is very frequent in all our fresh waters, ponds, ditches, and rivers: according to Mr. Pennant, it is the most universal of fish; yet is scarcely ever found in the Danube, though very common in the lakes and rivers of Upper Austria. In some respects it borders on the reptile tribe. It quits its element, and during night wanders along the meadows, not only in order to change its habitation, but also for the sake of prey, feeding on snails as it passes along. In winter it beds itself deep in the mud, and continues in a state like the serpent-kind. It is very impatient of cold, and will eagerly take shelter in a wisp of straw flung into a pond in severe weather, which has sometimes been practised as a method of taking them. Albertus affirms, that he has known eels take shelter in a hay-rick, yet perish through excess of cold. In a river of England called the *Nyne*, there is a variety of small eel, with a less head and narrower mouth than the common kind, found in clusters in the bottom of the river, and called the *bed-eel*: these are sometimes roused up by the violent floods, and are never found at that time with meat in their stomachs. Eels are extremely voracious, and destructive to the fry of others. No fish lives so long out of water as the eel; it is so extremely tenacious of life, that its parts will move a considerable time after they are flayed and cut in pieces. Eels vary much in their colours, from a sooty hue to a light olive green; and those which are called *silver-eels* have their bellies white, and a remarkable clearness throughout. There is a variety in the Thames called *grigs*, and about Oxford *grigs* or *gluts*. These are scarcely ever seen near Oxford in the winter; but appear in spring, and bite readily at the hook, which common eels in that neighbourhood will not. They have a larger head, a blunter nose, thicker skin, and are less fat, than the common sort; they are less esteemed, and seldom exceed 3 or 4 lb. in weight. Common eels grow to a large size, sometimes weighing 15 or 20 lb. but such are extremely rare. Mr. Dale in the *Pakes Trans.* and some others, bring instances of eels much exceeding that size; but Mr. Pennant suspects them to have been congers, as these enormous fish were all taken at the mouths of the Thames or Medway. The Romans held eels very cheap, but the luxurious *Sybarites* were so fond of them, as to exempt from tribute those who sold them. There is scarcely any animal, the generation of which has puzzled the learned more than this. Aristotle first broached an opinion that eels were of no sex, nor propagated their species like other animals, but were equivocally gendered of the mud; and absurd as this hypothesis is, there have not been wanting many, even in these enlightened times, who have adopted it. But there is now no room to doubt that all animals are produced by the copu-

lation of parents like themselves : and the finding of eels in new ponds is easily accounted for, from the above mentioned circumstance of their nocturnal migrations. Dr. Plot, and many others, have given accounts of whole droves of them leaving one ditch or pond to go to another. Though naturalists now generally allow that eels are produced like other animals, by parents of their own kind, yet there remain many doubts about the manner in which the generation is performed. Some allow the eels to be like the generality of other animals, of different sexes in the different individuals ; and others affirm that they are all hermaphrodites, each having the parts of both sexes. Rondeletius affirms that they are of both sexes ; and Mr. Allan, who has given a very curious paper concerning them in the Phil. Trans. is of the same opinion. Both say, that the parts of the sexes may be discovered on a careful inspection ; and some are found to be males, and others females ; but these parts are, in both sexes, they say, buried in a large quantity of fat ; and hence, they think, proceeded the mistake of Aristotle and his followers, who, not being able to find those parts, concluded that they did not exist. Among those who allow the eel to be produced, like other animals, from parents which have the sexes, some are of opinion that they are viviparous, and others that they are oviparous ; but Mr. Chartwynd seems to have determined this controversy by observing, that if the aperture under the belly of the eel, which looks red in May, be cut open at that time, the young eels will be seen to come forth alive after the operation. Mr. Lewenhoeck says, that he found an uterus in every eel he examined ; and therefore concludes, that they are hermaphrodites ; and he supposes that they have no male parts of generation like those of other animals ; but that the office of these is performed by a liquor analogous to the male seed of animals, which is contained in certain glands, situated in the inside of the uterus itself. Eels have sometimes been met with in recent ponds, made at such a distance from any other water that we cannot reasonably suppose them to have migrated thither over land. But in these cases it is probable, that the ponds have been supplied with them by aquatic fowls of prey, as vegetation is spread by many land-birds, either by being dropped, as they carry them to feed their young, or by passing quick through their bodies, as is the case with herons.

M. CONGER, the **CONGER EEL**, grows to a vast size. Dr. Borlase informs us, that they are sometimes taken near Mount's Bay of 100lb. weight ; and Mr. Pennant assures us, that he has heard of some taken near Scarborough, that were 10½ feet long, and 18 inches in circumference, in the thickest part. They differ from the common eel, in the following particulars : 1. Their colour in general is more dark. 2. Their eyes much larger in proportion. 3. The irides of a bright silvery colour. 4. The lower jaw is rather shorter than the upper. 5. The inside line is broad, whitish, and marked with a row of small spots. 6. The edges of the dorsal and anal fins are black. 7. They have more bones than the common eel, especially along the back quite to the head. 8. They grow to a much larger size. Congers are extremely voracious, preying on other fish, crabs, &c. They and eels in general are fond of carcasses of any kind, being frequently found lodged in such as are accidentally taken up. The conger eels probably generate like the fresh-water species. Innumerable quantities of what are supposed to be their fry come up the Severn about April, preceding the shads, which it is conjectured migrate into that river to feed on them ; they are called elvers. They swarm during their season, and are taken in a kind of sieve made of hair-cloth fixed to a long-pole ; the fisherman standing on the edge of the water during the tide, puts in his net as far as he can reach, and drawing it out again, takes multitudes at every sweep, and will take as many during one tide as will fill a bushel. They are dressed, and reckoned very delicate. See Plate CXXI.

M. OPHIS, **SPOTTED MURÆNA**. Observed by Forskal ; native of the Red Sea ; has a rising callus between the eyes, gold-coloured irides, upper lip shorter than the lower, and the dorsal and anal fins united at the tail. See Plate CXXI.

M. CATENATA, **CHAIN-STRIPED MURÆNA**. This species, of which the individuals hitherto described appear to be of the size of a smallish eel, is of a brown colour, crossed by large chain-like white bands, somewhat irregular in their form on different parts of the animal, and marked by numerous brown spots and freckles. This fish is a native of Surinam. See Plate CXXI.

M. RETICULATA, **RETICULATED MURÆNA** ; in size and general form resembles the preceding species, but differs in colour and in the disposition of the dorsal fin, which commences immediately at the back of the head, and is continued round the tail, where it unites with the vent-fin. It is a native of the Indian seas.

MURAI, [*murais*, *murus*, Lat.] any thing pertaining to a wall.

MURAL ARCH, a wall, or walled arch, placed exactly in the plane of the meridian, *i. e.* upon the meridian-line, for fixing a large quadrant, sextant, or other instrument, to observe the meridian-altitudes, &c. of the heavenly bodies. See **QUADRANT**. Tycho Brahé was the first who used a mural quadrant in his observations ; after him Hevelius, Mr. Flamsteed, De la Hire, &c. used it.

MURAL CROWN. See **CROWN**.

MURANO, an island in the Gulf of Venice, four miles N. of Venice.

MURANO, a very ancient town in the above island, about three Italian miles in circumference, famous for its manufactures of looking-glasses. Lon. 12. 5. E. Lat. 45. 16. N.

MURANT, **EMANUEL**, a much admired landscape-painter, born at Amsterdam in 1622. He was a disciple of Philip Wou-vernans, from whom he acquired that warmth and brilliancy of colouring, which rendered him eminent in his profession. His subjects were views in Holland, villages, towns, cities, ruins, and decayed castles ; all sketched after nature, and so exquisitely finished, that every minute part of a building was perfectly discernible, and even every particular stone or brick might be counted. But this demanded so much time, that it was impossible for him to paint many pictures ; on which account they are exceedingly scarce, and sold for extravagant prices. He died in 1700.

MURANUM, in ancient geography, a town of Italy, on the confines of Lucania ; now called Morano ; a citadel in Calabria Citra. It is supposed to have arisen from the ruins of Syphacum.

MURCIA, in geography, a kingdom of Spain, bounded on the N. by New Castile, E. by Valencia, W. by Andalusia and Granada ; and S. by the Mediterranean. It is about 62 miles long, and 58 broad : its principal river is Segura. The soil being dry, it produces little corn or wine ; but plenty of oranges, citrons, lemons, olives, almonds, mulberries, rice, pulse, and sugar. It has also a great deal of silk. It was taken from the Moors in 1265. The air is very healthful.

MURCIA, in ancient mythology, the goddess of idleness. The name is taken from *murcus* or *marcidus*, an obsolete word, signifying a dull, slothful, or lazy person.

MURCIA, a large, handsome, and populous town, capital of the above kingdom, and seated on the Segura. Lon. 0. 36. W. Lat. 37. 48. N.

MURDER, or **MURTHIER**, [from the Saxon, *morth*, death.] in law, is thus defined, or rather described, by Sir Edward Coke : " When a person, of sound memory and discretion, unlawfully kill eth any reasonable creature in being, and under the king's peace, with malice aforethought, either express or implied." See **HOMICIDE**.

MURDERERS, or **MURDERING PIECES**, in a ship, are small pieces of ordnance, either of brass or iron, which have chambers put in at their breeches. They are used at the bulk-heads of the fore-castle, half-deck, or steerage, in order to clear the deck, when the ship is boarded by an enemy.

MURENGERS, two officers of great antiquity in the city of Chester, annually chosen out of the aldermen, to see that the walls are kept in repair, and to receive a certain toll and custom for the maintenance thereof.

MURET, a town of France, in the department of Upper Garonne, and late province of Gascony ; 10 miles S. of Toulouse. Lon. 1. 18. E. Lat. 43. 26. N.

MUREX, in zoology, a genus of insects of the order, Vermes Testacea. Animal of the snail-kind ; shell univalve, spiral, rough, with membranaceous furrows ; aperture terminating in an entire canal, either straight, or somewhat ascending. Above 200 species, particularly distinguished by peculiarities in their shells, &c. have been enumerated. From a species of murex was obtained the famous Tyrian dye so much valued by the ancients. This, however, has long been superseded by the use of the cochineal. Two species, *M. babylonica*, and *M. brandaris*, are delineated in Plate LXXVI.

MUREX,

MUREX, a caltrap or iron-instrument, with sharp points projecting in every direction, used by the Romans as a defence against the enemy's horse. It was so called, probably, because the points bore some resemblance to the spines and tubercles with which the shell of the fish murex is surrounded.

MURG, a river of Snabia, which rises 2 miles S. E. of Oppenau, and falls into the Rhine.

MURGI, or **MURGIS**, in ancient geography, the last town of Hispania Baetica, next the Tarraconensis: the Urce of Ptolemy. Now called Muxara, a port-town of Granada, on the Mediterranean. Lon. 1. 50. W. Lat. 37. 6. N.

MURHARD, or **MURHART**, a town of Wirtemberg, 22 miles N. E. of Stuttgart, and 62 S. E. of Worms. Lon. 9. 51. E. Lat. 48. 56. N.

MURIA, alimentary salt. See **SALT**.

MURIATES, in chemistry, a genus of salts composed of muriatic acid and a base. When heated they melt, and are volatilized, without undergoing decomposition: they are soluble in water; effervesce with sulphuric acid, and white acid fumes of muriatic acid are disengaged; when mixed with nitric acid they exhale the odour of oxymuriatic acid. Muriate of potass, formerly called febrifuge, or digestive salt of sylvius, may be obtained by dissolving potass in muriatic acid, and evaporating the solution till the salt crystallizes: it has a disagreeable taste, and will dissolve in about three parts of cold water. Specific gravity 1.8. This substance contains

Muriatic acid	29
Potass.....	63
Water	8

100

Muriate of soda, or common salt, has been known from the earliest ages. It exists abundantly in nature. Immense quantities of it are found in different countries, which require only to be dug out and reduced to powder. In this state it is called rock-salt. It is also one of the constituents of sea-water, which, when evaporated, yields the salt in crystals. This salt usually crystallizes in cubes: its specific gravity is about 2.12, and it is soluble in less than three times its weight of water. When pure it is not affected by exposure to the air; but the salt of commerce contains some muriate of magnesia which renders it deliquescent. When heated, it decrepitates, and in a red heat it melts and evaporates in a white smoke without decomposition. It contains

Muriatic acid	44
Soda	50
Water	6

100 See **SALT**.

Muriate of ammonia, formerly denominated sal-ammoniac, because it was found in abundance near the temple of Jupiter Ammon, in Africa. It was lately imported entirely from Egypt, but it is now made in this country. In its common form it is an opaque mass, and is not affected by the air, but its crystals are liable to deliquesce. It is decomposed by the sulphuric and nitric acids, which combine with the alkali; and likewise by potass, soda, barytes, and lime, which unite with the acid. By the latter of these decompositions ammonia is obtained in a state of purity: hence, by breaking into small pieces muriate of ammonia, with soda, or potass, &c. and putting them together in a phial with a glass-stopper, we get a good smelling-bottle. This salt is used in many of the arts. In soldering, it cleans the surface of the metals to be united, and prevents their oxidation: in dyeing it renders several colours brighter, and it is not unfrequently employed in pharmacy and chemistry: its constituent parts are

Muriatic acid.....	48
Ammonia	14.9
Water.....	37.1

100

MURIATIC ACID, in chemistry, may be procured in various ways: if a retort with a curved tube be half-filled with well dried common salt, and some strong sulphuric acid be poured upon it, a copious effervescence takes place, and the elastic fluid extricated

appears in the form of a white vapour as soon as it comes in contact with the atmosphere. When all the common air has been driven out of the retort, the subsequent portions of gas may be collected in the usual manner in glass-jars, filled with mercury, and inverted in a bath of the same fluid. This is muriatic acid gas: it is transparent, colourless, and possessed of the same mechanical properties as common air. It is almost twice as heavy as common air: 100 cubic inches of it weighs nearly 60 grains. Its smell is pungent, and its taste highly acid. It is instantaneously fatal to animal life, and is incapable of supporting combustion; but if a burning taper be plunged into it, the flame, just before it goes out, may be observed to assume a green colour. If a little water be let into a jar filled with this gas, the whole gas disappears, and the liquid, which consists of a solution of muriatic gas in water, is usually denominated simply muriatic acid. Being obtained from salt, it was originally called "spirit of salt," then "marine acid," and now it is almost universally denominated "muriatic acid." A cubical inch of water, at the temperature of 60°, absorbs 515 inches of muriatic acid gas, which are equivalent to 308 grains: hence water thus impregnated contains more than half its weight of muriatic acid, in the same state of purity as when gaseous. During the absorption of the gas, the water becomes hot. Ice also absorbs this gas, and is at the same time liquified. The quantity of this gas absorbed by water diminishes as the heat of the water increases, and at a boiling heat water will not absorb any of it: of course the gas is easily expelled from the liquid acid by heat, and may readily be procured by heating the common muriatic acid of commerce. By this process Dr. Priestley first obtained it. The muriatic acid of the shops is always yellow, owing to a small quantity of iron which it holds in solution. Muriatic acid is capable of combining with oxygen, and forms with it compounds, which have a considerable analogy to the compounds of azote with the same principle. It does not appear that either hydrogen or carbon combines with muriatic acid, but charcoal absorbs it abundantly. Phosphorus absorbs a little, and sulphur imbibes it slowly. When mixed with nitric acid, it forms what was formerly denominated "aqua regia;" but is now called "nitro-muriatic acid." Muriatic acid in a state of gas neutralizes putrid miasmata, and destroys their bad effects. By this the most contagious diseases are prevented from spreading: two parts of sulphuric acid, and six of common salt, heated over a spirit-lamp, or in a hot sand-bath, will give out the gas very plentifully.

MURIATIC ACID, OXYGENATED. This was first noticed by Scheele in 1774. He formed it by applying the muriatic acid as a solvent for manganese. He perceived that a gas was disengaged, which had the smell of aqua; and he concluded that the muriatic acid abandoned its phlogiston to the manganese. On this account he termed it dephlogisticated marine acid. In 1780, it was hinted by M. Fourcroy, that the oxygen of the manganese entered into combination with the muriatic acid; and M. Berthollet has since shewn that supposition to be true, by a series of accurate and ingenious experiments. The oxygenated muriatic acid may be obtained by distilling, in Woulfe's apparatus, 10 pounds of marine salts, three or four pounds of manganese, and 10 pounds of sulphuric acid. Or it may be prepared in the following manner; take equal parts of the oxide of manganese, and the red oxide of mercury or lead; put them into a glass-retort, and add four parts of concentrated muriatic acid. This, on distillation, affords a quantity of yellow aeriform fluid, which is oxygenated muriatic gas; this being agitated with water combines with it, and forms oxygenated muriatic acid. The gas is yellow and transparent, and possesses a most suffocating smell. It instantly extinguishes flame, and destroys animal life. It has long been used with success in bleaching. See **BLEACHING**. It has also been employed in the whitening of paper and old prints, and in destroying ink: but printers' ink is not attacked by it.

MURINA, or **MURINES**, a delicious sweet wine, medicated with spices, and the usual drink of the ladies of antiquity.

MURINE QUADRUPEDS, the English name given by Mr. Kerr, in his translation of Linnaeus's Zoology, to the Genus *Mus*; which is divided by Dr. Gmelin into four sections. See *Mus*.

MURRAIN, a contagious disease incident to cattle; it is known by the animals hanging down their heads, which are swollen; by short and hot breathing; palpitation of the heart; staggering; an abundant secretion of viscid matter in the eyes; rattling in the throat;

throat; and a shining tongue. The murrain is occasioned by various causes, but principally by a hot, dry season, or a general corruption of the air; in consequence of which the blood becomes inflamed; the symptoms above stated speedily appear; and, if no precautions are taken, the disease suddenly proves fatal. It raged about the middle of the last century in various parts of the Continent, and carried off great numbers of cattle. The remedy then employed, both for its prevention and cure, consisted in a mixture of equal parts of gunpowder, salt, soot, and brimstone: one spoonful of this composition was given for a dose, and washed down with warm water. In the 36th vol. of *Annals of Agriculture*, the following recipe is inserted for the murrain in hogs: A handful of nettles is to be previously boiled in a gallon of small-beer, when half a pound of flour of sulphur, a quarter of a pound of elecampane, three ounces of liquorice, and a quarter of a pound of aniseeds, are to be added in a pulverized state. This preparation should be administered in milk, and the quantity here stated is said to be sufficient for six doses. But the most effectual preventative of this destructive contagion is, to keep the cattle cool during the summer, and to allow them a sufficiency of water: all carrion should be speedily buried; and as the feeding of those useful animals in wet places, or on rotten grass or hay, frequently causes this malady, their food ought to consist of dry and sweet fodder.

MURRAY, WILLIAM, Earl of Mansfield, the fourth son of David, Earl of Stormouth, was born at Perth, in 1705. He was educated at Westminster, and studied at Christ Church, Oxford, where he took his degrees. He afterwards travelled, and on his return, entered at Lincoln's Inn, and in due course was called to the bar, where he soon distinguished himself by his abilities as an advocate. On the 20th November 1738, he married Lady Elizabeth Finch, daughter of Lord Winchelsea. In 1742, he was appointed solicitor-general, and elected M. P. for Borough-bridge. In 1754, he was appointed attorney-general, and in 1756, Lord Chief Justice of the King's Bench, in the practice of which court he made many improvements. He was soon after created Baron Mansfield. In 1757, he was appointed chancellor of the Exchequer, in which office he effected a coalition of parties, whereby an administration was formed that carried the glory of Britain to a most unvalued pitch. In 1776, he was created Earl of Mansfield. In 1780, when London was a scene of anarchy, his lordship's house in Bloomsbury-Square was burnt by a lawless mob: his valuable library and MSS. annihilated, and even his person endangered. A resolution of the House of Commons was passed to make him a compensation for his loss; but he generously refused to accept of any. Indeed no pecuniary recompence could make up for the loss of so great a man's MSS. either to him or to the republic of letters. In June 1788, he was obliged by the infirmities of age to resign his office; on which occasion he received a most respectful address from the gentlemen of the bar, transmitted to him in their name by the Hon. Thomas Erskine. This great lawyer, whose abilities and probity will ever be an honour to his country, died March 20th, 1793, aged 89, and his remains lie interred in Westminster Abbey, between those of the Earl of Chatham, and Lord Robert Manners. As he died without issue his titles and fortune descended to his nephew, the Earl of Stormont.

MURRAY, or ELGINSHIRE, or MORAY, a county of Scotland, extending along the coast on the Spey on the E. to Beaulieu on the W. which is the boundary of Ross-shire. It produces wheat, barley, oats, rye, pease, beans, hemp, and a great deal of flax; of which linen is made, both for home-consumption and exportation. Great quantities of potatoes are also cultivated. Several hundreds of black cattle are exported. Peculiar to this province is a kind of wood, called red saugh, or sawall; which is as beautiful as mahogany, much more firm and tough, and resembles the lighter-coloured kind of that wood. It receives a fine polish, but is very scarce.

MURRAY ISLANDS, a cluster of islands of Scotland on the S. W. coast of Kirkcudbrightshire, 12 miles N. N. E. of Burrow-Head.

MURRAYA, in botany, a genus of the monogynia order and decandria class of plants. Calyx five-parted; corolla bell-shaped, with a nectary encircling the germ; berry one-seeded. There is but one species, *M. exotica*, ash-leaved Murraya, a native of the East Indies.

MURRHINA VASA, or MURRHINE VESSELS, [*Mezza*,] in antiquity, a delicate sort of cups and vases brought from the east, which added not a little to the splendor of the Roman banquets.

MUS, in zoology, a numerous genus of quadrupeds belonging to the order of glires, called MURINE QUADRUPEDS by Mr. Kerr. Upper fore-teeth wedge-shaped: three grinders, sometimes, though rarely, only two, on each side of the jaws; clavicles or collar-bones complete. Very great improvements have been made in the arrangement of this genus by modern zoologists, since the time of Linnaeus. The AGOUTI, ASHKOKO, CAVY, DORMOUSE, GUINEA PIG, JERBOA, MARMOT, &c. which were included by Linnaeus under the genus *Mus*, have, in consequence of more accurate investigation, been separated from it, and arranged under five new genera; viz. ARCTOMYS, CAVIA, DIPUS, HYRAX, and MYOXUS. See these articles. And even the remaining genera are still so numerous, that, in the late edition of Linnaeus's *Systema Naturae*, published by Dr. Gmelin, and translated by Mr. Kerr, they are "subdivided into four sections; I. Myocastores, or beaver rats, the individuals of which have tails flattened laterally at the ends. II. Murés, or rats and mice; which are subdivided into, 1. Myosuri, having round naked tails: 2. Cunicularii, with round hairy tails. III. Criceti, or hamsters, having pouches in their cheeks, and short hairy tails. IV. Myotalpæ, or mole-rats, called by Dr. Gmelin mures subterraneæ, having no external ears, very small eyes, very short tails or none; and living entirely under ground, like moles.

M. AMPHIBIUS, the WATER-RAT, has a long tail; the upper parts of the body are covered with black hair mixed with yellowish, and the under parts ash-coloured; the ears scarcely appear above the fur; the feet have three toes each, and the rudiments of a fourth. This species, of which there are several varieties, differing in the toes and in the colour, inhabit all Europe, the N. part of Asia as far as the icy sea, and North America.—They dwell chiefly near waters, forming burrows in their steep banks; about ponds and ditches; likewise in marshy places, meadows, and gardens: feeding on roots, herbs, and shrubs; and on frogs, crawfish, insects, small fish, and the fry of large ones. They swim and dive with great facility, and live much in the water. They are very fierce, and bite severely. Their flesh is reckoned very delicate by the savage inhabitants of Russia; and is eaten by the French along with that of the otter, in lent.

M. CRICETUS, HAMSTER RAT. Of the pouched rats the hamster is the most remarkable, and indeed is the only European species provided with those peculiar receptacles, which are situated on each side of the mouth, and when empty are so far contracted as not to appear externally, but when filled resemble a pair of tumid bladders, having a smooth veiny surface, concealed, however, under the fur or skin of the cheeks, which bulge out extremely in this state. They are so large as to hold the quantity of a quarter of a pint, English measure. The bodies of the males are about 10 inches long, and the tail about three, but the females are scarcely more than half so large: the former weigh from 12 to 16 ounces; the latter seldom above from four to six. The head is thick, with a blunt nose and numerous whiskers, large full black eyes, and large round open ears; the head and back of a reddish brown colour, with red cheeks; the sides paler, with three white spots; the breast, upper part of the fore-legs, and belly, are black; the feet large and white, with four toes, and a claw on the fore-feet, and five toes on each hind-toe. Sometimes, though rarely, they are entirely white or yellowish, or white with black spots on the back; sometimes the snout is white, and the forehead ash-coloured, or the lower jaw of a white colour. This species inhabits Siberia, the S. of Russia, Poland, Sclavonia, Hungary, Silesia, Bohemia, and Germany beyond the Rhine, especially in Thuringia. Each individual forms a subterraneous burrow, consisting of several chambers, with two holes leading from the surface; one of these is perpendicular, and the other, for their excrements, is oblique; the holes of the females have several perpendicular openings, and each young one is lodged in a separate chamber. These chambers are lined with straw or grass; the nest are larger, and filled with grain, beans, pease, lintseed, vetches, and other seeds, each in a separate cell. The chambers of the elder animals are dug several feet deep, while those of the younger seldom exceed a foot under the surface. The hamster sleeps during the winter; when in a torpid state

state, no respiration nor feeling can be perceived. The heart, however, beats 15 times in a minute. The blood continues fluid, but the intestines are not irritable; even an electrical shock does not awake him; but in the open air he never becomes torpid. When dug up in his state of torpidity, the hamster is found with his head bent under his belly between the two fore-legs. The eyes are shut; and when the eye-lids are forced open, they instantly close again. The members are stiff, like those of a dead animal, and the whole body feels as cold as ice. When dissected during this state, he seems to feel very little: sometimes, indeed, he opens his mouth as if he wanted to respire; but his lethargy is too strong to admit of his awakening entirely. This hath been ascribed to a certain degree of cold. But experience shews, that, to render the hamster torpid, he must also be excluded from all communication with the external air: for when he is shut up in a cage filled with earth and straw, and exposed in winter to a degree of cold sufficient to freeze the water, he never becomes torpid; but when the cage is sunk three or four feet under ground, and well secured against the access of the air, at the end of eight or ten days he is as torpid as if in his own burrow. If the cage be brought up to the surface, the hamster will awake in a few hours, and resume his torpid state when put below the earth. The experiment may be repeated as long as the frost continues. The hamster, in passing from a torpid to an active state, first loses the rigidity of his members, and then makes a profound respiration, but at long intervals. His legs begin to move, he opens his mouth, and utters disagreeable and rattling sounds. After some time, he opens his eyes, and endeavours to raise himself on his legs. But all these movements are still reeling and unsteady, like those of a man intoxicated. He, however, reiterates his efforts till he is able to stand on his legs, and gradually begins to walk, eat, and act, in his usual manner. This passage from a torpid to an active state requires more or less time, according to the temperature of the air. When exposed to a cold air, he sometimes requires more than two hours to awake; but in a temperate air he will awake in less than one. The hamster is very mischievous, and so exceedingly fierce, that he seems to have no other passion but rage. He attacks every other animal that comes in his way, without regarding the superior size and strength of his antagonist; and even allows himself to be beat to pieces with a stick rather than yield. If he seizes a man's hand, he must be killed before he quits his hold. When the hamster perceives a dog at a distance, he begins with emptying his cheek-pouches, if filled with grain, which are so capacious as to hold a quarter of a pint English. He then blows them up so prodigiously, that the size of the head and neck exceeds that of the body. He then raises himself on his hind-legs, and in this attitude darts on his enemy. If he catches hold, he never quits it but with life. But the dog generally seizes him behind, and strangles him. This ferocious temper leads him even to destroy his own species, not excepting the females. See Plate C.

M. DECUMANUS, the **BROWN RAT**, has a long, naked, scaly tail; the upper parts of the body are of a light brown, mixed with tawny and ash-colour, the lower parts dirty white. The head and body measure about nine inches; and the length of the tail, which consists of 200 rings, is $7\frac{1}{2}$. The whiskers are larger than the head; and the eyes are large, black, and prominent. The fore-feet have four toes, with a small claw or thumb. They inhabit India and Persia, but were not known in Europe till the 18th century. They dwell in burrows on the banks of rivers; and frequent towns, aqueducts, drains, necessaries, stables, barns, gardens, fields, and houses. They swim and dive with great dexterity: feed on vegetables, grains, fruits, and poultry; and are hunted eagerly by cats, dogs, and ferrets. They lay up stores of acorns, beech-mast, and other provisions, in their holes; in which the males remain during winter, except in fine weather, without hibernating; but the females and their young live mostly in barns and out-houses, in that season. They often emigrate in great companies. The female produces three times in the year from 12 to 19 at a litter. Their bite is not only severe but dangerous, the wound being immediately attended with great swelling, and slow in the healing. These animals are so bold as to turn upon those who pursue them, and fasten on the stick or hand of such as offer to strike them. See plate C.

M. LEMMUS, the **LEMMING**, has a very short tail: the head is

pointed, having very long whiskers, six of the hairs on each side, being longer and stronger than the rest; the mouth is small, having two very long fore-teeth in each jaw, and the upper lip is divided; the eyes are small and black; the ears are shorter than the fur, rounded, and reclined backwards; the fore-legs are very short, having four slender hairy toes on each, and a long sharp claw, like a cock's spur, in place of the fifth; the hind-feet have five toes; the skin is very thin, and the upper parts of the body are black and tawny, disposed in irregular blotches; the belly is white, tinged with yellow. The length from nose to tail is about five inches; of the tail half an inch. These singular animals inhabit the mountains of Norway and Lapland. They feed on grass, the catkins of the dwarf birch, the lichen *rangiferinus*, and other vegetables: in summer they form shallow burrows under the turf, and in winter they make similar long passages under the snow in quest of food; for as they do not lay up magazines, and do not hibernate, they are obliged to search for provisions in the rigorous winter of these northern climes. When they foresee, by some wonderful instinct, the approach of a very severe winter, they leave their northern haunts in autumn, and emigrate in immense multitudes into the lower parts of Norway and Sweden, keeping a straight line in spite of every obstacle, moving mostly in the nighttime, and making prodigious havoc of every vegetable they are able to reach. In this journey, which takes place at certain intervals, though generally once every ten years, they are destroyed by eagles, hawks, foxes, and other animals of prey, and numbers are drowned in passing rivers or lakes, which never interrupt their course, even proceeding on into the sea: from all these concurring causes very few live to return to their native mountains, and thus a check is put to their ravages, as it takes years to repair their numbers sufficiently for another migration. They are bold and fierce, so as even to attack men and beasts, if they meet them in their course; and bite so hard as to allow themselves to be carried a considerable way, hanging by their teeth to a stick, before they will quit their hold. The female breeds several times in the year, producing five or six young at a birth: sometimes they bring forth during their migration, when they carry their young in their mouths, or on their backs. See Plate C.

M. MUSCULUS, the **COMMON MOUSE**, has a very long, scaly, and almost naked, tail: the fore-feet have each four toes; the hind-feet five, the fifth, or thumb, having no claw: the head and body measure three inches and a half in length; the upper parts are tawny, and the lower whitish or ash-coloured. This little animal, which inhabits all parts of the world, lives almost entirely in houses, and follows mankind for the sake of their provisions. It feeds on grain, bread, cheese, butter, oil, and every kind of food used by mankind, and drinks little; it is of mild and gentle manners, exceedingly timid, and very quick in all its motions. The mouse never issues from his hole but in quest of food, and runs in again upon the least alarm. It goes not, like the rat, from house to house, unless forced, and is not near so destructive. It is also capable of being tamed to a certain degree, though not so perfectly as other animals. It has many enemies, from whom it can escape only by its agility and minuteness. Owls, birds of prey, cats, weasels, hedge-hogs, and even rats, make war upon the mice, so that they are destroyed by millions; yet the species still subsist by its amazing fecundity. They bring forth at all seasons, and several times in the year; the litter generally consists of five or six; and in less than fifteen days the young disperse, and are able to provide for themselves. Aristotle tells us, that having shut up a pregnant mouse in a vessel, along with plenty of grain, he found in a short time after 120 mice, all sprung from the same mother. Several varieties of mice as to colour are found, some altogether black, some yellowish, others spotted with white; some of a white colour with ash-coloured spots; but the most beautiful of all, and the least common, are entirely white, with red eyes. These little depredators may be destroyed in houses by the common traps, baited with cheese: in barns, it will be necessary to allure them by means of singed leather, grease, or other animal food; and, in chambers where cheese is preserved, with malt meal. As, however, all these methods are troublesome; and, as the exposing of poisonous substances may be attended with danger, we shall communicate a remedy that is both safe and efficacious: take a few handfuls of wheaten flour, or malt-meal, knead it into a dough, and let it grow sour in a warm place; then mix with it finely levigated

gated iron-filings, form the whole into small balls, and put them into the holes frequented by mice. On eating this preparation, they are inevitably killed.

M. PUMILIO, the **DWARF MOUSE**, is of a brownish ash-colour, with the forehead and nape of the neck black, and having four black lines along the back meeting at the tail. It is scarcely two inches long, the tail is about two-thirds of the length of the body, and the whole animal, even when steeped many months in spirits, hardly weighs four scruples.

M. RATIUS, the **BLACK or COMMON RAT**, has an almost naked scaly tail, which is very small, has 250 distinct rings, and is eight inches long. The head and body measure seven inches in length; the upper parts are deep black-grey, and the under parts ash-coloured. There are four toes, and a small claw on each fore-foot, and five on the hind-feet. This species inhabits India, Persia, and Europe, except its most northern parts; hence it has been carried to Africa and America; and is common in Otaheite, but less so in the other islands of the South Sea. Of late it has greatly diminished in Europe, and is even in many places extirpated, by the brown species, which destroy the black rats; though little is gained by the exchange, the brown having the same dispositions, with greater strength and abilities for doing mischief. The black is the most pernicious of any of our smaller quadrupeds. Meat, corn, paper, clothes, furniture, and every convenience of life, are a prey to these destructive creatures. They make equal havoc among poultry, rabbits, and young game; and have even been known to gnaw the extremities of infants when asleep. They reside much in houses, barns, and granaries; and have fore-teeth of such strength, as to force their way through the hardest wood and oldest mortar. They make lodges for their residence, and nests for their young, near chimneys; and improve the warmth by forming magazines of wool, cloth, hay, or straw. They lodge also in ceilings, and in the void spaces between the wall and the wainscoting. The female has ten teats, and brings forth several times a-year, but always in summer. The litter generally is five or six; and in spite of poison, traps, and cats, they multiply to such a degree as often to do a great deal of damage. In houses where grain is kept, they often increase so prodigiously, that the possessors are sometimes obliged to remove, unless the rats destroy each other. When a famine happens by too many being crowded into one place, the strong kill the weak, open their heads, and first eat the brain, and then the rest of the body. Next day the war is renewed, and continues in the same manner till most of them are destroyed; which is the reason why these animals disappear all of a sudden, and do not return for a long time. Rats are extremely lascivious; they squeak during their amours, and cry when they fight. When the young begin to issue from the hole, the mother watches, defends, and even fights with the cats, to save them. A large rat is more mischievous than a young cat, and nearly as strong: the rat uses his fore-teeth; the cat makes most use of her claws; so that the latter requires both to be vigorous, and accustomed to fight, to destroy her adversary. The weasel, though smaller, is a much more dangerous and formidable enemy, because he can follow the rat into its retreat. Their strength being nearly equal, the combat often continues long; but the method of using their arms is very different. The rat wounds only by reiterated strokes with his fore-teeth, which are better formed for gnawing than biting; and being situated at the extremity of the lever or jaw, they have not much force. But the weasel bites cruelly with the whole jaw, and instead of letting go its hold, sucks the blood from the wounded part, so that the rat is always killed. The rat was first introduced into America by the Europeans in 1544, and is now the pest of all that continent.

MUSA, the **PLANTAIN-TREE**; in botany, a genus of the monocæcia order, and polyandria class of plants: natural order, Scitamineæ. Calyx, spathe partial; corolla two-petaled; one petal erect, quinque-dentate; the other nectariferous, concave, shorter; germen inferior and abortive: female hermaphrodite, calyx, corolla, filaments, and pistil, as in the male, hermaphrodite, with only one filament perfect; berry oblong, three-angled below. There are three species.

M. PARADISAICA, is cultivated in all the islands of the West Indies, where the fruit serves the Indians for bread; and some of the white people also prefer it to most other things, especially to the yams and cassada bread. The plant rises with a soft stalk fif-

teen or twenty feet high; the lower part of the stalk is often as large as a man's thigh, diminishing gradually to the top, where the leaves come out on every side; these are often eight feet long, and from two to three broad, with a strong fleshy midrib, and a great number of transverse veins running from the midrib to the borders. The leaves are thin and tender, so that where they are exposed to the open air, they are generally torn by the wind; for, as they are large, the wind has great power against them: these leaves come out from the centre of the stalk, and are rolled up at their first appearance; but when they are advanced above the stalk, they expand and turn backward. As these leaves come up rolled in this manner, their advance upward is so quick, that their growth may almost be discovered by the naked eye: and if a fine line is drawn across level with the top of the leaf, in an hour the leaf will be near an inch above it. When the plant is grown to its full height, the spikes of flowers appear in the centre, which is often near four feet long, and nods on one side. The fruit or plantain is about a foot long, and an inch and a half or two inches diameter: it is at first green, but when ripe pale yellow. The skin is tough; and within is a soft pulp of a luscious sweet flavour. The spikes of the fruit are often so large as to weigh upwards of forty pounds. The fruit of this sort is generally cut before it is ripe. The green skin is pulled off, and the heart is roasted in a clear fire for a few minutes, and frequently turned: it is then scraped and served up as bread. Boiled plantains are not so palatable. This tree is cultivated on a very extensive scale in Jamaica; without the fruit of which, Dr. Wright says, the island would scarcely be habitable, as no species of provision could supply their place. Even flour or bread itself would be less agreeable, and less able to support the laborious negro, so as to enable him to do his business, or to keep in health. Plantains also fatten horses, cattle, swine, dogs, fowls, and other domestic animals. The leaves being smooth and soft are employed as dressings after blisters. The water from the soft trunk is astringent, and employed by some to check diarrhoeas. Every other part of the tree is useful in different parts of rural economy. The leaves are used for napkins and table-cloths, and are food for hogs. See **PLATE XCIX**.

M. SAPIENTUM, the **BANANA TREE**, differs from the preceding in having its stalks marked with dark purple stripes and spots. The fruit is shorter, straighter, and rounder: the pulp is softer, and of a more luscious taste. It is never eaten green; but when ripe, it is very agreeable, either eaten raw, or fried in slices as fritters; and is relished by all ranks of people in the West Indies. Both these plants were carried to the West Indies from the Canary Islands; whither, it is believed, they had been brought from Guinea, where they grow naturally. They are also cultivated in Egypt, and in most other hot countries, where they grow to perfection in about ten months from their first planting to the ripening of their fruit.

MUSE, the **MUSES**. See **MUSES**.

MUSEUM. See **MUSEUM**.

MUSEUM, a hill near the citadel of Athens; so called, according to Pausanias, from Musæus, who used to retire thither to meditate and compose his religious hymns; at which place he was afterwards buried.

MUSEUS, an ancient Greek poet, who was, according to Plato and Diodorus Siculus, an Athenian, the son of Orpheus, the chief of the Eleusinian mysteries instituted at Athens in honour of Ceres. According to others, he was the only disciple of Orpheus; but, from the great resemblance between his talents and those of his master, he was called his son. Musæus is one of the first poets who versified the oracles. He is placed in the Arundelian marbles, epoch 15, 1426 B. C. at which time his hymns are there said to have been received in the celebration of the Eleusinian mysteries, Laertius says, that Musæus not only composed a theogony, but formed a sphere for the use of his companions; yet as his honour is generally given to Chiron, Sir Isaac Newton supposed that he enlarged it with the addition of several constellations after the conquest of the golden fleece. The sphere itself shews that it was delineated after the Argonautic expedition, which is described in the asterisms, together with several other more ancient histories of the Greeks, and without any thing later. Musæus is celebrated by Virgil in the character of hierophant, or priest of Ceres, at the head of the most illustrious mortals who merited a place in Elysium. Here he is made the conductor of Æneas to the recess where he meets the shade

shade of his father Anchises. The works which went under his name, like those of Orpheus, were by many attributed to Onochritus. Nothing remains of them now, nor were any of his writings extant in the time of Pausanias, except a hymn to Ceres, which he made for the Lyeomides. And as his hymns were likewise set to music, and sung in the mysteries by Musæus himself in the character of priest, he thence perhaps acquired from after times the title of musician.

MUSCA, the **FLY**; in zoology, a genus of insects of the order diptera. Mouth furnished with a fleshy proboscis, and two lateral lips; sucker furnished with bristles; feelers two, very short; antennæ generally short. This genus affords not fewer than a thousand species, principally distinguished by the peculiarities in their feelers. They are divided into sections: 1. With short feelers; and 2. Without feelers. These sections are again separated into others. The larva in the different tribes of flies differs far more in habit than the complete insects, some being terrestrial, and others aquatic. Those of the common kinds are emphatically distinguished by the title of maggots, and spring from eggs deposited on various putrid substances. "Variety (as Mr. Barbut observes) runs through their forms, their structure, their organization, their metamorphoses, their manner of living, propagating their species, and providing for their posterity. Every species is furnished with implements adapted to exigencies. What exquisiteness! what proportion in the several parts that compose the body of a fly! What precision, what mechanism in the springs and motion! Some are oviparous, others viviparous; which latter have but two young ones at a time, whereas the propagation of the former is by hundreds. Flies are lascivious troublesome insects, that put up with every kind of food. When storms impend, they have most activity, and sting with greatest force. They multiply most in hot moist climates; and so great was formerly their numbers in Spain, that there were fly-hunters commissioned to kill them. The vapour of sulphur or arsenic destroys them; and their numbers may be reduced by taking them in phials of honeyed water, or between boards done over with honey."

MUSCA, a name given to such persons among the Romans as officiously thrust themselves into the company of their superiors, and those who despised them, by finding means of getting admittance to entertainments without invitation, and without a welcome: so that muscæ were the same as parasites, who were frequently by the Greeks termed *μαῖναι*. See **PARASITE**.

MUSCADINE, or **MUSCADEL**, a rich wine, of the growth of Provence, Languedoc, Ciudad, &c.

MUSCHENBROECK, **PETER DE**, a distinguished natural philosopher and mathematician, born at Utrecht about 1700. He was first professor of these sciences in his own university, and afterwards invited to the chair at Leyden, where he died full of honours, in 1761. He was a member of several academies; particularly that of Sciences at Paris. He wrote several works in Latin, all of which shew the greatest penetration. He was also very consummate in the knowledge of law. His *Course of Natural and Experimental Philosophy* is a valuable work, and has been translated into English by Colson, in 2 vols. 8vo. Muschenbroeck was also the author of *Tentamina Experimentorum*, 4to. *Institutiones Physicæ*, 4to. and *Compendium Physicæ Experimentalis*, 12mo.

MUSCI, **MOSSES**, one of the seven families, or classes, into which all vegetables are divided by Linnaeus in the *Philosophia Botanica*. The ancients took the moss of trees to be the effect of a disorder or discomposure of the texture on the bark; or at most a kind of little filaments arising from the bark; but the moderns find, by several observations, that mosses are all real distinct plants, whose seed, being extremely small, is inclosed in little capsule; which, bursting of themselves, the seed is carried off by the winds; till, falling into the inequalities of the bark of trees, it is there stopped, takes root, and feeds at the expence of the tree, as mouldiness does on bread, &c. These plants, in the Linnaean or Sexual System of botany, constitute the second order of the class cryptogamia, which contain all those plants in which the parts of the flower and fruit are either wanting or not conspicuous. The characteristics are, 1. Antheræ, or tips without filaments or threads. 2. The male flower, constituted by the presence of the tips, placed apart from the female, either on the same or distinct roots. 3.

The female flowers distinct and without any pistillum. 4. The seeds devoid of both lobes, or cotyledons, and proper coverings; so that they exhibit the naked embryo. This order is subdivided into eleven genera, from the presence or absence of the calyx, which on these plants is a veil or cover like a monk's cowl, that is placed over the male organs or tips of the stamina, and is denominated calyptra, from the sexes of the plants, which bear male and female flowers, sometimes on the same, sometimes on distinct roots; and from the manner of growth of the female flowers, which are sometimes produced singly, sometimes in bunches or cones. These distinctions are mostly borrowed from Dillenius, whose merit in developing this part of the vegetable kingdom Linnaeus acknowledges.

MUSCI, is likewise the name of the 56th order in Linnaeus's *Fragments of a Natural Method*. See **BOTANY**.

MUSCICAPA, the **FLY-CATCHER**; a genus of birds of the order passeræ. Bill flattened at the base, almost triangular, notched at the upper mandible, beset with bristles; toes generally divided as far as their origin. Ninety-seven species are enumerated. These birds are of eminent utility in warm climates, by preying upon the numerous insects which swarm in them, and which would otherwise multiply to an extent, occasioning the most severe and intolerable annoyance.

M. CRINITA, the **CRESTED FLY-CATCHER**, is about the size of a lark: the head is crested, and of a dull green: the hind part of the neck and back are of the same colour; the under parts from the chin to the breast of an ash-colour, and thence to the vent yellow; the legs are black. See **PLATE CXX**. These inhabit Carolina and Virginia in summer; they build there, and depart in autumn. *M. Flabellifera* is also figured in **PLATE CXX**.

M. GRISOLA, the **SPOTTED FLY-CATCHER**, is about five inches three quarters long. The head is large, of a brownish hue, spotted obscurely with black: the back is of a mouse-colour: the wings and tail are dusky: the breast and belly white: the throat and sides under the wings dashed with red: the legs and feet are short and black. It is a bird of passage; appears here in spring, breeds with us, and departs in September. It builds its nest against any part of a tree that will support it; often in the hollow caused by the decay of some large limb, hole in a wall, &c. also on old posts and beams of barns; and returns to the same place season after season. It lays four or five pale eggs marked with red. It feeds on insects, and collects them on the wing. When the young can fly, the old ones retire with them into thick woods, where they frolic among the top-branches; dropping from the boughs often quite perpendicular on the flies that sport beneath, and rising again in the same direction. They will also stand on the top of some stake or post, whence they spring forth on their prey, returning still to the same stand for many times together. They feed also on cherries.

MUSCLE, in zoology. See **MYTILUS**.

MUSCLE, in animal economy, a fleshy, fibrous part, destined to be the instrument or organ of motion. See **ANATOMY**. A muscle is composed of a great number of thin parallel plates, each of which is divided into smaller fleshy threads or fibres, and inclosed in its proper cellular membrane. The muscles are divided into three parts, namely, the head, belly, and tail: the first and third are firmly attached to the bones; whereas the belly adheres loosely to other parts, by means of the cellular membrane which swells, when the muscle acts. Their substance is fleshy in the middle, but tendinous or sinewy in the extremities: the fibres of the former are sensible and irritable, while those of the latter are destitute of all sensation. Various denominations have been given to the muscles, according to the different parts where they are situated. For which see **ANATOMY**. In a chemical view, the muscular parts of animals are known in common language by the name of flesh. They constitute a considerable proportion of the food of man. Muscular flesh is composed of a great number of fibres and threads, of reddish or whitish colour; these, after they have been acted on by water, in order to separate the extraneous matter from them, are left in the state of grey fibres, insoluble in water, and becoming brittle when dry. The substance possesses all the properties of **FIBRIN**, which see. Besides fibrin, they are found to contain albumen, gelatine, extractive, phosphate of soda, of ammonia, and lime.

MUSCLES,

MUSCLES, ACTION OF THE. All the muscles act, by the inflation of their bellies; in consequence of which they are compressed or shortened. Thus, in muscular contraction, the moveable bone only is drawn in the direction of the fibres, while the other bone, to which the muscle is attached, remains fixed. Hence they operate in some measure as a lever; the two ends of every muscle being fastened to the bones by means of the tendons; but, if any fibre or nerve of the muscle be divided, or only obstructed by a ligature, the power of contraction instantly ceases.

MUSCLES, INSERTION AND FORCE OF THE. The all-wise Author of nature has furnished animals with limbs, moveable about the joints by means of muscular cords, inserted near the joint or centre of motion; the great wisdom of which will appear, from supposing the insertion to be at E, Plate CXVIII. fig. 3, near the wrist B, the muscle DE being either loose and separate from the bones DAB, or bound down to it by some ligament or fascia R; in either of which cases the bone AB cannot be turned up quite to the situation AH, unless the muscle DE be contracted or shortened to DM, which would not only be troublesome, but even impossible. It would be troublesome because the breadth and thickness of the arm would be vastly increased, so as to become as big as the belly of an animal. On the other hand, the structure of a muscle being such that it cannot be contracted but a little, seldom above two or three fingers-breadth; such an insertion as that at E, which requires a contraction of above a foot and a half, would be altogether impossible. Therefore, in fact, we find the muscles inserted near the centre of motion, as at I, fig. 4. In order to calculate the force of any muscle, we are to consider the bones as levers; and then the power or force of the muscle will be always to the resistance or weight it is capable of raising, as the greater distance of the weight from the centre of motion is to the less distance of the power. Hence, it being found by experiments, that a robust young man is able to suspend a weight R, fig. 4, equal to twenty-eight pounds, when the arm is extended in a supine and horizontal situation, we have this proportion, viz. the force of the muscle ID is to the weight R, = 28lb. as the distance BC is to the distance IC. But it is found, that BC, the length of the cubit and hand, is more than twenty times greater than IC, the distance of the muscle from the centre of motion. Therefore the force of the muscle ID, must be more than twenty times greater than the weight R, or more than $28 \times 20 = 560$ lb. Again, to find the force which the biceps and brachialis muscles exert, when the humerus EA, fig. 5, is perpendicular to the horizon, we are first to consider what weight a man is capable of sustaining in this posture, viz. R = 35lb. and next the quantity of the distances CB, CI, which, in this case, are as 16 to 1. Therefore the force of these muscles is to the weight R = 35lb. as the distance CB = 16 is to the distance IC = 1; or the force is equal to 560, as before. But what appears most wonderful, is the force of the muscles that move the lower jaw; which, when taken altogether, do not in a man exceed the weight of 1lb. and yet exert a force equal to 534lb. and in mastive dogs, wolves, bears, lions, &c. their force is vastly superior, so as to break large bones, as they practise daily in their feeding. Thus we see that, on account of the insertion of the muscles being so near the centre of motion, it is necessary for them to exert a much greater force than would otherwise be required. And as Dr. Blane observes, there is another circumstance which tends to waste the power, and that is the obliquity with which they are inserted into their bones; so that the greater part of the force is expended in pressing one bone against another at the articulation, and only a small part of it in making the flexures and extensions. These disadvantages, however, are compensated by a number of conveniences, which could not have been obtained on any other plan. We must distinguish between those actions which consist in pressure, and those which depend on percussion; for as the momentum of this last depends on velocity, it is evident, that there must be a great advantage from the insertion of the tendon being near the centre of motion, as greater velocity, with less expence of contraction, will thus be communicated to the extremity. The muscles, for instance, which are attached to the olecranon, in performing those actions with the hand which require rubbing, act with a disadvantage exactly proportional to the inequality of the distance from their insertion to the joint of the elbow, and that from the same joint to the hand. This is an act of pressure. But in the case of percussion, as in the action of

using a hammer, there is an evident advantage resulting from the velocity communicated to the extremity; for, in order to have produced the same velocity, with the insertion at a greater distance from the centre of motion, a much greater degree of contraction would have been necessary; and the doctor shews that fatigue principally depends on a contraction of the muscles. "If any one (says he) will take the trouble of comparing the fatigue of the biceps muscle, in bearing a weight in the hand with the elbow-joint bent to a right angle, with that of bearing the same weight for the same length of time with the joint at an acute angle, he will be sensible how much the degree of fatigue depends on the extent of contraction; and, by attending to the relative situation of muscular fibres, it will appear that Nature, in distributing the fibres of muscles obliquely, has had it in view not only to increase their number, but to save contraction." In considering the actions of the various muscles in producing the different actions of the body we find scarcely one produced that can be called direct. In some instances we find two muscles, or two sets of muscles, co-operating, so that the motion effected by them shall be in the diagonal of their direction. This is the case of the oblique muscles of the abdomen in some of their actions, and of the intercostal muscles in all theirs. Sometimes different portions of the same muscle combine in like manner to produce a similar effect; and in all the long muscles, however simple their origin and insertion may be, there is an internal obliquity of their fibres with regard to one another; for these do not run from end to end, but there are parts of the tendon running into the belly of the muscle, so as to divide it into penniform and rhomboidal portions. This distribution of the fibres takes off from the length; but as it takes place in those cases where the origin and insertion are at a considerable distance, this can be afforded: and this, as well as the waste of power, in consequence of oblique action, is more than compensated by the increased strength from the fibres being multiplied; for, in consequence of this structure, there is an extent of tendon afforded sufficient for the insertion of a greater number of fleshy fibres. The doctor thus shews that, by the obliquity of the muscles, a very considerable quantity of contraction is saved, and consequently a proportional degree of fatigue prevented. "Let the line AB (says he) in the annexed diagram, represent a moveable bone, and the line CD a fixed bone parallel to it. Let FE, perpendicular to these lines, represent a muscle acting in its own direction, and the lines GE, HE, represent two muscles acting obliquely, and producing by a diagonal-action the same effect as the other. If the bone AB be brought to the situation *ab* by the action of the muscle FE, the muscle will then be in the situation FK. If the bone is brought into the same situation by the action of the muscles GE, HE, these muscles will then be in the situation GK, HK, Plate CXVIII. fig. 6. The proposition to be demonstrated is, that the line GK bears a greater proportion to the line GE, than the line FK does to the line FE; for FK is to FE as GL is to GE (Euc. Elem. B. vi. Prop. 2); and the angle ELK being less than a right angle, the angle GLK, which is adjacent to it, must be greater than a right angle; and the angle GKL being in the same triangle with GLK, must be less than a right angle. The line GK, therefore, which subtends the greater angle, is greater than the line GL, subtending the less, and therefore bears a greater proportion to GE. But the line GL is to GE as FK is to FE; and therefore GK bears a greater proportion to GE than FK does to FE; that is, the fibres of the muscles acting obliquely, suffer a less proportional decurtation than those of the muscle acting directly. It is farther obvious, that the more oblique the action becomes, the greater saving there will be of contraction; for in moving the line *ab* towards CD, the line FK diminishes in a swifter ratio than the line GK; and when the former has vanished, the latter is in the situation GF." Besides these advantages in point of diminishing fatigue, there are others relating to the shape or the members. Thus, if the insertions of the muscles had been at a great distance from the joints, they must, upon every occasion, have passed like bow-strings from one bone to the other, and the limbs must have been exceedingly clumsy and unwieldy; all the motions must also have been extremely slow: and notwithstanding the superior strength which people would then have enjoyed, it is very plain, that they would scarcely have been fit for any of the offices of life which they now perform. The motions of the far greater part of the muscles are voluntary, or dependent on our

will; those of a few others, involuntary. The former are called animal, the other natural, motions. Finally, the motions of some of the muscles are of a mixed kind, partly animal, and partly natural. Those muscles which perform the voluntary motions, receive nerves from the brain or spinal marrow: those which perform their motions involuntarily, have their nerves from the cerebellum; and those whose motion is partly voluntary and partly involuntary, have theirs in part from the brain, and in part from the cerebellum. And as a muscle can no longer act when its nerves is either cut asunder or tied up, so the same absolute dependence it has on its artery: for from the experiments of Steno and others on living animals, it appears, that on cutting or tying up the artery, the muscle in the same manner loses its whole power of action, as if the nerve had been cut or tied up.

MUSCOVY. See **RUSSIA**.

MUSCOVY GLASS. See **MICA**.

MUSCULAR FIBRES. See **ANATOMY**.

MUSCULAR MOTION. See **ANATOMY**, **MUSCLE**, and **GALVANISM**.

MUSCULUS, a military machine, made use of by the Romans to cover and protect the soldiers while they approached and undermined the walls of besieged places, or filled the ditches. It seems to have resembled the testudo in form, but was smaller in size. See **TESTUDO**.

MUSCULUS, WOLFGANG, a learned Protestant divine, born at Dieuze in Lorraine, in 1497. He joined the Benedictines, but having embraced Luther's doctrines, he was obliged to fly to Strasburg, where he married. After this he suffered great hardships, but at length was made minister-deacon of the chief church in Strasburg; whence he removed, in 1527, to Augsburg, where he prevailed on the magistrates to abolish the popish worship. He died at Berne in 1563. He was a man of deep erudition, and translated several works of the Greek fathers into Latin. He also published comments on the Scriptures.

MUSCULUS, in zoology. See **MUS**.

MUSEIA, Grecian festivals in honour of the Muses, celebrated with games every fifth year, particularly by the Thespians.

MUSES, deities among the pagans, supposed to preside over the arts and sciences. Hence it was usual for the poets, at the beginning of a poem, to invoke the aid of these goddesses. The Muses are said to have been originally only singers and musicians in the service of Osiris, or the great Egyptian Bacchus, under his son Orus; but in succeeding times they were deified, and called the daughters of Jupiter and Mnemosyne, or Memory. These are the only pagan divinities whose worship may be said to have continued through all changes in the religion and sentiments of mankind. Even Christian poets seldom undertake the slightest work without invoking their aid? Milton begins the seventh book of his *Paradise Lost*, (from which, on account of the sacredness of the subject, all such nonsense should have been excluded,) with an invocation to Urania. Diodorus Siculus says that Alcman of Messene, a lyric poet, who flourished in the 27th Olympiad, 670 years B. C. makes them the daughters of Uranus and Terra. It has been asserted by some ancient writers, that at first they were only three in number, and that their names were Melete, (meditation,) Mneme, (memory,) and Aoede; (song, or music;) but Homer, Hesiod, and other mythologists, admit of nine; and Hesiod, in his theogony, names them all. Each of them presides over some art or science, as music, poetry, dancing, astronomy, &c. By some they are called virgins, because the virtues of education appear unalterable: they are called Muses, *Musai*, from *muō*, to inquire or explain mysteries, because they taught things the most curious and important. An epigram of Callimachus gives the attributes of the nine Muses in as many lines:

Calliope the deeds of heroes sings;
Great *Clio* sweeps to history the strings;
Euterpe teaches mimes their silent show;
Melpomene presides o'er scenes of woe;
Terpsichore the flute's soft pow'r displays;
And *Erato* gives hymns the gods to praise;
Polymnia's skill inspires melodious strains;
Urania wise, the stary course explains;
And gay *Thalia*'s glass points out where folly reigns.

MUSEUM, [*μουσειον*, Gr.] a repository of rare and interesting objects, selected from the whole circle of natural history and the arts, and deposited in apartments or buildings, either by the com-

mendable generosity of rich individuals, general governments, or monarchs, for the inspection of the learned, and the great mass of the public. Museum originally signified a part of the palace of Alexandria, which took up at least one-fourth of the city. This quarter was so called on account of its being set apart for the Muses, and the study of the sciences. Here were lodged and entertained the men of learning; who were divided into companies or colleges, according to the sciences of which they were the professors; and to each of these houses or colleges was allotted a handsome revenue. The foundation of this establishment is attributed to Ptolemy Philadelphus, who here placed his library. Hence museum is now applied to any place set apart as a repository for things that have an immediate relation to the sciences.

MUSEUM, ASHMOLEAN, a noble pile of building, at Oxford, erected at the expence of the university, at the W. end of the theatre, at which side it has a magnificent portal, sustained by pillars of the Corinthian order. The front, which is to the street, extends about sixty feet, where there is this inscription over the entrance in gilt characters, "Museum Ashmoleanum, schola naturalis historiae, officina chymica." It was begun in 1679, and finished in 1683, when a valuable collection of curiosities was presented to the university by Elias Ashmole, Esq. which were the same day reposit-ed there: several accessions have been since made to it; among which are hieroglyphics, and other Egyptian antiquities, an entire mummy, Roman antiquities, altars, medals, lamps, &c. and a variety of natural curiosities.

MUSEUM, BRITISH, a large, beautiful, and magnificent building in London, the noblest cabinet of curiosities in the world. It is under the immediate care of government, and itself governed by fifteen trustees, selected from the highest and most honourable offices of the state. Sir Robert Cotton may be said to have laid the foundation of the British Museum, by his presenting his excellent collection of manuscripts to the public; those, and the offer of Sir Hans Sloane's books, MSS. and curious articles in antiquity and natural history, for 20,000*l.* suggested the propriety of accepting the latter, and providing a place for the reception of both; from this time government proceeded rapidly in forming the plan, and at length every interior regulation for officers, trustees, &c. being made, Montague-House, situated in Russel-street, Bloomsbury, was purchased for 10,250*l.* and fitted for the reception of the articles then possessed, and to be bought, at the further expence of 14,484*l.* 6*s.* 4*d.* after which Lord Oxford's manuscripts were procured for 10,000*l.* to which the King added others, and since the above period vast numbers of interesting things have been placed there, particularly Sir William Hamilton's discoveries, a vast variety of valuable medals, fossils, minerals, manuscripts, and printed books, together with several Egyptian antiquities, and the late Mr. Townley's marbles and bas reliefs from Italy. The latter were given to the public under the express condition that a proper place should be built for their reception, which has been complied with, and they are now exhibited with the rest of the museum to an admiring multitude, amounting daily to upwards of ninety persons. Various alterations have taken place in the regulations adopted for the convenience of those who read at the museum, and the visitors, since 1757, when it was first opened for inspection and study, and it is but justice to say, each was intended well, though till lately it was generally thought that too many impediments existed in the way of visiting that which was solely intended for the use of the community; at present, however, no such complaint can be made with truth, as any decently dressed persons, presenting themselves at certain hours, are conducted, free of every kind of expence, through the suite of rooms by civil and well-informed officers, who explain the uses and nature of each object. Admission to the reading-room is, besides, attended with no other difficulty than necessarily follows ascertaining whether the applicant is deserving of indulgence, or likely to injure the interests of the institution; when there, every facility is afforded him by commodious tables, with pens and ink for writing, and a messenger waits to bring him any books he may think proper to select from the vast stores of literature submitted in this generous way to his use.

MUSHROOM, in botany. See **AGARICUS**, and **BOLETUS**. To try the quality of mushrooms: Take an onion, strip the outer skin, and boil it with your mushrooms: if the onion became blue or black, there are certainly dangerous ones among them; if it remain white, they are good.

MUSIC,

MUSIC.

MUSIC, [*μουσική*, Gr.] the art of combining sounds in a manner agreeable to the ear. This combination may be either simultaneous or successive: in the first case it constitutes harmony; in the last, melody. But though the same sounds, or intervals of sound, which give pleasure when heard in succession, will not always produce the same effect in harmony; yet the principles which constitute the simpler and more perfect kinds of harmony are mostly, if not entirely, the same with those of melody. By perfect harmony, we do not here mean that plenitude, those complex modifications of harmonic sound, which are admired in practice; but that harmony which is called perfect by theoreticians and artists; that harmony which results from the coalescence of simultaneous sounds produced by vibrations in the proportions of thirds, fifths, and octaves, or their duplicates. The principles upon which these various combinations of sound are founded, and by which they are regulated, constitute a science, which is not only extensive but profound, when we would investigate the principles from which these happy modifications of sound result, and by which they are determined; or when we would explore the sensations, whether mental or corporeal, with which they affect us. The first and most capital division of this science is into speculative and practical music.

SPECULATIVE MUSIC is the knowledge of the nature and use of those materials which compose it; or of all the different relations between the high and low, between the harsh and the sweet, between the swift and the slow, between the strong and the weak, of which sounds are susceptible: relations which, comprehending all the possible combinations of music and sounds, seem likewise to comprehend all the causes of the impressions which their succession can make upon the ear and upon the soul.

PRACTICAL MUSIC is the art of applying and reducing to practice those principles which result from the theory of agreeable sounds, whether simultaneous or successive; or of conducting and arranging sounds according to the proportions resulting from consonance, duration, and succession, so as to produce upon the ear the effect which the composer intends. This is the art which we call composition. With respect to the actual production of sounds by voices or instruments, which is called execution, this department is merely mechanical and operative: which, only presupposing the powers of sounding the intervals true, demands no other knowledge, but a familiar acquaintance with the characters used in music, and a habit of expressing them with promptitude and facility.

SPECULATIVE MUSIC is likewise divided into two departments; viz. the knowledge of the proportions of sounds or their intervals, and that of their relative durations; that is to say, of measure and of time. The first is what among the ancients seems to have been called harmonical music. It shews in what the nature of air or melody consists; and discovers what is consonant or discordant, agreeable or disagreeable, in the modulation. It discovers the effects which sounds produce on the ear by their nature, their force, and their intervals; which is equally applicable to their consonance and succession. The second has been called rhythmical, because it treats of sounds with regard to their time and quantity. It contains the explication of their continuance, of their proportions, of their measures, whether long or short, quick or slow, of the different modes of time, and the parts into which they are divided, that to these the succession of sounds may be conformed.

PRACTICAL MUSIC is likewise divided into two departments, which correspond to the two preceding. That which answers to harmonical music, and which the ancients called *melopée*, teaches the rules for combining and varying the intervals, whether consonant or dissonant, in an agreeable and harmonious manner. The second, which answers to the rhythmical music, and which they called *rhythmopée*, contains the rules for applying the different modes of time, for understanding the feet by which verses were scanned, and the diversities of measure; in a word, for the practice of the rhythmus.

Music is at present divided more simply into melody and harmony; for since the introduction of harmony the proportion between the length and shortness of sounds, or even that between the distance of returning cadences, are of less consequence. For it often happens in modern languages, that the verses assume their measures from the musical air, and almost entirely lose the small share of proportion and quantity which in themselves they possess. By melody the successions of sound are regulated in such a manner as to produce pleasing airs. Harmony consists in uniting to each of the sounds, in a regular succession, two or more different sounds, which simultaneously striking the ear soothe it by their concurrence. See **HARMONY**.

HISTORY OF MUSIC.

The ancient history of music, even among the most cultivated nations, is now entirely lost, or so unhappily obscured, that we can make but few certain or satisfactory discoveries in it. And as no annals could be transmitted to posterity of that music which prevailed among such people as are called barbarous, our accounts of it must be still less authentic and satisfactory than those of the former. Even at periods which are more recent, and may therefore be thought more within the sphere of our investigation, we are at a loss both for the eras and the authors of some essential improvements in music. Kircher and many others inform us, that music prevailed in Egypt before it was known in Greece. These authors derive its name from a word which is primitive in the Egyptian language, and attribute the invention of the art to the stridulous murmur of the winds whistling through reeds, or other vegetable tubes, which grew upon the banks of the river Nile. But if this legendary account of the discovery merits any attention, it must relate to instrumental music alone; for it cannot be imagined that mankind, if in the least attentive to the natural modulation of their own voices, would have recourse for their ideas of melody to objects so extrinsic and so contingent as the whistling of winds through reeds. "The origin of instrumental music (says a writer in the English Encyclopædia,) appears to have been at a period much prior to the date of authentic history; and when we look for its epoch or its discoverer, we are carried at once into the wild regions of fable and mythology. The god Mercury, or Hermes, is said to have been the inventor of the lyre, by distending strings of different tensions and diameters upon the shell of a tortoise which he found upon the shore. See **LYRE**. The first exhibition of the fistula, or shepherd's-pipe, is ascribed to Pan. But of these persons and their actions, little or nothing can be ascertained with proper evidence." In fact, we do not need to ransack mythology or fabulous history for the origin of this science. We have the most authentic accounts of the origin of instrumental music, that the most scrupulous antiquarian can desire. Moses expressly records, that musical instruments were made before the flood; and that Jubal, the seventh in descent from Adam, by his eldest son Cain, "was the father (or instructor) of all such as handle the harp and organ." (Gen. iv. 21.) The ingenious William Maxwell Morison, Esq. is therefore evidently mistaken, when he affirms, in his History of Music prefixed to that article in the Encyclopædia Britannica, that, because "No nation has been able to produce proofs of antiquity so indisputable as the Egyptians, it would be vain to attempt tracing music higher than the history of Egypt." We may safely, however, put confidence in what follows, of that ingenious gentleman's history of this art—"By comparing the accounts (he adds,) of Diodorus Siculus and of Plato, there is reason to suppose, that in very ancient times the study of music in Egypt was confined to the priesthood, who used it only on religious and solemn occasions; that, as well as sculpture, it was circumscribed by law; that it was esteemed sacred, and forbidden to be employed on light or common occasions; and that innovation in it was prohibited: but what the style or relative excellence of this very ancient music was, there are no traces by which we can form an accurate judgement. After the reigns of the Pharaohs, the Egyptians fell by turns under the dominion of the Ethiopians, the Persians, the Greeks, and the Romans. By such

such revolutions, the manners and amusements of the people, as well as their form of government, must have been changed. In the age of the Ptolemies, the musical games and contests instituted by those monarchs were of Greek origin, and the musicians who performed were chiefly Greeks. "The most ancient monuments of human art and industry, at present extant at Rome, are the obelisks brought thither from Egypt, two of which are said to have been erected by Sesostris at Heliopolis, about 400 years before the siege of Troy. These were by order of Augustus brought to Rome after the conquest of Egypt. One of them called *guglia rotta*, or the broken pillar, which, during the sacking of the city in 1527, was thrown down and broken, still lies in the Campus Martius. On it is seen the figure of a musical instrument of two strings, and with a neck. It resembles much the *calascione* still used in the kingdom of Naples. This curious relic of antiquity is mentioned, because it affords better evidence than, on the subject of ancient music, is usually to be met with, that the Egyptians, at so very early a period of their history, had advanced to a considerable degree of excellence in the cultivation of the arts. By means of its neck, this instrument was capable, with only two strings, of producing a great number of notes. These two strings, if tuned fourths to each other, would furnish that series of sounds called by the ancients *heptachord*, which consists of a conjunct tetrachord as B, C, D, E: E, F, G, A; if tuned fifths, they would produce an octave, or two disjunct tetrachords. The *calascione* is tuned in this last manner. The annals of no nation other than Egypt, for many ages after the period of the obelisk at Heliopolis, exhibit the vestige of any contrivance to shorten strings during the performance by a neck or finger-board. Father Montfaucon observes, that after examining 500 ancient lyres, harps, and citharas, he could discover no such thing." "The Hermes of the Egyptians, (continues Mr. Morison) surnamed *Trismegistus*, or thrice illustrious, who was, according to Sir Isaac Newton, the secretary of Osiris, is celebrated as the inventor of music. No one person ought strictly to be called the inventor of an art which seems to be natural to, and coeval with, the human species; but the Egyptian Mercury is without doubt entitled to the praise of having made striking improvements in music, as well as of having advanced in various respects the civilization of the people, whose government was chiefly committed to his charge." The *MONAULOS*, or single flute, called by the Egyptians *phoinix*, was probably one of the most ancient instruments used either by them or any other nation. From various remains of ancient sculpture, it appears to have been shaped like a bull's horn, and was at first, it may be supposed, no other than the horn itself. Before the invention of flutes, as no other instrument except those of percussion were known, music must have been little more than metrical. When the art of refining and lengthening sounds was discovered, the power of music over mankind, from the agreeable surprise occasioned by soft and extended notes, was probably irresistible. At a time when all the rest of the world was involved in savage ignorance, the Egyptians were possessed of musical instruments capable of much variety and expression. Of this the astonishing remains of the city of Thebes still subsisting afford ample evidence. In a letter from Mr. Bruce, ingrossed in Dr. Burney's History of Music, there is a particular description of the Theban harp, an instrument of extensive compass, accompanied with a drawing taken from the ruins of an ancient sepulchre at Thebes, supposed by Mr. Bruce to be that of the father of Sesostris. On the subject of this harp, Mr. Bruce makes the following striking observation: It overturns all the accounts of the earliest state of ancient music and instruments in Egypt, and is altogether, in its form, ornaments, and compass, an incontestable proof, stronger than a thousand Greek quotations, that geometry, drawing, mechanics, and music, were at the greatest perfection when this harp was made. It cannot be doubted, that during the reigns of the Ptolemies, music must have been much cultivated. The father of Cleopatra, the last of that race, derived his title of *Auletes*, or fluteplayer, from his excessive attachment to the flute. Like Nero, he used to array himself in the dress of a tибicen, and exhibit his performance in the public musical contests. The sacred Scriptures afford almost the only materials from which any knowledge of Hebrew music can be drawn. Moses, who led the Israelites out of Egypt, was educated by Pharaoh's daughter, in all the literature and elegant arts of that country. The taste and

style of Egyptian music would therefore be infused into that of the Hebrews. Music appears to have been interwoven through the whole tissue of religious ceremony in Palestine. The priesthood seem to have been musicians hereditarily and by office. The prophets accompanied their inspired effusions with music; and every prophet seems to have been accompanied by a musical instrument. Music, vocal and instrumental, constituted a great part of the funeral-ceremonies of the Jews. The number of flute-players in the processions amounted sometimes to several hundreds, and the attendance of the guests continued frequently for 30 days. (Josephus. l. 3, c. 9.) The Hebrew language abounds with consonants, and has so few vowels, that in the original alphabet they had no characters. Their instruments of music were chiefly those of percussion; so that, both on account of the language and the instruments, the music must have been coarse and noisy. The vast numbers of performers too, whom they collected together, could with such language and such instruments produce nothing but clamour and jargon. Josephus says, there were 200,000 musicians at the dedication of Solomon's temple. Cadmus, with the Phœnician colony which he led into Greece, imported at the same time various arts into that country. That chief discovered gold in Thrace and copper at Thebes, where it is still termed *Cadmia*. Of these materials, and of iron, they formed instruments of war. These they struck against each other during their dances at sacrifices, by which they first obtained the idea of instrumental music. Such is the origin of that species of music in Greece, produced by instruments of percussion. The invention of wind-instruments is attributed to Minerva; and to the Grecian Mercury is assigned the honour of many discoveries probably due to the Egyptian Hermes, particularly the invention of stringed instruments." See *LYRE*. The Grecian lyre, though invented by Mercury, was cultivated principally by Apollo, who first played upon it with method, and accompanied it with the voice. The celebrated contest between him and Marsyas is mentioned by various authors; in which, by conjoining the voice with his lyre, his music was declared superior to the flute of Marsyas. Diodorus Siculus says, "The Muses added to the Grecian lyre the string called *mese*; Linus that of *lichanos*; and Orpheus and Thamyras those strings which are named *hypate* and *parhypate*." The lyre invented by the Egyptian Mercury had but three strings. *Mese*, in the Greek music, is the fourth sound of the second tetrachord of the great system, and first tetrachord invented by the ancients, answering to our A, on the fifth line in the base. If this sound then was added to the former three, it proves that the most ancient tetrachord was that from E. in the base to A; and that the three original strings in the Mercurian and Apollonian lyre were tuned E, F, G, which the Greeks call *hypate meson*, *parhypate meson*, and *meson diatonos*: the addition, therefore, of *mese* to these completed the first and most ancient tetrachord, E, F, G, A. The string *lichanos* again being added to these, and answering to our D on the third line in the base, extended the compass downwards, and gave the ancient lyre a regular series of five sounds. The two strings *hypate* and *parhypate*, corresponding with our B and C in the base, completed the heptachord or seven sounds, b, c, d, e, f, g, a; a compass which received no addition till after the days of Pindar. It has been imagined, that the occupation of the first poets and musicians of Greece resembled that of the Celtic and German Bards, and the Scalds of Iceland and Scandinavia. They sung their poems in the streets of cities and palaces of princes. They were treated with high respect, and regarded as inspired. Such was the employment of Homer. His poems exhibit the most authentic picture of the times of which he wrote, and in which he lived. Music is always named throughout the *Iliad* and *Odyssey* with rapture. The instruments most frequently named are the lyre, the flute, and the *syrinx*. The trumpet appears not to have been known at the siege of Troy. From the time of Homer till that of Sappho, only a few fragments remain of the works of those poets and musicians, who flourished between those periods. During the century which elapsed between Sappho and Anacreon, no literary productions are preserved entire. From Anacreon to Pindar there is another chasm of near a century. Subsequent to this time, the works still extant of Æschylus, Sophocles, Euripides, Plato, Aristotle, Aristoxenus, Euclid, Theocritus, Callimachus, Polybius, &c. produced all within less than 300 years, distinguish this illustrious period, as that in which the whole powers.

powers of genius seem to have been exerted to illuminate mankind. Then eloquence, poetry, music, architecture, history, painting, sculpture, like the spontaneous blossoms of nature, flourished without the appearance of labour or of art. The poets, epic, lyric, and elegiac, were all likewise musicians, so strictly connected were music and poetry for many ages. The invention of notation and musical characters marked a distinguished era in the progress of music. Terpander is the celebrated poet and musician, to whose genius music is indebted for this. He flourished about the 27th Olympiad, or B. C. 671. Before that valuable discovery, music being entirely traditional, must have depended much on the memory and taste of the performer. There is an incident mentioned in the accounts of the Olympic games, which may serve to mark the character of music at the time it happened. Lucian relates that a young flute-player named Harmonides, at his first public appearance in these games, began a solo with so violent a blast, on purpose to surprise and elevate the audience, that he breathed his last breath into his flute, and died on the spot. When to this anecdote, (to us almost incredible,) it is added, that the trumpet-players at these exhibitions expressed an excess of joy, when they found their exertions had neither rent their cheeks nor burst their blood-vessels, some idea may be formed of the noisy and vociferous style of music which then pleased. In whatever manner the flute was played on, there is no doubt that it was long in Greece an instrument of high favour, and that the flute-players were held in much estimation. The flute used by Ismenias, a celebrated Theban musician, cost at Corinth three talents, or 551*l.* 5*s.* The ancients were not less extravagant in gratifying the ministers of their pleasures than ourselves. Amœbeus, a harper, was paid an Attic talent, or 193*l.* 15*s.* per day for his performances. Roscius had 500 sesteria, or 4036*l.* 9*s.* 2*d.* St. a-year. The beautiful Lamia, who was taken captive by Demetrius, when he vanquished Ptolemy Soter, and who captivated her conqueror, with many other female musicians, are recorded by ancient authors in terms of admiration. The philosophers of Greece were not inattentive to the theory of music. This science became the source of various sects, and of much diversity of opinion. The founders of the most distinguished sects were Pythagoras and Aristoxenus. The Romans, from their first origin, were possessed of a peculiar species of music. It was rude and coarse, but as soon as they opened a communication with the Greeks, they borrowed their music and musical instruments. Most nations have introduced music into their religious ceremonies. That the art was early admitted into the rites of the Egyptians and Hebrews, and constituted a considerable part of the Grecian and Roman religious service, appears from many ancient authors. It soon obtained an introduction into the Christian church, as the Acts of the Apostles discover in many passages. The chanting of psalms was introduced into the western churches by St. Ambrose, about A. D. 359; and in 600 was improved by St. Gregory the Great. The Ambrosian chant contained four modes. In the Gregorian the number was doubled. So early as the age of Constantine the Great, instrumental music was introduced into the service of the church. In England, Bishop Stillfleet says, music was employed in the church-service, first by St. Augustine, and afterwards much improved by St. Dunstan, who was himself an eminent musician, and first furnished the English churches and convents with the organ; which seems to have been an improvement of the hydraulicon, or water-organ of the Greeks. The first organ seen in France was sent from Constantinople in 757, as a present to king Pepin from the emperor Constantine V. In Italy, Germany, and England, it became frequent during the 10th century. During the dark ages no work of genius or taste in any science was produced in Europe; and except in Italy, music was equally neglected. In the middle ages, when the most fertile provinces of Europe were occupied by the Goths, Huns, Vandals, and other barbarous tribes, whose language was as harsh as their manners were savage, no improvement of music is to be looked for. Literature, arts, and refinements, however, were encouraged at the courts of the Roman pontiffs; and thus the scale, the counterpoint, the best melodies, the chief graces and elegancies of modern music, have derived their origin from Italy. Counterpoint, or music in parts, is an invention purely modern. The term harmony meant in the language of antiquity what is now understood by Melody. Guido, a monk of Arezzo, entertained the first idea

of counterpoint about 1022: See ARETIN, an art which has since experienced gradual and imperceptible improvements, far exceeding the powers of any one individual. The term counterpoint, or contra punctum, denotes its etymology and import. Musical notation was at one time performed by small points; and the present mode is only an improvement of that practice. Counterpoint, therefore, denotes the notation of harmony or music in parts, by points opposite to each other. The improvements of this acquisition kept pace at first with those of the organ; and both were employed chiefly in sacred music, till the 13th century, when secular music began to be cultivated. Before the invention of characters for time, music in parts must have consisted entirely of simple counterpoint, or note against note, as is still practised in psalmody. But the discovery of a time-table extended infinitely the powers of combined sounds. The ancients had no other resource to denote time and movement in music, except two characters (— ∪), for a long and a short syllable. But time is of such importance in music, that it can impart meaning and energy to the repetition of the same sound: without it variety of tones has no effect with respect to gravity and acuteness. The invention of the time-table is attributed to John De Muris, who flourished about 1330. But in a M. S. of Muris himself, bequeathed to the Vatican library by the Queen of Sweden, that honour seems to be yielded to Mr. Franco, who was alive in 1083. Muris, however, who, it is believed, was an Englishman, though not the inventor of the cantus mensurabilis, by his numerous writings greatly improved it. His tract on the Art of Counterpoint is the most useful essay of which those times can boast. In the 11th century, during the first crusade, Europe began to emerge from the barbarous stupidity and ignorance which had long overwhelmed it. Then the poets and songsters, named Troubadours, who first appeared in Provence, instituted a new profession; which was patronised by the count of Poictou, and many other princes and barons, who had cultivated music and poetry. At the courts of their munificent patrons, the troubadours were treated with respect. The ladies, whose charms they celebrated, gave them the most flattering reception. During almost two centuries after the arrangement of the scale, and the invention of the time-table, no remains of secular music can be discovered, except those of the troubadours. In the simple tunes of these bards no time is marked, and but little variety of notation; but they discover the germs of the future melodies, as well as the poetry of France and Italy. Almost every species of Italian poetry is derived from the Provencals. Air, the most captivating part of secular vocal music, seems to have had the same origin. The most ancient strains extant are such as were set to the songs of the troubadours. The provencal language began to be used by poets about the end of the 10th century. In the 12th it became the general vehicle, not only of poetry, but of prose, to all who were ignorant of Latin. At this period, violars, or performers on the vielle or viol, juglars or flute-players, musics or players on other instruments, and comics or comedians, abounded all over Europe. This swarm of poet-musicians, formerly entitled jongleurs, travelled from province to province, singing their verses at the courts of princes. They were rewarded with clothes, horses, arms, and money. They were employed often to sing the verses of troubadours, who were deficient in voice or ignorant of music. The term troubadour, therefore, implies poetry as well as music. The jongleurs, menetriers, strollers, or minstrels, were often musicians, without any pretensions to poetry. These last have been common at all times; but the troubadour or bard distinguished a particular profession, only during the dawnings of literature. In the 13th century, the songs were on various subjects; moral, merry, amorous; and melody was little more than plain song or chanting. The notes were square, and written on four lines only like those of the Latin church in the clif C, and without any marks for time. The movement and embellishments of the air depended on the abilities of the singer. By the cultivation of the voice modern music has since been much extended, for it was not till the end of St. Lewis's reign that the fifth line began to be added to the staff. The singer always accompanied himself with an instrument in unison. As the lute was the favourite instrument in Grecian poetry, so the harp held the same place in the estimation of the poets who flourished in this period. A poet of the 14th century, Machau, wrote a poem on the harp alone; in which he assigns to each of its 25 strings an allegorical

name; calling one liberality, another wealth, &c. The instrument which frequently accompanied, and indeed disputed the pre-eminence with the harp, was the viol. Till the 16th century this instrument was furnished with frets; after that period it was reduced to four strings: and still under the name of violin holds the first place among treble instruments. British harpers were famous long before the conquest. The bounty of William I. to his jocular or bard is recorded in Doom-day book. The harp was the favourite instrument for many ages, under the British, Saxon, Danish, and Norman kings. The Fiddle, however, is mentioned so early as 1200, in the legendary life of St. Christopher. The ancient privileges of the minstrels at the fairs of Chester are well known. The extirpation of the bards of Wales by Edward I. is likewise a familiar incident. But his persecuting spirit seems to have been limited to that principality: for at the ceremony of knighting his son, a multitude of minstrels attended. In 1315, under Edward II. such extensive privileges were claimed by the minstrels, and so many dissolute persons assumed that character, that it became necessary to restrain them by express laws. After the invention of printing, music became an object of high importance. The names of the most eminent composers who flourished in England, from that time to the Reformation, were, Fairfax, William of Newark, Shervyngham, Turges, Banister, Tudor, Taverner, Tye, Johnson, Parsons; to whom may be added John Marbeck, who set the whole English cathedral-service to music. Before this period Scottish music had advanced to a high degree of perfection. James I. was a great composer of airs to his own verses; and may be considered as the father of that plaintive melody, which in Scotch tunes is so pleasing to a taste not vitiated by modern affectation. Besides the testimony of Fordun and Major, we have that of Alexander Tessani, to the musical skill of that accomplished prince. Among us moderns (says this foreigner) we may reckon James king of Scotland, who not only composed many sacred pieces of vocal music, but also of himself invented a new kind of music, plaintive and melancholy, different from all others; in which he has been imitated by Carlo Gesualdo prince of Venosa, who in our age has improved music with new and admirable inventions." Under such a genius as king James I. the national music must have been greatly improved. He composed several anthems, which shew that his knowledge of the science must have been very considerable. Organs were by him introduced into the cathedrals and abbeys of Scotland, and choir-service brought to a high-degree of perfection. By an able antiquary (Mr. Tytler), the great era of music, as of poetry, in Scotland, is supposed to have been from the beginning of the reign of James I. down to the end of that of James V. During that period flourished Gavin Douglas, Bishop of Dunkeld, Ballendeau archdeacon of Murray, Dunbar, Henryson, Scott, Montgomery, Sir David Lindsay, and many others, whose fine poems have been preserved in Banatyne's Collection, and of which several have been published by Allan Ramsay in his *Evergreen*. In the 16th century music was an indispensable part of polite education. There is a collection preserved in M. S. called queen Elizabeth's Virginal Book. Tallis, profound in musical composition, and Bird his admirable scholar, were two of the authors of this famous collection. In queen Elizabeth's reign, the genius and learning of the British musicians were not inferior to any on the continent. The most eminent musical theorists of Italy, who flourished in the 16th century, were, Franchinus Gaserius of Lode, Peter Aaron of Florence, Lewis Fogliano, John Sparato, John Maria da Terentio, Lanfranco, Stephen Uanneo, Anth. Francis Done, Luigi Dentice, Nicholas Vicentio, and Joseph Zarlino, the most general, voluminous, and celebrated theorist of that period; Vincent Galilei, a Florentine nobleman, and father of the great Galileo Galilei; Maria Artusi of Bologna, Oraseo Tegrini, Peter Pontio, Lewis Zaccconi, and Andrew Rota, an admirable contrapunctist. The principal Roman authors were, John Annucina, John Pierluigi da Palestrina, justly celebrated; Ruggiero Giovannelli, Lucas Marenzio, who brought to perfection madrigals, the most cheerful species of secular music. Of the Venetians Adrian Willaeri is allowed to be at the head. At the head of the Neapolitans is deservedly placed Rocco Rodio. At Naples, too, the illustrious dilettante, Charles Gesualdo prince of Venosa, is highly celebrated. Lombardy could also furnish an ample list of eminent musicians during the 16th century. The chief of them were,

Constance Porta, Gastoldi, Biffi, Cima, Vecchi, and Monteverde. Francis Cortecchia, a celebrated organist and composer, and Alexander Strigglio, a lutanist and voluminous composer, were the most eminent Florentines. The Germans have long made music a part of general education. During the 16th century, their most eminent composers of music and writers on the subject were, Geo. Reischius, Michael Roswick, Andrew Ornithorparchus, Paul Hofhaimer, Luspinius, Henry Loris or Lorit, Faber, Fink, and Hofman. In France, during the 16th century, no art except that of war made much progress. Rousard, Bail, Coudimel, Claud la Jeune, Caurroy, and Maudit, are the chief French musicians of that period. In Spain, music was early received into the circle of sciences. The musical professorship at Salamanca was founded by Alfonso the Wise, K. of Castile. The most celebrated of the Spanish musicians was Francis Salinas, who had been blind from his infancy. He was a native of Burgos. Christopher Morales, and Thomas Lewis da Vittorio, deserve likewise to be mentioned. The Netherlands, during this period, produced many eminent composers; as Verletot, Gombert, Arkadelt, Berchem, Richefort, Crequillon Le Coq, Canis, Jacob Clemens Non-Papa, Peter Manchicourt, Baston, Kerl, Rore, Orlando di Lasso, and his sons Ferdinand and Rodolph. In the 17th century, the musical writers and composers, who acquired fame in England, were, Dr. Nathanael Giles, Thomas Tomkins, and his son; Elway Bevin, Orlando Gibbons, Dr. William Laws, Dr. John Wilson, John Hilton, John Playford, Captain Henry Cook, Pelham Humphrey, John Blow, William Turner, Dr. Christopher Gibbons, Benjamin Rogers, and Henry Purcell. About the end of the reign of James I. a music lecture or professorship was founded in the university of Oxford by Dr. William Heychin. In the reign of Charles I. a charter was granted to the musicians of Westminster, incorporating them, as the king's musicians, into a body politic, with powers to prosecute and fine all who, except themselves, attempt to make any benefit or advantage of music in England or Wales. About the end of the reign of Charles II. a passion was excited in England for the violin, and for pieces composed for it, in the Italian manner. Prior to 1600, there was little other music except masses and madrigals; but from that time to the present, dramatic music became the chief object. The music of the church and of the chamber continued to be cultivated in Italy till near the middle of the century; yet a revolution in favour of melody and expression was preparing, even in sacred music, by the success of dramatic composition, consisting of recitation and melodies for a single voice. Such melodies began now to be preferred to music of many parts; in which canons, fugues, and full harmony, had chiefly employed the master's study and the hearer's attention. The most celebrated violin-players of Italy, from the 16th century to the present time, have been Favinia, M. Angelo Rossi, Bassani the violin-master of Corelli, the admirable Angelico Corelli himself, Torelli, Alberti, Albenoni, Tassarini, Vivaldi, Geminiani one of the most distinguished of Corelli's scholars, Tartini, Veracini, Barbella, Locatelli, Ferrari, Martini, Boccherini, and Giardini. So late as the beginning of the 18th century, the performers in the operas of Germany, particularly at Hamburg, "were all tradesmen; your shoemaker" says Riccobardi, was often the first performer on the stage; and you might have bought fruit and sweatmeats of the same girls, whom the night before you had seen in the characters of Armida or Semiramis. Soon, however, the German opera arose to a more respectable situation; and even during the 17th century many eminent composers flourished in that country. Music was but little cultivated in France till the operas of Lulli, under the patronage of Lewis XIV. excited public attention. The favourite singing master and composer of France, in the 17th century, was Michael Lambert. John Baptist Luili, soon after this, rose from the rank of a menial servant to fame, opulence, and nobility, by his skill in musical compositions. The celebrated singer La Rochois was taught singing and acting by Lulli. After Purcell's time the chief composers for the church were Clarke, Dr. Holden, Dr. Creighton, Tucker, Aldrich, Golwin, Weldon, Dr. Crofts, Dr. Green, Boyce, Nares, and John Stanley, who attained high proficiency in music, although from two years old totally deprived of sight. The annals of modern music have hitherto furnished no event so important to the progress of the art, as the invention of recitative or dramatic melody; a style of music which

which resembles the manner of the ancient rhapsodists. "The Orsea of Politian was the first attempt at musical drama. It was afterwards perfected by Metastasio. No musical dramas, similar to those afterwards known by the names of opera and oratorio, had existence in Italy before the 17th century. About 1600, eunuchs were first employed for singing in Italy. There seem to have been no singing eunuchs in ancient times, unless the galli or archigalli, priests of Cybele, were such. Castration was never practised merely to preserve the voice, till about the end of the 16th century. The word opera seems to have been familiar to English poets from the beginning of the 17th century. Stilo recitativo, a recent innovation in Italy, is mentioned by Ben Jonson so early as 1617. From this time it was used in masques, occasionally in plays, and in cantatas, before a regular drama wholly set to music was attempted. By the united abilities of Quinault and Lulli, the opera in France had arisen to high favour. During the 17th century, whatever attempts were made in the musical drama, the language sung was always English. About the end of that century, however, Italian singing began to be encouraged, and vocal as well as instrumental musicians from that country began to appear in London. The first musical drama, performed wholly after the Italian manner in recitative for the narrative parts, and measured melody for the airs, was Arsinoe queen of Cyprus, translated from an Italian opera of the same name, written by Stanzani of Bologna. The English version of this opera was set to music by Thomas Clayton, one of the royal band, in the reign of William and Mary. The singers were all English, Messrs. Hughes, Leveredge, and Cook; Mrs. Tofts, Mrs. Cross, and Mrs. Lyndsey. The translation of Arsinoe, and the music to which it is set, are execrable; yet such is the charm of novelty, that this miserable performance, deserving neither the name of a drama by its poetry, nor of an opera by its music, sustained 24 representations, and the second year 11. Operas, notwithstanding their deficiencies in poetry, music, and performance, became so formidable to our actors at the theatres, that it appears from the Daily Courant, 14th January, 1707, a subscription was opened "for the encouragement of the comedians acting in the Haymarket, and to enable them to keep the diversion of plays under a separate interest from operas." The year 1710 is distinguished in the annals of music, by the arrival in Britain of George Frederic Handel. (See HANDEL.) The fame of this great musician had reached this country before he arrived; and Aaron Hill, of the Haymarket theatre, instantly applied to him to compose an opera. It was Rinaldo; the admirable music of which he produced entirely in a fortnight. Soon after this period appeared, for the first time as an opera-singer, the celebrated Mrs. Anastasia Robinson, afterwards Countess of Peterborough. She made her first public exhibitions in the concerts at York-buildings; and acquired so much the public favour, that her father took a house in Golden Square, for weekly concerts and assemblies, in the manner of Conversazioni, which became the resort of the most polite audiences. The sacred musical drama, or oratorio, was invented early in the 14th century. Every nation in Europe seems first to have had recourse to religious subjects for dramatic exhibitions. The oratorios had been common in Italy during the 17th century; they had never been publicly introduced in England till Handel exhibited, in 1732, his oratorios of Esther, and Acis and Galatea. The most formidable opposition, which Handel met with, was a new theatre for exhibiting these operas, in Lincoln's-inn Fields, under Nicolas Porpora, a respectable composer. A difference having occurred between Handel and Senesino, Senesino deserted the Haymarket, where Handel managed, and engaged at Lincoln's-inn Fields. To supply the place of Senesino, Handel brought over John Carestini, a singer of the most extensive powers. His voice was at first a powerful and clear soprano; afterwards it changed into the fullest, finest, deepest, counter-tenor that has perhaps ever been heard. His person was tall, beautiful, and majestic. He rendered every thing he sung interesting by energy and taste. In the execution of difficult divisions from the chest, his manner was articulate and admirable. The opera under Porpora was removed to the Haymarket, which Handel had left. Handel occupied the theatre of Lincoln's-inn Fields; but his rivals now acquired a vast advantage, by the arrival of Carlo Broschi dello Farinelli. This renowned singer transcended all anterior vocal excellence. No vocal performer of the 18th cen-

tury has been so unanimously allowed to possess an uncommon power, sweetness, extent, and agility of voice, as Farinelli. Nicolini, Senesino, and Carestini, gratified the eye as much by the dignity, grace, and propriety, of their action, as the ear by the judicious use of a few notes within a small compass of voice; but Farinelli, without significant gestures or graceful attitudes, enchanted and astonished his hearers, by the force, extent, and mellifluous tones of the mere organ, when he had nothing to execute, articulate, or express. Though during the time of singing he was as motionless as a statue, his voice was so active, that no intervals were too close, too wide, or too rapid, for his execution. Since this time the science has acquired additional improvements by the performances and exertions of several excellent composers, and others famous for their musical talents.

OF SOUNDS, MELODY, HARMONY, &c.

Sounds, as they are more intense or remiss, are said to be loud and low, or strong and weak; which depends on the nature of the sonorous body, its figure, the force of percussion, &c. The same loud or low sound hath divers degrees of note or tone, which are in the extremes called acuteness and gravity of the sound: in the lower degrees, the note or tone is grave, flat, or low; in the higher it is acute, sharp, or high. The degrees of acuteness and gravity make all the different and distinguishable tones or tunes of a voice or sound; which are the component parts of harmony. Sound is again distinguished into long and short, which relates to its duration, or continuance. Farther sounds are simple or compound; a simple sound is the product of one voice, or individual body, as that of one wire or word. A compound sound consists of several simple ones, all united in the same measure of time, or striking the ear altogether. A compound sound is also called a chord being the mixture of several sounds heard at the same time. Melody is a series of simple sounds, which succeed in a manner agreeable to the ear; or it is a pleasing succession of simple sounds. Harmony is a series of chords which delights the ear: also sometimes a pleasing coalescence of sounds in a single chord is called harmony. A chord, that is two or more notes sounded together, is called a consonance, when the compound sound pleases the ear: but when its effect is disagreeable, it is called a dissonance: concord is that agreement of the sounds of chords which renders them harmonious. In melody and harmony an interval is the difference in the sounds with respect to the degree in which it is higher or lower than another; thus if several sounds gradually exceed one another in acuteness, the interval between the first and second is the least, and that between the first and last the greatest interval, and in general the greater the distance between these sounds the greater is the interval. In ascending sounds the highest is said to be in the interval in respect of the lowest, and vice versa. See INTERVAL. As sounds are produced by the vibrations of the parts of bodies, and strings are the most simple and proper subjects to examine these matters in; so it has been found that the following articles, respecting strings and their vibrations, are founded in nature, and confirmed by repeated experience. The forces requisite to draw any string ΔCB , Plate CXXII. fig. 1, out of its place to the distance of ce , cf , cg , are directly proportional to the spaces or lines ce , cf , cg . The vibrations, therefore, of the same string are all performed in equal spaces of time; that is, the chord will return from the situation AgB as soon as from AeB to ACB , because the force at g is as much greater than the force at e , by which it returns, as Cg is greater than Ce . If strings differ only in tension, the times of their vibrations are inversely as the square roots of the weights which stretch them. That is, if the weights are as four to nine, the times will be as three to two. The number of vibrations in the same time, are directly as the square roots of the weights; that is, as two to three, in the preceding case. The number of vibrations made in the same time by two strings differing in thickness, are as the diameters of their bases inversely. If strings differ only in length, the times of their vibrations are directly proportional to their lengths; and the number of vibrations in the same time are inversely as the lengths. Hence strings of different tensions, diameters, and lengths, may be so adjusted by compounding the foregoing ratios, that the times of their vibrations shall be in any given proportion; which is of great use in stringing instruments, as the spinet, harpsichord, &c. As the tune of a note or sound is constituted by the measure and proportion of vibrations in respect of their

their velocity, the quicker vibrations making the acute tone, and the slower the grave one; so it follows, the tune of any string's note will be acuter or graver, in proportion as it is smaller or greater, shorter or longer, tighter or slacker. As the vibrations of strings is the cause of sounds in general, so the coincidences of their vibrations is the reason and ground of concordance. If there be two strings A, B, whose lengths are as four to three, then by the above it appears that while A makes three vibrations, B will make four; and therefore supposing them to begin together, there will be constantly at every three vibrations in A, and four in B, a coincidence of vibration; that is, they will then vibrate together, and begin each period of vibrations so long as they continue in motion. This makes them concord with each other, and produce an agreeable sound. The more frequent these coincidences are, the more agreeable is the concordance; and therefore unison is the first degree of concord, because there the vibrations begin and end together; this is expressed by the ratio of one to one, viz. 1 : 1. Next to this the ratio of 1 : 2 is the most agreeable and perfect concord, and then 2 : 3; after which, the concordance becomes less perfect and pleasant in the ratios 3 : 4, 4 : 5, 5 : 6, beyond which the concordance is unsufferable; for in these the coincidences of vibration become less frequent. Besides the ratios of concord found in the natural order of numbers, 1 : 2 : 3 : 4 : 5 : 6, there are some others, viz. 3 : 5, and 5 : 8, which the ear adjudgeth concordances, though in a lower degree. And hence, it is plain, there is somewhat besides the frequency of the coincidences of vibrations, that qualifies the ratio for concordance or pleasing sound, for else 4 : 7, or 5 : 7, both discords, would be preferable to 5 : 8, a concord, contrary to experience. If one certain string be struck, in order to compare the sounds of others with its own, it is called the fundamental; and its note is called the key, or key-note. A table of all the concordances between the ratio of unison 1 : 1, and the octave 2 : 1, expressing the lengths, vibrations, coincidences, names, and perfection thereof, you have here subjoined.

Longt.	Vibrat.	Coin.			Names.	Perfection.
1 : 1	1 : 1	1	100	1000	Unison.	Most perfect.
6 : 5	5 : 6	5	120	833	Third minor.	Imperfect.
5 : 4	4 : 5	4	125	800	Third major.	Imperfect.
4 : 3	3 : 4	3	133	750	Fourth.	Imperfect.
3 : 2	2 : 3	2	150	666	Fifth.	Perfect.
8 : 5	5 : 8	5	160	625	Sixth minor.	Imperfect.
5 : 3	3 : 5	3	167	600	Sixth major.	Imperfect.
2 : 1	1 : 2	1	200	500	Octave.	Perfect.

This table wants but little explanation; take an example of the fifth; the length of the string sounding this concord must be as 3 to 2, their vibrations then performed in the same time, will be as 2 to 3; the coincidence of these vibrations will be at every second vibration of the fundamental; the string which is a fifth makes 150 vibrations, while the fundamental makes 100. The same string is 666 of such equal parts as the fundamental contains 1000. It is called a fifth, as being the fifth note from the key inclusive; and is a perfect concord. To divide a right line so as to exhibit the seven concords, is very easy; for let AB be the given line, fig. 2, divide it into two equal parts in C; and divide CB into two equal parts in D; and lastly, divide CD into two equal parts in E.

Then is $\left\{ \begin{array}{l} AC \text{ to } AB \\ AC \text{ to } AD \\ AD \text{ to } AB \\ AC \text{ to } AE \\ AE \text{ to } AD \\ EB \text{ to } AD \\ AE \text{ to } AB \end{array} \right\}$ As $\left\{ \begin{array}{l} 1 : 2, \text{ An Octave.} \\ 2 : 3, \text{ A Fifth.} \\ 3 : 4, \text{ A Fourth.} \\ 4 : 5, \text{ A third major.} \\ 5 : 6, \text{ A third minor.} \\ 3 : 5, \text{ A sixth major.} \\ 5 : 8, \text{ A sixth minor.} \end{array} \right.$

Of these seven concords, three of them are simple, the rest compound. The simple concords are 5 : 6, a third minor, 4 : 5 a third major, and 3 : 4, a fourth; for these cannot be parted into any other concords, by putting any mean number (whether arithmetical or harmonical) between the terms of the ratios. But the other four concords are composed of the simple ones, as is plain by interposing an arithmetical or harmonical mean, or both, between the terms of the ratios of these concords, as in the following table:

With Arithmetical Means.

A Fifth, or 2 : 3, contains 3 : 5 : 6, a 3d major and 3d minor.
A Sixth, G. or 3 : 5, contains 3 : 4 : 7, a 4th and 3rd major.
An Octave, or 1 : 2, contains 2 : 3 : 4, a 5th and 4th.

With Harmonical Means.

A fifth, 2 : 3 contains 10 : 12 : 15, a 3d minor and 3d major.
A sixth, G. 3 : 5 contains 12 : 15 : 20, a 3d major and 4th.
An octave, 1 : 2 contains 3 : 4 : 6, a 4th and 5th.
Also between the terms of a sixth minor 5 : 8, you put the mean 6, it resolves it into 5 : 6 : 8, a 3d minor and 4th.

If between the extremes of the octave 6 : 12, we put an arithmetical mean 9, it resolves it into 6 : 9 : 12, a 5th and 4th. If you put an harmonical mean 8, it resolves it into 6 : 8 : 12, a 4th and 5th. If both the means are interposed, the series will be geometrical, viz. 6 : 8 : 9 : 12. Thus it appears that a 4th and 5th are the two concords that the octave is immediately resolvable into.

The relations of a 3d, 4th, 5th, 6th, and octave, to the fundamental are called primary relations, and are concords therewith, as we have seen: but the relations of concords to each other, are called musical relation, and these ought to be all concord, to make or stand together in harmony. Thus the 3d major, 5th and octave, make perfect harmony; for the 5th is to the 3d major, as 5 : 6, a 3d minor; the octave to the 3d major, as 5 : 8, a sixth minor; the octave to the 5th as 3 : 4, a 4th. But the 4th, 5th, and octave, cannot make harmony, because the ratio of the 5th to the 4th is as 8 : 9, which is a discord.

Some of the discords are admitted in music to make the concords appear more agreeable by opposition; these discords which are admitted arise from the differences of the concords. Thus the difference between a 4th and a 5th, viz. $\frac{3}{4}$ and $\frac{3}{5}$ is $\frac{2}{20}$ or 8 : 9; this constitutes the note which is called the second major from the fundamental: and the difference between a 3d major and 4th is 15 : 16, and this makes a second minor, which is the very next the fundamental.

The ratio 8 : 9 is called a major tone or interval, 9 : 10 a minor tone, and 15 : 16 a semitone, or rather, an interval greater than half, and less than a whole tone. Now if from a minor tone 9 : 10 (the difference of a 3d minor and 4th) you take an octave 1 : 2, there will remain the ratio 5 : 9, which is the note above the 6th major, viz. the seventh minor; and the seventh major is the difference between the semitone 15 : 16 and the octave 1 : 2, viz. the ratio 8 : 15. And these constitute the notes in present use, the rest produce very harsh notes, or gross discords, not used in music.

The first or fundamental note of any tune, is called the key, as being that to which all the notes in the melody of the song are referred, and by which they are governed and regulated. In this key the melody generally begins, and always closes. The key is distinguished into two kinds, viz. the flat and sharp key.

The flat key is that which hath always the 2d major, 3d minor, 4th, 5th, 6th minor, 7th minor, and octave; the sharp key has the 2d major, 3d major, 4th, 5th, 6th major, 7th major, and octave. Whence it is plain that the air or tune of the melody in the flat key is a half-note lower than it is in the sharp key; and is therefore more suited to, and generally used in, the melancholy and mournful, than brisk and airy tunes, which the other key is adapted to, being half a note higher.

OF THE COINCIDENCE OF ANY NOTE AND ITS OCTAVE, AND OF THE DIATONIC-SCALE.

There is no person insensible of the resemblance which subsists between any sound and its octave, whether above or below. These two sounds, when heard together, almost entirely coalesce in the organ of sensation. We may besides be convinced (by two facts which are extremely simple) of the facility with which one of these sounds may be taken for the other. Let it be supposed that any person has an inclination to sing a tune, and having at first begun this air upon a pitch too high or too low for his voice, so that he is obliged, lest he should strain himself too much, to sing the tune in question on a key higher or lower than the first; without being initiated in the art of music, he will naturally take his new key in the octave below or the octave above the first; and

that in order to take this key in any other interval except the octave, he will find it necessary to exert a sensible degree of attention. This is a fact of which we may easily be persuaded by experience. Let any person sing a tune in our presence, and let it be sung in a tone too high or too low for our voice; if we wish to join in singing this air, we naturally take the octave below or above, and frequently in taking this octave, we imagine it to be the unison. From this agreement between each note and its octave, it follows, that the seven notes above-mentioned are all that can, with propriety, be admitted in music, for after these seven are passed over we arrive at the octave above or below, and thence ascend or descend to the next octave, which is no more than passing through the same notes, on account of the coincidence of each note with its octave.

These seven notes are designated by the letters A, B, C, D, E, F, G, in each octave; also by the syllables *la, si, ut, re, mi, fa, sol*; for the origin of these, see ARÉTIN. Of these seven notes, five exceed each other by nearly equal degrees or intervals, and are called tones, the other two are called semitones, their intervals being only about half as much. Hence the octave is composed of five tones and two semitones, that is, in all twelve semitones.

This division of the octave is most natural, and because it contains three major-tones, two minor-tones, and two semitones, is called the Diatonic Scale of Music, but more vulgarly the Gamut, from the name of the lowest note therein.

Musicians, in writing music, use various characters to express notes of different length of time, as breve, semibreve, &c. any one of which contains two of the next below, in common time; but in what is called triple time, a semibreve contains $1\frac{1}{2}$ minims, 3 crotchets, 6 quavers, &c. See fig. 6.

The gamut contains three parts called clefs, the base, the tenor, and the treble clef, as represented in fig. 3; each part singly contains five lines, on which, and in the spaces between them, are wrote the characters of the notes. The marks on the clefs, and names of each part you there see expressed. Part of the tenor is common to the base below, and the treble above, and is moveable, the part common to the base being sometimes increased and sometimes diminished, while that part common to the treble is either diminished or increased. This is further exemplified in fig. 4, which shews the extent of five octaves, and the manner in which the ledger-lines are used to such notes as do not come within the compass of the stave. The five uppermost are distinguished by this character G , which was formerly meant for a written G , and is supposed to stand on the second line of the five included in the treble stave, *i.e.* the eighth of the whole stave, reckoning, as is the invariable rule in music, from the bottom upwards. This figure is called the G clef, and purports that the music standing on the stave appertains to the treble class of voices, or of instruments. Sometimes the G clef is placed on the first line. The order, and the names of the notes appertaining thereto, are severally shewn, commencing with that G which stands under these ledger-lines, and rising to D in alt. The five lowest lines in the stave appertain to the bass clef, which is distinguished by an inverted C standing on the fourth line, sometimes on the third, on each side of which is a large dot, close to the back of the C . The presence of this sign denotes that the music appertains to that class of voices, or of instruments, whose deep tones rank them among the bass, or lowest species. The ledger-lines appropriate to the basses, all stand below the first line of their stave, in contradistinction to the treble ledgers, which stand above. The sixth or middle line, which, for the sake of distinction, is made much thicker than the other ten, is called the C , or tenor-line. Its characteristic sign is made by three perpendicular lines, extending to a depth corresponding with the thickness of the whole stave, *i.e.* of five lines, and sometimes terminated by a K ; the two middle perpendiculars are joined by two short, thick, horizontal lines, equidistant from their centres. This sign is called the C , or tenor-clef; it is moveable, but on whatever line its centre stands, the notes upon that line all become C , and the whole nomenclature of the notes on the stave changes in conformity thereto. The tenor-clef governs the stave it is on, and occasions those who sing or perform its music to be called tenors; but of different degrees, according as the stave is found. This requires particular description: the tenor clef may remain on the C line, and taking two lines from

the bass, and two from the treble, complete its stave: in such case it is called the alto, and is always prefixed to every line of the music intended to be played on the tenor-violin, or alto, or quinte, as it is variously designated. It also applies to such voices as answer to that particular pitch. But as the greatest variety of voices lie between the treble and the bass parts, it was found necessary to move the tenor-clef higher or lower, for the purpose of accommodating to those many and various compasses which were found to be the greatest supports to the harmony; they connecting the extremes, *i.e.* of treble and bass, and sustaining the great body of the chorus, &c. To effect this, instead of confining the tenor-stave to the C line, added to the two adjoining upper lines of the bass, and to the two lower of the treble, liberty was given to take, at pleasure, one, two, three, or even four lines from the treble, adding them above the C line: thus requiring only one, two, or three lines to be taken from the bass-stave to complete the tenor-stave to five lines. Hence we see, that instead of taking two lines from the bass, and two from the treble, as is done at A, (fig. 4,) to form the complement of its stave; at B it takes only one from the treble, and adds three from the bass to form a stave, which sinks the whole of the music a fifth, *i.e.* five notes. Again, at C, it borrows none from the bass, but takes four lines from the treble; this is called the soprano-tenor-clef, which depresses the music one-third, that is, three notes. We shall here add an example of an octave in the bass-clef of a spinet, which will be illustrative of what has been advanced respecting the division of strings, diatonic-scale, &c. The scale is divided into an hundred equal parts: opposite to which are placed the strings which sound the twelve notes or semitones of the octave; at the lower end, are the keys of the seven natural notes marked with the letters C, D, E, F, G, A, B, C, between which are the other keys of the semitones. The key-note is C, with respect to which the strings of the other keys are proportioned in length as they are 2d, 3d, 4th, &c. to it. On each string are numbers, shewing how many equal parts of the scale it contains; and others which shew the ratio of its length to that of the key or scale. From the ends of the strings go dotted lines to the notes of a tune wrote in the gamut, in their proper lines and spaces. On the left of the scale of equal parts is the diatonic-scale, which is destined to shew both in the flat and sharp keys, the intervals of the tones and semitones, and their order in each.

To descend or rise diatonically, is to descend or rise from one sound to another by the interval of a tone or of a semitone. An interval of a semitone is called a second minor, and that of a tone a second major. An interval composed of a tone and a semitone, is called a third minor. An interval composed of two full tones, a third major. An interval composed of two tones and a semitone, is called a fourth. An interval consisting of three full tones, a triton or fourth redundant. An interval consisting of three tones and a semitone, is called a fifth. An interval composed of three tones and two semitones, is called a sixth minor. An interval composed of four tones and a semitone, is called a sixth major. An interval consisting of four tones and two semitones, is called a seventh minor. An interval composed of five tones and a semitone, is called a seventh major. And an interval consisting of five tones and two semitones, is called an octave. A great number of the intervals now mentioned, are still signified by other names, but those now given are the most common. If, after having sung the scale C, D, E, F, G, A, B, C; or (expressing the notes by the syllables which Guido Arétin first introduced) *ut, re, mi, fa, sol, la, si, UT*, one would carry this scale still farther in ascent, it would be discovered without difficulty that a new scale would be formed, *UT, RE, MI, FA*, &c. entirely similar to the former, and of which the sounds will be an octave ascending, each to its corresponding note in the former scale: thus RE, the second note of the second scale, will be an octave in ascent to the *re* of the first scale; in the same manner MI shall be an octave to *mi*, &c. and so of the rest. See fig. 7, Plate CXXII. As there are nine notes from the first *ut* to the second RE, the interval between these two sounds is called a ninth, and this ninth is composed of six full tones and two semitones. For the same reason the interval from *ut* to FA is called an eleventh, and the interval between *ut* and SOL, a twelfth, &c. It is plain that the ninth is the octave of the second, the eleventh of the fourth, and the twelfth of the fifth, &c. The octave above the octave of any sound is called

ed a double octave; the octave of the double octave is called a triple octave, and so of the rest. The double octave is likewise called a fifteenth; and for the same reason the double octave of the third is called a seventeenth, the double octave of the fifth a nineteenth, &c. It is plain that one may imagine the five tones which enter into the scale, as divided each into two semitones; thus one may advance from *ut* to *re*, forming in his progress an intermediate sound, which shall be higher by a semitone than *ut*, and lower in the same degree than *re*. A sound in the scale is called sharp, when it is raised by a semitone above the natural pitch; and it is marked with this character ♯. A sound in the scale depressed by a semitone is called flat, and is marked thus, ♭. The particular manner of constituting the octave; or, the melodious constitution of the octave, as it consists of seven essential sounds, besides the key or fundamental, is called a mode. The proper difference between a mode and a key is this, that an octave, with all its natural and concinnous degrees, is called a mode, with respect to the constitution or manner of dividing it; and, with respect to its place in the scale, it is called a key. Now it may be farther observed, that, of the natural notes of every mode, three go under the name of the essential notes, namely, the fundamental, the third and fifth; their octaves being reckoned the same, and marked with the same letters or syllables in the scale; the rest are called dependents.

THE ORIGIN OF THE MODES MAJOR AND MINOR; OF THE MOST NATURAL MODULATION, AND THE MOST PERFECT HARMONY.

By experiment it will be found, that when a sonorous body is struck till it gives a sound, the ear, besides the principal sound and its octave, perceives two other sounds very high, of which one is the twelfth above the principal sound, that is to say, the octave to the fifth of that sound; and the other is the seventeenth major above the same sound, that is to say, the double octave of its third major. This experiment is peculiarly sensible upon the thick strings of the violoncello, of which the sound being extremely low, gives to an ear, though not very much practised, an opportunity of distinguishing with sufficient ease and clearness the 12th and 17th now in question. The principal sound is called the generator, and the two other sounds which it produces, and with which it is accompanied, are, inclusive of its octave, called its harmonies. To render our ideas still more precise and permanent, we shall call the tone produced by the sonorous body *ut*: it is evident, by the above, that this sound is always attended by its 12th and 17th major; that is to say, with the octave of *sol*, and the double octave of *mi*. This octave of *sol* then, and this double octave of *mi*, produces the most perfect chord which can be joined with *ut*, since that chord is the work and choice of nature. For the same reason, the modulation formed by *ut* with the octave of *sol* and the double octave of *mi*, sung one after another, would likewise be the most simple and natural of all modulations which do not descend or ascend directly in the diatonic order, if our voices had sufficient compass to form intervals so great without difficulty: but the ease and freedom with which we can substitute its octave to any sound, when it is more convenient for the voice, afford us the means of representing this modulation. On this account, after having sung the tone *ut*, we naturally modulate the third *mi*, and the fifth *sol*, instead of the double octave of *mi*, and the octave of *sol*; whence we form, by joining the octave of the sound *ut*, this modulation, *ut, mi, sol, ut*, which in effect is the simplest and easiest of them all; and which likewise has its origin even in the protracted and compounded tones produced by a sonorous body. The modulation *ut, mi, sol, ut*, in which the chord *ut, mi*, is a third major, constitutes that kind of harmony or melody which we call the mode major; from whence it follows, that this mode results from the immediate operation of nature. See INTERVAL, and MODE. In the new modulation *ut, mi, sol*, of which we have now been treating, the sounds *mi* and *sol* are so proportioned one to the other, that the principal sound *ut* causes both of them to resound; but the second tone *mi* does not cause *sol*, to resound, which only forms the interval of a third minor. Let us then imagine, that, instead of this sound *mi*, one should substitute between the sounds *ut* and *sol* another note which (as well as the sound *ut*) has the power of causing *sol* to resound, and which is, however, different from the sound *ut*; the sound which we explore ought

to be such, by that it may have for its 17th major *sol*, or one of the octaves of the *sol*; of consequence the sound which we seek ought to be a 17th major below *sol*, or, what is the same thing, a 3d major below the same *sol*. Now the sound *mi* being a third minor beneath *sol*, and the third major being greater by a semitone than the third minor, it follows, that the sound of which we are in search shall be a semitone beneath the natural *mi*, and of consequence *mi* ♭. This new arrangement *ut, mi ♭, sol*, in which the sounds *ut* and *mi ♭* have both the power of causing *sol* to resound, though *ut* does not cause *mi ♭* to resound, is not indeed equally perfect with the first arrangement *ut, mi, sol*; because in this the two sounds *mi* and *sol* are both the one and the other generated by the principal sound *ut*; whereas, in the other, the sound *mi ♭* is not generated by the sound *ut*; but this arrangement *ut, mi ♭, sol*, is likewise dictated by nature, though less immediately than the former; and accordingly experience evinces that the ear accommodates itself almost as well to the latter as to the former. In this modulation or chord *ut, mi ♭, sol, ut*, it is evident that the third from *ut* to *mi ♭*, is minor; and such is the origin of that mode which we call minor. See INTERVAL, and MODE. The most perfect chords then are, 1. All chords related one to another, as *ut, mi, sol, ut*, consisting of any sound of its third major, of its fifth, and of its octave. 2. All chords related one to another, as *ut, mi ♭, sol, ut*, consisting of any sound, of its third minor, of its fifth, and of its octave. In effect, these two kinds of chords are exhibited by nature; but the first more immediately than the second. The first are called perfect chords major, the second perfect chords minor.

OF THE SERIES WHICH THE FIFTH REQUIRES, AND OF THE LAWS WHICH IT OBSERVES.

Since the sound *ut* causes the sound *sol* to be heard, and is itself heard in the sound *fa*, which sounds *sol* and *fa*, are its two-twelfths, we may imagine a modulation composed of that sound *ut* and its two-twelfths, or, which is the same thing, of its two-fifths *fa* and *sol*, the one below, the other above; which gives the modulation or series of fifths *fa, ut, sol*, which I call the fundamental bass of *ut* by fifths. Thus from the sound *ut*, one might make a transition indifferently to the sound *sol*, or to the sound *fa*. One may, for the same reason, continue this kind of fifths in ascending, and in descending, from *ut*, in this manner: *mi ♭, si ♭, fa, ut, sol, re, la*, &c. And from this series of fifths one may pass to any sound which immediately precedes or follows it. But it is not allowed in the same manner to pass from one sound to another which is not immediately contiguous to it; for instance, from *ut* to *re*, or from *re* to *ut*: for this very simple reason, that the sound *re* is not contained in the sound *ut*, nor the sound *ut* in that of *re*; and thus these sounds have not any alliance one with the other, which may authorise the transition from one to the other. And as these sounds *ut* and *re*, by the experiment of a sonorous body already noticed, naturally bring along with them the perfect chords consisting of greater intervals *ut, mi, sol, ut, re, fa* ♯, *la, re*; hence may be deduced this rule, That two perfect chords, especially if they are major, cannot succeed one another diatonically in a fundamental bass; we mean, that in a fundamental bass two sounds cannot be diatonically placed in succession, each of which, with its harmonics, forms a perfect chord, especially if this perfect chord be major in both.

OF MODES IN GENERAL.

A mode, in music, is the order of sounds prescribed, as well in harmony as melody, by the series of fifths. Thus the three sounds *fa, ut, sol*, and the harmonies of each of these three sounds, that is to say, their thirds major and their fifths, compose all the major modes which are proper to *ut*. The series of fifths then, or the fundamental bass *fa, ut, sol*, of which *ut* holds the middle space, may be regarded as representing the mode of *ut*. One may likewise take the series of fifths, or fundamental bass, *ut, sol, re*, as representing the mode of *sol*; in the same manner *si ♭, fa, ut*, will represent the mode of *fa*. By this we see, that the mode of *sol*, or rather the fundamental bass of that mode, has two sounds in common with the fundamental bass of the mode of *ut*. It is the same with the fundamental bass of the mode *fa*. The mode of *ut* (*fa, ut, sol*), is called the principal mode with respect to the modes of these two fifths, which are called its two adjuncts. See ADJUNCTS.

ADJUNCTS. It is then, in some measure, indifferent to the ear whether a transition be made to the one or to the other of these adjuncts, since each of them has equally two sounds in common with the principal mode. Yet the mode of *sol* seems a little more eligible: for *sol* is heard amongst the harmonics of *ut*, and of consequence is implied and signified by *ut*; whereas *ut* does not cause *fa* to be heard, though *ut* is included in the same sound *fa*. Hence the ear, affected by the mode of *ut*, is a little more prepossessed for the mode of *sol* than for that of *fa*. Nothing, likewise, is more frequent, nor more natural, than to pass from the mode of *ut* to that of *sol*. For this reason, as well as to distinguish the two fifths one from the other, we call *sol* the fifth above the generator the DOMINANT sound, and the fifth *fa* beneath the generator the SUBDOMINANT. (See these articles.) As we have seen in the preceding chapter, that, in the series of fifths, we may indifferently pass from one sound to that which is contiguous: in the same manner, and for the same reason, one may pass from the mode of *sol* to the mode of *re*, after having made a transition from the mode of *ut* to the mode of *sol*, as from the mode of *fa* to the mode of *si* $\flat$. But it is necessary to observe, that the ear which has been immediately affected with the principal mode feels always a strong propensity to return to it. Thus the further the mode to which we make a transition is removed from the principal mode, the less time we ought to dwell upon it; or rather, to speak in the terms of the art, the less ought the phrase of that mode to be protracted.

OF THE FORMATION OF THE DIATONIC SCALE AS USED BY THE GREEKS AND MODERNS.

From this rule, that two sounds which are contiguous may be placed in immediate succession in the series of fifths, *fa, ut, sol*, it follows, that one may form this modulation, or this fundamental bass, by fifths, *sol, ut, sol, ut, fa, ut, fa*. Each of the sounds which forms this modulation, brings necessarily along with itself its third major, its fifth, and its octave; (see fig. 8.) inasmuch that he who, for instance, sings the note *sol*, may be reckoned to sing at the same time the notes *sol, si, re, sol*: in the same manner the sound *ut* in the fundamental bass brings along with it this modulation, *ut, mi, sol, ut*; and, in short, the same sound *fa* brings along with it *fa, la, ut, fa*. This modulation then, or this fundamental bass, *sol, ut, sol, ut, fa, ut, fa*, gives the following diatonic series, *si, ut, re, mi, fa, sol, la*; which is precisely the diatonic scale of the Greeks. (See fig. 8.) We are ignorant upon what principles they had formed this scale; but it may be sensibly perceived, that that series arises from the bass *sol, ut, sol, ut, fa, ut, fa*; and that of consequence this bass is justly called fundamental, as being the real primitive modulation, that which conducts the ear, and which it feels to be implied in the diatonic modulation, *si, ut, re, mi, fa, sol, la*. This scale of the Greeks is formed, by means of a fundamental bass composed of three sounds only, *fa, ut, sol*: but to form the scale *ut, re, mi, fa, sol, la, si, UT*, which we use at present, we must necessarily add to the fundamental bass the note *re*, and form, with these four sounds *fa, ut, sol, re*, the following fundamental bass: *ut, sol, ut, fa, ut, sol, re, sol, ut*; from whence we deduce the modulation or scale, *ut, re, mi, fa, sol, la, si, UT*. In effect, *ut* in the scale belongs to the harmony of *ut* which corresponds with it in the bass; *re*, which is the second note in the gamut, is included in the harmony of *sol*, the second note of the bass; *mi*, the third note of the gamut, is a natural harmonic of *ut*, which is the third sound in the bass, &c. Thence it follows, that the diatonic scale of the Greeks is, at least in some respects, more simple than ours; since the scale of the Greeks may be formed alone from the mode proper to *ut*; whereas ours is originally and primitively formed, not only from the mode of *ut* (*fa, ut, sol*), but likewise from the mode of *sol*, (*ut, sol, re*.) It likewise appears, that this last scale consists of two parts; of which the one, *ut, re, mi, fa, sol*, is in the mode of *ut*; and the other, *sol, la, si, ut*, in that of *sol*. For this reason the note *sol* is found to be twice repeated in immediate succession in this scale; once as the fifth of *ut*, which corresponds with it in the fundamental bass; and again, as the octave of *sol*, which immediately follows *ut* in the same bass. As to what remains, these two consecutive *sols* are otherwise in perfect unison. For this reason we are satisfied with singing only one of them when one modulates the scale *ut, re, mi, fa, sol, la, si, UT*: but this does not prevent us from employing a pause or

repose, expressed or understood, after the sound *fa*. There is no person who does not perceive this whilst he himself sings the scale.

The scale of the moderns then, may be considered as consisting of two tetrachords, disjunctive indeed, but perfectly similar one to the other, *ut, re, mi, fa*, and *sol, la, si, ut*, one in the mode of *ut*, the other in that of *sol*. For what remains, we shall see in the sequel by what artifice one may cause the scale *ut, re, mi, fa, sol, la, si, UT*, to be regarded as belonging to the mode of *ut* alone. The introduction of the mode proper to *sol* in the fundamental bass has this happy effect, that the notes *fa, sol, la, si*, may immediately succeed each other in ascending the scale, which cannot take place in the diatonic series of the Greeks, because that series is formed from the mode of *ut* alone. From whence it follows: 1. That we change the mode at every time when we modulate three notes in succession. 2. That if these three notes are sung in succession in the scale *ut, re, mi, fa, sol, la, si, UT*, this cannot be done but by the assistance of a pause expressed or understood after the note *fa*; inasmuch, that the three tones *fa, sol, la, si*, (three only because the note *sol* which is repeated is not enumerated) are supposed to belong to two different tetrachords. It ought not then to surprise us, that we feel some difficulty whilst we ascend the scale in singing three tones in succession, because this is impracticable without changing the mode; and if one pauses in the same mode, the fourth sound above the first note will never be higher than a semitone above that which immediately precedes it; as may be seen by *ut, re, mi, fa*, and by *sol, la, si, ut*, where there is no more than a semitone between *mi* and *fa*, and between *si* and *ut*.

OF REPOSES, OR CADENCES.

In a fundamental bass whose procedure is by fifths, there always is, or always may be, a repose, or crisis, in which the mind acquiesces in its transition from one sound to another: but a repose may be more or less distinctly signified, and of consequence more or less perfect. If one should rise by fifths: if, for instance, we pass from *ut* to *sol*; it is the generator which passes to one of these fifths, and this fifth was already pre-existent in its generator: but the generator exists no longer in this fifth; and the ear, as this generator is the principle of all harmony, and of all melody, feels a desire to it. Thus the transition from a sound to its fifth in ascent, is termed an imperfect repose, or imperfect cadence; but the transition from any sound to its fifth in descent, is denominated a perfect cadence, or an absolute repose: it is the offspring which returns to its generator, and, as it were, recovers its existence once more in that generator itself, with which when sounding it resounds. Amongst absolute reposes, there are some more absolute, that is to say, more perfect, than others. Thus in the fundamental bass *ut, sol, ut, fa, ut, sol, re, sol, ut*, which forms the diatonic scale of the moderns, there is an absolute repose from *re* to *sol*, as from *sol* to *ut*: yet this last absolute repose is more perfect than the preceding, because the ear, prepossessed with the mode of *ut* by the multiplied impression of the sound *ut* which it has already heard thrice before, feels a desire to return to the generator *ut*; and it accordingly does so by the absolute repose *sol, ut*. What is commonly called cadence in melody, ought not to be confounded with what we name cadence in harmony. In the first case, this word only signifies an agreeable and rapid alteration between two contiguous sounds, called likewise trill or shake; in the second, it signifies a repose or close. It is, however, true, that this shake implies, or at least frequently enough presages, a repose, either present or impending, in the fundamental bass. (See TRILL.) Since there is a repose in passing from one sound to another in the fundamental bass, there is also a repose in passing from one note to another in the diatonic scale, which is formed from it, and which this bass represents: and as the absolute repose *sol, ut*, is of all others the most perfect in the fundamental bass, the repose from *si* to *ut*, which answers to it in the scale, and which is likewise terminated by the generator, is for that reason the most perfect of all others in the diatonic scale ascending. It is then a law dictated by nature itself, that if you would ascend diatonically to the generator of a mode, you can only do this by means of the third major from the fifth of that very generator. This third major, which, with the generator, forms a semitone, has for that reason been called the sensible note, as introducing the generator, and preparing us for the most perfect repose. As the fundamental

bass is the principle of melody, so the effect of a repose in melody arises solely from the fundamental bass.

OF THE DIFFERENT NAMES GIVEN TO THE SAME INTERVAL.

There are particular intervals which have obtained different names, according to particular circumstances; which it is proper to explain. An interval composed of a tone and a semitone, which is commonly called a third minor, is likewise sometimes called a second redundant; such is the interval from *ut* to *re* ♯ in ascending, or that of *la* to *sol* ♭ descending. This interval is so termed, because one of the sounds which form it is always either sharp or flat, and that if you deduce that sharp or that flat, the interval will be that of a second. An interval composed of two tones and two semitones, as that from *si* to *fa*, is called a false fifth. This interval is the same with the triton, or fourth redundant, since two tones and two semitones are equivalent to three tones. There are, however, some reasons for distinguishing them, as will appear below. As the interval from *ut* to *re* ♯ in ascending has been called a second redundant, they likewise call the interval from *ut* to *sol* ♯ in ascending a fifth redundant, or from *si* to *mi* ♭ in descending, each of which intervals are composed of four tones. This interval is in the main, the same with that of the sixth minor: but in the fifth redundant there is always a sharp or a flat; inasmuch, that if this sharp or flat were deduced, the interval would become a true fifth. For the same reason, an interval composed of three tones and three semitones, as from *sol* ♯ to *fa* in ascending, is called a seventh diminished; because, if you deduce the sharp from *sol*, the interval from *sol* to *fa* will become that of an ordinary seventh: the interval of a seventh diminished is in other respects the same with that of the sixth major. The major seventh is likewise sometimes called a seventh redundant.

COMPARISON OF THE DIFFERENT INTERVALS.

If we sing *ut si* in descending by a second, and afterwards *ut si* in ascending by a seventh, these two *si*'s shall be octaves one to the other; or, as we commonly express it, they will be replications one of the other. On account then of the resemblance between every sound and its octave, it follows, that to rise by a seventh, or descend by a second, amount to one and the same thing. In like manner, it is evident that the sixth is nothing but a replication of the third, nor the fourth, but a replication of the fifth. The following expressions either are, or ought to be, regarded as synonymous:

To rise	To descend
by a second.	by a seventh.
To descend	To rise
To rise	To descend
by a third.	by a sixth.
To descend	To rise
To rise	To descend
by a fourth	by a fifth.
To descend	To rise

Thus, therefore, we shall employ them indifferently the one for the other: so that when we say, for instance, to rise by a third, it may be said with equal propriety to descend by a sixth, &c.

OF THE DIFFERENT CLEFS; OF THE QUANTITY; OF THE RHYTHMUS; AND OF SYNCOPATION.

Of the three clefs, viz. the base, tenor, and treble, the base clef, called also the C clef, or clef of *fa*, is placed on the fourth line, or on the third; and the line upon which this clef is placed gives the name of *fa* or *F*, to all the notes which are upon that line. See Plate CXXXIII. No. 1. The C, or tenor clef, or clef of *ut*, is placed upon the fourth, the third, the second, or the first line; (See No. II.) and in these different positions all the notes upon that line where the clef is placed, take the name of *ut*, or *C*. Lastly, the G, or treble clef, or clef of *sol*, is placed upon the second or first line; and all the notes upon that line where the clef is placed take the name of *sol*, or *G*, No. III. As the notes are placed on the lines, and in the spaces between the lines, any one, when he sees the clef, may easily find the name of any note whatever. (See No. I.) Thus he may see, that, in the first clef of

fa, the note which is placed on the lowest line ought to be *sol*; that the note which occupies the space between the two first lines should be *la*; and that the note which is on the second line is a *si*, &c. A note before which there is a sharp (marked thus ♯) ought to be raised by a semitone; and if, on the contrary, there is a ♭ before it, it ought to be depressed by a semitone, (♭ being the mark of a flat). The natural (marked thus ♮) restores to its natural value a note which had been raised or depressed by a semitone. When you place at the clef a sharp or a flat, all the notes upon the line on which this sharp or flat is marked are sharp or flat. See No. IV. Thus let us take, for instance, the clef of *ut* upon the first line, and let us place a sharp in the space between the second and third line, which is the place of *fa*; all the notes which shall be marked in that space will be *fa* ♯; and if you would restore them to their original value of *fa* natural, you must place a ♮ or a ♭ before them. See No. V. In the same manner, if a flat be marked at the clef, and if you would restore the note to its natural state, you must place a ♮ or a sharp before it. See No. VIII. Every piece of music is divided into different equal times, which they call measures or bars; and each bar is likewise divided into different times. There are properly two kinds of measures or modes of time (see No. VI.) the measure of two times, or of common time, which is marked by the figure 2 placed at the beginning of the tune; and the measure of three times, or of triple time, which is marked by the figure 3 placed in the same manner. (See No. VII.) The different bars are distinguished by perpendicular lines. In a bar we distinguish between the perfect and imperfect time; the perfect time is that which we beat, the imperfect that in which we lift up the hand or foot. A bar consisting of four times ought to be regarded as compounded of two bars, each consisting of two times: thus there are in this bar two perfect and two imperfect times. In general, by the words perfect and imperfect, even the parts of the same time are distinguished: thus the first note of each time is reckoned as belonging to the perfect part, and the others as belonging to the imperfect. (See No. IX.) The longest of all notes is a semibreve. A minim is half its value; that is to say, in singing, we only employ the same duration in performing two minims which was occupied in one semibreve. A minim in the same manner is equivalent to two crotchets, the crotchet to two quavers, &c. See Plate CXXII, fig. 6. A note which is divided into two parts by a time, that is to say, which begins at the end of a time, and terminates in the time following, is called a syncopated note. (See No. X. where the notes *ut*, *si*, *la*, are each of them syncopated. (See also SYNCOPATION.) A note followed by a point or dot is increased half its duration. The *si*, for instance, in the fifth bar of the example IX, followed by a point, has the duration of a minim, and of a crotchet at the same time.

DEFINITION OF THE PRINCIPAL CHORDS.

The chord composed of a third, a fifth, and an octave, as *ut mi sol ut*, is called a perfect chord, if the third be major, as in *ut mi sol ut*, the perfect chord is denominated major: if the third minor, as in *la ut mi la*, the perfect chord is minor. The perfect chord major constitutes what we call the major mode; and the perfect chord minor, what we term the minor mode, as before noticed. A chord composed of a third, a fifth, and a seventh, as *sol si re fa*, or *re fa la ut*, &c. is called a chord of the seventh. It is obvious that such a chord is wholly composed of thirds in ascending. All chords of the seventh are practised in harmony, save that which might carry the third minor and the seventh major, as *ut mi ♭ sol si*; and that which might carry a false fifth and a seventh major, as *si re fa la ♯*. As thirds are either major or minor, and as they may be differently arranged, it is clear that there are different kinds of chords of the seventh: there is even one, *si, re, fa, la*, which is composed of a third, a false fifth, and a seventh. A chord composed of a third, a fifth, and a sixth, as *fa, la, ut, re, re, fa, la, si*, is called a chord of the greater sixth. Every note which carries a perfect chord is called a tonic, and a perfect chord is marked by an 8, by a 3, or by a 5, which is written above the note; but frequently these numbers are suppressed. Thus in the example XI, the two *uts* equally carry a perfect chord. Every note which carries a chord of the seventh is called a dominant; and this chord is marked by a 7 written above the note. Thus in the example XII. *re* carries the chord *re fa la ut*, and *sol* the chord

chord *sol si re fa*. Among the chords of the seventh we do not reckon the chord of the seventh diminished, which is only improperly called a chord of the seventh. Every note which carries the chord of the great sixth, is called a subdominant, and is marked with a 6. Thus in the example XIII. *fa* carries the chord of *fa la ut re*. You ought to remark that the sixth should always be major. In every chord, whether perfect, or a chord of the seventh, or of the great sixth, the note which carries this chord, and which is the flattest or lowest, is called the fundamental note. Thus *ut* in the example XI. *re* and *sol* in the example XII. and *fa* in the example XIII. are fundamental notes. See FUNDAMENTAL. In every chord of the seventh, and of the great sixth, the note which forms the seventh or sixth above the fundamental, that is to say, the highest note of the chord, is called a dissonance. Thus in the chords of the seventh *sol si re fa*, *re fa la ut*, *fa* and *ut* are the dissonances, viz. *fa* with relation to *sol* in the first chord, and *ut* with relation to *re* in the second. In the chord of the great sixth *fa la ut re*, *re* is the dissonance, but that *re* is only, properly speaking, a dissonance with relation to *ut* from which it is a second, and not with respect to *fa* from which it is a sixth major. When a chord of the seventh is composed of a third major followed by two thirds minor, the fundamental note of this chord is called the tonic dominant. In every other chord of the seventh the fundamental is called the simple dominant. Thus in the chord *sol si re fa*, the fundamental *sol* is the tonic dominant; but in the other chords of the seventh, as *ut mi sol si*, *re fa la ut*, &c. the fundamentals *ut* and *re* are simple dominants. In every chord, whether perfect, or of the seventh, or of the sixth, if you have a mind that the third above the fundamental note should be major, though it is naturally minor, you must place a sharp above the fundamental note. For example, if I would mark the perfect major chord *re fa $\sharp$ la re*, as the third *fa* above *re* is naturally minor, I place above *re* a sharp, as you may see in example XIV. In the same manner the chord of the seventh *re fa $\sharp$ la ut*, and the chord of the great sixth *re fa $\sharp$ la si*, is marked with a $\sharp$ above *re*, and above the $\sharp$ a 7 or a 6 (see XV. and XVI.) On the contrary, when the third is naturally major, and if you incline to render it minor, you must place above the fundamental note a b. Thus the examples XVII. XVIII. XIX. shew the chords *sol si $\flat$ re sol*, *sol si $\flat$ re fa*, *sol si $\flat$ re mi*. See Plate CXXIII.

OF THE FUNDAMENTAL BASS.

Invent a modulation at your pleasure; and under this modulation let there be set a bass composed of different notes, of which some may carry a perfect chord, others that of the seventh, and others that of the great sixth, in such a manner that each note of the modulation which answers to each of the bass, may be one of those which enters into the chord of that note in the bass; this bass being composed according to the following rules, will be the fundamental bass of the modulation proposed. See FUNDAMENTAL. Thus (Exam. XX.) you will find that this modulation, *ut re mi fa sol la si ut*, has, or may, admit for its fundamental

bass, *ut⁷ sol⁶ ut⁷ fa⁷ ut⁷ re⁷ sol⁷ ut*. In reality, the first note *ut* in the upper part is found in the chord of the first note *ut* in the bass, which chord is *ut mi sol ut*; the second note *re* in the treble is found in the chord *sol si re fa*, which is the chord of the second note in the bass, &c. and the bass is composed only of notes which carry a perfect chord, or that of the seventh, or that of the great sixth. Moreover, it is formed according to the rules which we are now about to give.

RULES FOR THE FUNDAMENTAL BASS.

All the notes of the fundamental bass being only capable of carrying a perfect chord, or the chord of the seventh, or that of the great sixth, are either tonics, or dominants, or subdominants; and the dominants may be either simple or tonic. The fundamental bass ought always to begin with a tonic, as much as it is practicable. And now follow the rules for all the succeeding chords.

Rule 1. In every chord of the tonic, or of the tonic dominant, it is necessary that at least one of the notes which form that chord should be found in the chord that precedes it.

Rule 2. In every chord of the simple dominant, it is necessary that the note which constitutes the seventh, or dissonance, should likewise be found in the preceding chord.

Rule 3. In every chord of the subdominant, at least one of its consonances must be found in the preceding chord. Thus, in the chord of the subdominant *fa la ut re*, it is necessary that *fa*, *la*, or *ut*, which are the consonances of the chord, should be found in the chord preceding. The dissonance *re* may either be found in it or not.

Rule 4. Every simple or tonic dominant ought to descend by a fifth. In the first case, that is to say, when the dominant is simple, the note which follows can only be a dominant; in the second it may be any one you choose; or, in other words, it may either be a tonic, a tonic dominant, or a simple dominant, or a subdominant. The conditions prescribed in the second rule should be observed, if it be a simple dominant. For let us assume the succession of the two chords *la ut mi sol*, *re fa la ut*, (see Exam. XXI.) this succession is by no means legitimate, though in it the first dominant descends by a fifth; because the *ut* which forms the dissonance in the second chord, and which belongs to a simple dominant, is not in the preceding chord. But the succession will be admissible, if, without meddling with the second chord, one should take away the sharp carried by the *ut* in the first; or if, without meddling with the first chord, one should render *ut* or *fa* sharp in the second; or in short, if one should simply render the *re* of the second chord a tonic dominant, in causing it to carry *fa $\sharp$* instead of *fa* natural. By the same rule, we ought to reject the succession of the two following chords,

re fa la ut, *sol si re fa $\sharp$* ;

(see Exam. XXII.)

Rule 5. Every subdominant ought to rise by a fifth; and the note which follows it may, at your pleasure, be either a tonic, a tonic dominant, or a subdominant.

OF THE RULES TO BE OBSERVED IN THE TREBLE, WITH RELATION TO THE FUNDAMENTAL BASS.

The treble is nothing else but a modulation above the fundamental bass, and whose notes are found in the chords of that bass which corresponds with it. Thus, in Exam. XX. the scale *ut re mi fa sol la si ut*, is a treble with respect to the fundamental bass *ut sol ut fa ut re sol ut*.

Remarks. 1. Many notes of the treble may answer to one and the same note in the fundamental bass, when these notes belong to the chord of the same note in the fundamental bass. For example, this modulation *ut mi sol mi ut*, may have for its fundamental bass the note *ut* alone, because the chord of that note comprehends the sounds *ut*, *mi*, *sol*, which are found in the treble. 2. A single note in the treble may, for the same reason, answer to several notes in the bass. For instance, *sol* alone may answer to these three notes in the bass, *ut sol ut*.

Rule 1. For the treble. If the note which forms the seventh in a chord of the simple dominant is found in the treble, the note which precedes it must be the very same. This is what we call a discord prepared. For instance, let us suppose that the note of the fundamental bass shall be *re*, bearing the chord of the simple dominant *re fa la ut*; and that this *ut*, which is the dissonance, should be found in the treble; it is necessary that the note which goes before it in the treble should likewise be an *ut*. And it is requisite to observe, that, according to the rules which we have given for the fundamental bass, *ut* will always be found in the chord of that note in the fundamental bass which precedes the simple dominant *re*. (See XXIII. XXIV. XXV.) In the first example the dissonance is *ut*, in the second *sol*, and in the third *mi*; and these notes are already in the preceding chord.

Rule 2. If a note of the fundamental bass be a tonic dominant, or simple dominant, and if the dissonance be found in the treble, this dissonance in the same treble ought to descend diatonically. But if the note of the bass be a subdominant, it ought to rise diatonically. This dissonance, which rises or descends diatonically, is what we call a dissonance saved or resolved. See XXVII. XXVIII. XXIX. Plate CXXIII. According to the rules for the fundamental bass which we have given, the note upon which the dissonances ought to descend or rise will always be found in the subsequent chord.

OF THE CONTINUED BASS, AND ITS RULES.

A continued or thorough bass, is nothing else but a fundamental bass whose chords are inverted. (See CONTINUED BASS.) We

invert

invert a chord when we change the order of the notes which compose it. For example, if instead of the chord, *sol si re fa*, I should say, *si re fa sol*, or *re fa sol si*, &c. the chord is inverted. Let us see then all the possible ways in which a chord may be inverted.

Ways in which a Perfect Chord may be inverted. The perfect chord *ut mi sol ut* may be inverted in two different ways: *mi sol ut mi*, which we call a chord of the sixth, composed of a third, a sixth, and an octave, and in this case the note *mi* is marked with a 6. (See XXXI.) 2. *Sol ut mi sol*, which we call a chord of the sixth and fourth, composed of a fourth, a sixth, and an octave, and it is marked with a 4. (See XXXII.) The perfect minor chord is inverted in the same manner.

Ways in which the chord of the seventh may be inverted. In the chord of the tonic dominant, as *sol si re fa*, the third major *si* above the fundamental note *sol*, is called a sensible note; and the inverted chord *si re fa sol*, composed of a third, a false fifth, and sixth, is called the chord of the false fifth, and is marked with an 8 or 5. (See XXXIII. and XXXIV.) The chord *re fa sol si*, composed of a third, a fourth, and a sixth, is called the chord of the sensible sixth, and marked with a 6 or a 6. In this chord thus figured, the third is minor, and the sixth major, as it is easy to be perceived. (See XXXV.) The chord *fa sol si re*, and composed of a second, a tritone, and a sixth, is called the chord of the tritone, and is marked thus 4+, thus $\times 4$, or thus $\times 4$. (See XXXVI.) In the chord of the simple dominant *re fa la ut*, we find, 1. *Fa la ut re*, a chord of the great sixth, which is composed of a third, a fifth, and a sixth, and which is figured with a 5. (See XXXVIII.) 2. *La ut re fa*, a chord of the less sixth, which is figured with a 6. (See XXXIX.) 3. *Ut re fa la*, a chord of the second, composed of a second, a fourth, and a sixth, and which is marked with 2. See XXXVII.

Ways in which the Chord of the Subdominant may be Inverted. The chord of the subdominant, as *fa la ut re*, may be inverted in three different manners; but the method of inverting it which is most in practice is the chord of the less sixth *la ut re fa*, which is marked with a 6, and the chord of the seventh *re fa la ut*. (See XXXIX.)

Rules for the continued Bass. The continued bass is a fundamental bass, whose chords are only inverted in order to render it more in the taste of singing, and suitable to the voice. See XL. in which the fundamental bass which in itself is monotonic and little suited for singing, *ut sol ut sol ut sol ut*, produces, by inverting its chords, this continued bass highly proper to be sung, *ut si ut re mi fa mi*, &c. The continued bass then is properly nothing else but a treble with respect to the fundamental bass.

Rule 1. Every note which carries the chord of the false fifth, and which of consequence must be what we have called a sensible note, ought (XL.) to rise diatonically upon the note which follows it. Thus in example XL. the note *si*, carrying the chord of the false fifth marked with an 8, rises diatonically upon *ut*.

Rule 2. Every note carrying the chord of the tritone should descend diatonically upon the subsequent note. Thus in the same example, XL. *fa*, which carries the chord of the tritone figured with a 4+ descends diatonically upon *mi*.

Rule 3. The chord of the second is commonly put in practice upon notes which are syncopated in descending, because these notes are dissonances which ought to be prepared and resolved. See the example XLI. where the second *ut*, which is syncopated, and which descends afterwards upon *si*, carries the chord of the second.

METHOD OF FINDING THE FUNDAMENTAL BASS, WHEN THE CONTINUED BASS IS FIGURED.

This may be done by the following rules: 1. Every note which has no figure in the continued bass, ought to be the same, and without a figure in the fundamental bass; it either is a tonic, or reckoned such. 2. Every note which in the continued bass carries a 6, ought in the fundamental bass to give its third below not figured, (see FIGURED,) or its fifth below marked with a 7. 3. Every note carrying 2 gives in the fundamental bass its fifth below not figured. (See XXXII.) 4. Every note figured with a 7 or a 7, is the same in both basses, and with the same figure. 5. Every note figured with a 2 gives in the fundamental bass the diatonic note above figured with a 7. (See XXXVII.) 6. Every note marked with a 4 gives in the fundamental bass the

diatonic note above, figured with a 7. (See XXXVI.) 7. Every note figured with an 8 gives its third below figured with a 7. (See XXXIII.) 8. Every note marked with a 6 gives the fifth below marked with a 7; (see XXXV.) and in the chord of the seventh, the third ought to be major, and the seventh minor, this chord of the seventh being the chord of the tonic dominant. 9. Every note marked with a 9 gives its third above figured with a 7. (See XLIII. and XLV.) 10. Every note marked with a 2 gives the fifth above figured with a 7. (See XLIV.) 11. Every note marked with a $\times 5$, or with a + 5, gives the third above figured with a 7. (See XLVII.) 12. Every note marked with a $\times 7$ gives a fifth above figured with a 7, or with a 7. (See XLII.) It is the same case with the notes marked 4, 5, or 2: which shews a retrenchment, either in the complete chord of the eleventh, or in that of the seventh redundant. 13. Every note marked with a 4 gives a fifth above figured with a 7, or a 7. (See XLVI.) 14. Every note marked with $\times 6$ gives the third minor below, figured with a 7. (See XLIX.) 15. Every note marked with a $\times 6$ gives the tritone above, figured with a 7. (See L.) 16. Every note marked with a + 2 gives the second redundant above, figured with a 7. (See LI.) 17. Every note marked with a $\times 2$ gives the second redundant above, figured with a 7. (See LI.) 18. Every note marked with a $\times 7$ gives the seventh redundant above, figured with a 7. (See LIII.)

WHAT IS MEANT BY BEING IN A MODE OR TONE.

In the first part of this treatise we have explained, how by the means of the note *ut*, and of its two-fifths *sol* and *fa*, one in ascending, which is called a tonic dominant, the other in descending, which is called a sub-dominant, the scale *ut re mi fa sol la si ut* may be found: the different sounds which form this scale compose what we call the major mode of *ut*, because the third *mi* above *ut* is major. If we would have a modulation in the major mode *ut*, no other sounds must enter into it than those which compose this scale; in such a manner that if, for instance, I should find *fa* in this modulation, thus *fa* discovers to me that I am not in the mode of *ut*, or at least that, if I have been in it, I am no longer so. In the same manner, if I form this scale in ascending *la si ut re mi fa sol la*, which is exactly similar to the scale *ut re mi fa sol la si ut* of the major mode of *ut*, this scale, in which the third from *la* to *ut* is major, shall be in the major mode of *la*; and if I incline to be in the minor mode of *la*, I have nothing to do but to substitute for *ut* sharp *ut* natural; so that the major third *la ut* may become minor *la ut*: I shall have then *la si ut re mi fa sol la*, which is the scale of the minor mode of *la* in ascending; and the scale of the minor mode of *la* in descending shall be *la sol fa mi ut re si la*, in which the *sol* and *fa* are no longer sharp. For it is a singularity peculiar to the minor mode, that its scale is not the same in rising as in descending. This is the reason why, when we wish to begin a piece in the major mode of *la*, we place three sharps at the clef upon *fa*, *ut*, and *sol*; and on the contrary, in the minor mode of *la*, we place none, because the minor mode of *la*, in descending, has neither sharps nor flats. As the scale contains twelve sounds, each distant from the other by the interval of a semitone, it is obvious that each of these sounds can produce both a major and a minor mode, which constitute 24 modes upon the whole. Of these we shall immediately give a table, which may be very useful to discover the mode in which we are.

A TABLE OF THE DIFFERENT MODES.

MAJOR MODES.

Maj. Mode.

of <i>ut</i>	<i>ut re mi fa sol la si ut.</i>
of <i>sol</i>	<i>sol la si ut re mi fa sol.</i>
of <i>re</i>	<i>re mi fa sol la si ut re.</i>
of <i>la</i>	<i>la si ut re mi fa sol la.</i>
of <i>mi</i>	<i>mi fa sol la si ut re mi.</i>
of <i>si</i>	<i>si ut re mi fa sol la si.</i>
of <i>fa</i>	<i>fa sol si ut re mi fa.</i>

of *ut*

of *ut* } *re b mi b fa sol b la b si b ut re b.*
 or *re b* }
 of *sol* } *la b si b ut re b mi b fa sol la b.*
 or *la b* }
 of *re* } *mi b fa sol la b si b ut re mi b.*
 or *mi b* }
 of *la* } *si b ut re mi b fa sol la si.*
 or *si b* }
 of *mi* } *fa sol la si b ut re mi fa.*
 or *fa b* }
 of *si* } *ut re mi fa sol la si ut.*
 or *ut b* }

MINOR MODES.

Of *la*.
 In descending. *la sol fa mi re ut si la.*
 In rising. *la si ut re mi fa sol la.*
 Of *mi*.
 In descending. *mi re ut si la sol fa mi.*
 In rising. *mi fa sol la si ut re mi.*
 Of *si*.
 In descending. *si la sol fa mi re ut si.*
 In rising. *si ut re mi fa sol la si.*
 Of *fa*.
 In descending. *fa mi re ut si la sol fa.*
 In rising. *fa sol la si ut re mi fa.*
 Of *ut*.
 In descending. *ut si la sol fa mi ut.*
 In rising. *ut re mi fa sol la si ut.*
 Of *sol* or *la b*.
 In descending. *sol fa mi ut si la sol.*
 In rising. *la b si b ut re mi b fa sol la b.*
 Of *re* or *mi b*.
 In descending. *mi b re b ut si b la b sol fa mi b.*
 In rising. *mi b fa sol la b si b ut re mi b.*
 Of *la* or *si b*.
 In descending. *si b la b sol fa mi re b ut si b.*
 In rising. *si b ut re mi b fa sol la si b.*
 Of *mi* or *fa b*.
 In descending. *fa mi b re b ut si b la b sol fa.*
 In rising. *fa sol la b si b ut re mi fa.*
 Of *ut*.
 In descending. *ut si b la b sol fa mi re ut.*
 In rising. *ut re mi b fa sol la si ut.*
 Of *sol*.
 In descending. *sol fa mi b re ut si b la sol.*
 In rising. *sol la si b ut re mi fa sol.*
 Of *re*.
 In descending. *re ut si b la sol fa mi re.*
 In rising. *re mi fa sol la si ut re.*

These then are all the modes, as well major as minor. Those which are crowded with sharps and flats are little practised, as being extremely difficult in execution. From thence it follows, 1. That when there are neither sharps nor flats at the cleff, it is a token that the piece begins in the major mode of *ut*, or in the minor mode of *la*. 2. That when there is one single sharp, it will always be placed upon *fa*, and that the piece begins in the major mode of *sol*, or the minor of *mi*, in such a manner that it may be sung as if there were no sharp, by singing *si* instead of *fa*, and in singing the tune as if it had been in another cleff. For instance, let there be a sharp upon *fa* in the cleff of *sol* upon the first line; one may then sing the tune as if there were no sharp: and instead of the cleff of *sol* upon the first line, let there be the cleff of *ut*; for the *fa* when changed into *si*, will require that the cleff of *sol* should be changed to the cleff of *ut*, as may be easily seen. This is what we call TRANSPOSITION. See that article. It is evident, that when *fa* is changed into *si*, *sol* must be changed into *ut*, and *mi* into *la*. Thus by transposition, the air has the same melody as if it were in the major mode of *ut*, or in the minor mode of *la*. The major mode then of *sol*, and the minor of *mi*, are by transposition reduced to those of *ut* major, and of *la* minor. It is the same case with all the other modes.

TO FIND THE FUNDAMENTAL BASS OF A GIVEN MODULATION.

It is of the greatest utility in searching for the fundamental bass, to know what is the tone or mode of the melody to which that bass should correspond. But it is difficult in this matter to assign general rules, and such as are absolutely without exception; because sometimes we seem to have the free choice of referring a particular melody either to one mode or another. For example, this melody *sol ut* may belong to all the modes, as well major as minor, in which *sol* and *ut* are found together; and each of these two sounds may even be considered as belonging to a different mode. Also one may sometimes proceed without the knowledge of the mode, for two reasons: 1. Because, since the same sounds belong to several different modes, the mode is sometimes considerably undetermined; above all, in the middle of a piece, and during the time of one or two bars. 2. Without giving ourselves much trouble about the mode, it is often sufficient to preserve us from deviating in composition, if we observe in the simplest manner the rules above prescribed for the procedure of the fundamental bass. In the mean time, it is above all things necessary to know in what mode we operate at the beginning of the piece, because it is indispensable that the fundamental bass should begin in the same mode, and that the treble and bass should likewise end in it; nay, that they should even terminate in its fundamental note, which in the mode of *ut* is *ut*, and *la* in that of *la*, &c. Besides, in those passages of the modulation where there is a cadence, it is generally necessary that the mode of the fundamental bass should be the same with that of the part to which it corresponds. To know upon what mode or in what key a piece commences, our enquiry may be entirely reduced to distinguish the major mode of *ut* from the minor of *la*. For, as above, all the modes may be reduced to these two, at least in the beginning of the piece. We shall now therefore give a detail of the different means by which these two modes may be distinguished. 1. From the principal and characteristic sounds of the mode, which are *ut mi sol* in the one, and *la ut mi* in the other; so that if a piece should, for instance, begin thus, *la ut mi la*, it may be almost constantly concluded, that the tone or mode is in *la* minor, although the notes *la ut mi* belong to the mode of *ut*. 2. From the sensible note, which is *si* in the one, and *sol* in the other; so that if *sol* appears in the first bars of a piece, one may be certain that he is in the mode of *la*. 3. From the adjuncts of the mode, i. e. the modes of its two-fifths, which for *ut* are *fa* and *sol*, and *re* and *mi* for *la*. For example, if having begun a melody by some of the notes which are common to the modes of *ut* and of *la* (as *mi re mi fa mi re ut si ut*), I should afterwards find the mode of *sol*, which I ascertain by the *fa*, or that of *fa* which I ascertain by the *si* or *ut b*, I may conclude that I have begun in the mode of *ut*; but if I find the mode of *re*, or that of *mi*, which I ascertain by *si b*, *ut*, or *re*, &c. I conclude from thence that I have begun in the mode of *la*. 4. A mode is not for ordinary deserted, especially in the beginning of a piece, but that we may pass into one or other of these modes which are most relative to it, which are the mode of its fifth above, and that of its third below, if the original mode be major, or of its third above if it be minor. Thus, for instance, the modes, which are most intimately relative to the major mode of *ut*, are the major mode of *sol*, and that of *la* minor. From the mode of *ut* we commonly pass either into the one or the other of these modes, so that we may sometimes judge of the principal mode in which we are, by the relative mode which follows it, or which goes before it, when these relative modes are decisively marked. For what remains, besides these two relative modes, there are likewise two others into which the principal mode may pass but less frequently, viz. the mode of its fifth below, and that of its third above, as *fa* and *mi* for the mode of *ut*. 5. The modes may still be distinguished by the cadences of the melody. These cadences occur at the end of every two, or at every four bars, as in the fundamental bass: now the notes of the fundamental bass which is most suitable to these closes, are easy to be found. When a person is once able to ascertain the mode, and can render himself sure of it by the different means which we have pointed out, the fundamental bass will cost little pains. For in each mode there are three fundamental sounds. 1. The tonic of the mode, or its principal sound, which carries always the perfect

fect chord major or minor, according as the mode itself is major or minor.

Major mode of UT. *ut mi sol ut.*

Minor mode of LA. *la ut mi la.*

2. The tonic dominant, which is a fifth above the tonic, and which, whether in the major or minor mode, always carries a chord of the seventh, composed of the third major followed by two thirds minor.

Tonic dominant.

Major mode of UT. *sol si re fa.*

Tonic dominant.

Minor mode of LA. *mi sol $\times$ si re.*

3. The sub-dominant, which is a fifth below the tonic, and which carries a chord composed of a third, fifth, and sixth major, the third being either greater or less, according as the mode is major or minor.

Sub-dominant.

Major mode of UT. *fa la ut re.*

Minor mode of LA. *re fa la si.*

These three sounds, the tonic, the tonic dominant, and the sub-dominant, contain in their chords all the notes which enter into the scale of the mode: so that when a melody is given, it may almost always be found which of these three sounds should be placed in the fundamental bass, under any particular note of the upper part. Yet it sometimes happens that not one of these notes can be used. For example, let it be supposed that we are in the mode of *ut*, and that we find in the melody these two notes *la si* in succession; if we confine ourselves to place in the fundamental bass one of the three sounds *ut sol fa*, we shall find nothing for the sounds *la* and *si* but this fundamental bass *fa⁶ sol⁷*; now such a succession as *fa* to *sol* is prohibited by the fifth rule for the fundamental bass according to which every sub-dominant, as *fa*, should rise by a fifth; so that *fa* can only be followed by *ut* in the fundamental bass, and not by *sol*. To remedy this, the chord of the sub-dominant *fa la ut re* must be inverted into a fundamental chord of the seventh, in this manner, *re fa la ut*. By these means we give to the modulation *la si*, this fundamental bass *re sol*, which procedure is agreeable to rules. Here then are four chords, *ut mi sol ut*, *sol si re fa*, *fa la ut re*, *re fa la ut*, which may be employed in the major mode of *ut*. We shall find in like manner, for the minor order of *la*, four chords,

la ut mi la, *mi sol $\times$ si re*,

re fa la si, *si re fa la*.

And in this mode we sometimes change the last of these chords into *si re fa $\times$ la*, substituting the *fa $\times$* for *fa*. For instance, if we have this melody in the minor mode of *la mi fa $\times$ sol $\times$ la*, we would cause the first note *mi* to carry the perfect chord *la ut mi la*, the second note *fa $\times$* to carry the chord of the seventh *si re fa $\times$ la*, the third note *sol $\times$* the chord of the tonic dominant *mi sol $\times$ si re*, and in short, the last the perfect chord *la ut mi la*. On the contrary, if this melody is given always in the minor mode *la la sol $\times$ la*, the second *la* being syncopated, it might have the same bass as the modulation *mi fa $\times$ sol $\times$ la* with this difference alone, that *fa $\times$* might be substituted for *fa $\times$* in the chord *si re fa $\times$ la*, the better to mark out the minor mode. Besides these chords just mentioned, which may be regarded as the principal chords of the mode, there are still many others; for example, the series of dominants,

ut la re sol ut fa si mi la re sol ut,

which are terminated equally in the tonic *ut*, either entirely be long, or at least may be reckoned as belonging, to the mode of *ut*; because none of these dominants are tonic dominants, except *sol*, which is the tonic dominant of the mode of *ut*; and besides,

because the chord of each of these dominants forms no other sounds than such as belong to the scale of *ut*. But if I were to form this fundamental bass,

7 7 7 7b

ut la re sol ut,

considering the last *ut* as a tonic dominant in this manner, *ut mi sol si $\flat$* ; the mode would then be changed at the second *ut*, and we should enter in to the mode of *fa*, because the chord *ut mi sol si $\flat$* indicates the tonic dominant of the mode of *fa*; besides, it is evident that the mode is changed, because *si $\flat$* does not belong to the scale of *ut*. In the same manner, were I to form this fundamental bass,

7 7 7 6

ut la re sol ut,

considering the last *ut* as a tonic dominant in this manner, *ut mi sol la*; this last *ut* would indicate the mode of *sol*, of which *ut* is the sub-dominant. In like manner, still, if in the first series of dominants, I caused the first *re* to carry the third major, in this manner, *re fa $\times$ la ut*; this *re* having become a tonic dominant, would signify to me the major mode of *sol*, and the *sol* which

should follow it, carrying the chord *si re fa*, would relapse into the mode of *ut*, from whence we had departed. Finally, if in this series of dominants, one should cause *si* to carry *fa $\times$* in this manner, *si re fa $\times$ la*, this *fa* would shew that we had departed from the mode *ut*, to enter into that of *sol*. Hence it is easy to form this rule for discovering the changes of mode in the fundamental bass. 1. When we find a tonic in the fundamental bass, we are in the mode of that tonic; and the mode is major or minor, according as the perfect chord is major or minor. 2. When we find a sub-dominant, we are in the mode of the fifth above that sub-dominant; and the mode is major or minor, according as the third in the chord of the sub-dominant is major or minor. 3. When we find a tonic dominant, we are in the mode of the fifth below that tonic dominant. As the tonic dominant carries always the third major, one cannot be secure by the assistance of this dominant alone, whether the mode be major or minor: but it is only necessary for the composer to cast his eye upon the following note, which must be the tonic of the mode in which he is; by the third of this tonic he will discover whether the mode be major or minor.

OF THE CHROMATIC AND ENHARMONIC.

We call that melody chromatic which is composed of several notes in succession, whether rising or descending by semitones. (See LIV. and LV.) When an air is chromatic in descending, the most natural and ordinary fundamental bass is a concatenated series of tonic dominants; all of which follow one another in descending by a fifth, or which is the same thing, in rising by a fourth. (See LIV.) When the air is chromatic in ascending, one may form a fundamental bass by a series of tonics and of tonic dominants, which succeed one another alternately by the interval of a third in descending, and of a fourth in ascending: see LV. There are many other ways of forming a chromatic air, whether in rising or descending; but these details are not necessary. The two extremes, or highest and lowest notes *ut sol $\times$* , of the fundamental bass by thirds major, *ut mi sol $\times$* , give the modulation *ut si $\times$* ; and these two sounds *ut*, *si $\times$* , differ between themselves by a small interval which is called the *diests*, or *enharmonic fourth of a tone* which is the difference between a semitone major and a semitone minor. This quarter tone is inapprehensible by the ear, and impracticable upon several of our instruments. Yet means have been found to put it in practice, or rather to perform what will have the same effect upon the ear. But this practice is extremely difficult and seldom attempted. See ENHARMONIC.

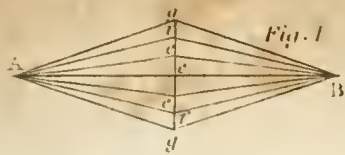


Fig. 3

Treble	<i>c</i>	Ela								
	<i>d</i>	Ma ^{re} ot								
	<i>e</i>	C ^o sol ^u ta								
	<i>f</i>	B ^u bbm								
	<i>g</i>	Alamire								
Tenor	<i>a</i>	G ^o sol ^u reut								
	<i>b</i>	F ^u ant								
	<i>c</i>	Elamir								
	<i>d</i>	D ^o sol ^u re								
	<i>e</i>	G ^o sol ^u reut								
Base	<i>f</i>	B ^u bbm								
	<i>g</i>	Alamire								
	<i>a</i>	G ^o sol ^u reut								
	<i>b</i>	F ^u ant								
	<i>c</i>	Elamir								
	<i>d</i>	D ^o sol ^u re								
	<i>e</i>	F ^u ant								
	<i>f</i>	Elamir								
	<i>g</i>	B ^u bbm								
	<i>a</i>	G ^o sol ^u reut								
	<i>b</i>	F ^u ant								
	<i>c</i>	Elamir								
	<i>d</i>	D ^o sol ^u re								
	<i>e</i>	F ^u ant								
	<i>f</i>	Elamir								
	<i>g</i>	B ^u bbm								
	<i>a</i>	G ^o sol ^u reut								
	<i>b</i>	F ^u ant								
	<i>c</i>	Elamir								
	<i>d</i>	D ^o sol ^u re								
	<i>e</i>	F ^u ant								
	<i>f</i>	Elamir								
	<i>g</i>	B ^u bbm								
	<i>a</i>	G ^o sol ^u reut								
	<i>b</i>	F ^u ant								
	<i>c</i>	Elamir								
	<i>d</i>	D ^o sol ^u re								
	<i>e</i>	F ^u ant								
	<i>f</i>	Elamir								
	<i>g</i>	B ^u bbm								
	<i>a</i>	G ^o sol ^u reut								
	<i>b</i>	F ^u ant								
	<i>c</i>	Elamir								
	<i>d</i>	D ^o sol ^u re								
	<i>e</i>	F ^u ant								
	<i>f</i>	Elamir								
	<i>g</i>	B ^u bbm								
	<i>a</i>	G ^o sol ^u reut								
	<i>b</i>	F ^u ant								
	<i>c</i>	Elamir								
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	<i>f</i>	Elamir								
	<i>g</i>	B ^u bbm								
	<i>a</i>	G ^o sol ^u reut								
	<i>b</i>	F ^u ant								
	<i>c</i>	Elamir								
	<i>d</i>	D ^o sol ^u re								
	<i>e</i>	F ^u ant								
	<i>f</i>	Elamir								
	<i>g</i>	B ^u bbm								
	<i>a</i>	G ^o sol ^u reut								
	<i>b</i>	F ^u ant								
	<i>c</i>	Elamir								
	<i>d</i>	D ^o sol ^u re								

Fig. 6

<i>Breve</i>	≡ {
<i>Semibreve</i>	○ {
<i>Minim</i>	q {
<i>Crotchet</i>	♩ {
<i>Quaver</i>	♪ {
<i>Semiquaver</i>	♫ {
<i>Demi-quaver</i>	♬ {

Fig. 7

ut re me fa sol la si UTRE ME FA SOL &

Scale first Scale second.

Fig. 8

The Diatonic Scale of the Greeks.

Si Ut Re Mi Fa Sol La

Sol Ut Sol Ut Fa Ut Fa

The Fundamental Bass.

Fig. 5

The Diatonic Scale		Flat Key		Ten Min.		Ten Min.		Semitone		Ten Min.		Ten Min.		Ten Min.		Ten Min.	
		Sharp Key		Semitone		Ten Min.		Semitone		Ten Min.		Ten Min.		Ten Min.			
		10	20	30	40	50	60	70	80	90	100						
Menechord																	
	100	Unison		Key													
C	D	93,7	15 to 16	2 nd minor													
C	D	88,8	8 to 9	2 nd major													
D	E	83,3	5 to 6	3 rd minor													
D	E	80,	4 to 5	3 rd major													
E	F	75,	3 to 4	4 th													
F	G	71,4	5 to 7	4 th redundant													
G	G	66,6	2 to 3	5 th													
G	A	62,5	5 to 8	6 th minor													
A	A	60,	3 to 5	6 th major													
A	B	55,5	5 to 9	7 th minor													
B	B	53,3	8 to 15	7 th major													
C	C	50,	1 to 2	Octave													

Fig. 1

A B C

The musical notation for Fig. 1 consists of a treble staff and a bass staff. The treble staff begins with a treble clef and contains three measures labeled A, B, and C. Measure A contains a whole note G4. Measure B contains a whole note A4. Measure C contains a whole note B4. Following these measures, the treble staff continues with a sequence of eighth notes: C5, D5, E5, F5, G5, A5, B5, C6, D6, E6, F6, G6, A6, B6, C7, D7, E7, F7, G7, A7, B7, C8, D8, E8, F8, G8, A8, B8, C9, D9, E9, F9, G9, A9, B9, C10, D10, E10, F10, G10, A10, B10, C11, D11, E11, F11, G11, A11, B11, C12, D12, E12, F12, G12, A12, B12, C13, D13, E13, F13, G13, A13, B13, C14, D14, E14, F14, G14, A14, B14, C15, D15, E15, F15, G15, A15, B15, C16, D16, E16, F16, G16, A16, B16, C17, D17, E17, F17, G17, A17, B17, C18, D18, E18, F18, G18, A18, B18, C19, D19, E19, F19, G19, A19, B19, C20, D20, E20, F20, G20, A20, B20, C21, D21, E21, F21, G21, A21, B21, C22, D22, E22, F22, G22, A22, B22, C23, D23, E23, F23, G23, A23, B23, C24, D24, E24, F24, G24, A24, B24, C25, D25, E25, F25, G25, A25, B25, C26, D26, E26, F26, G26, A26, B26, C27, D27, E27, F27, G27, A27, B27, C28, D28, E28, F28, G28, A28, B28, C29, D29, E29, F29, G29, A29, B29, C30, D30, E30, F30, G30, A30, B30, C31, D31, E31, F31, G31, A31, B31, C32, D32, E32, F32, G32, A32, B32, C33, D33, E33, F33, G33, A33, B33, C34, D34, E34, F34, G34, A34, B34, C35, D35, E35, F35, G35, A35, B35, C36, D36, E36, F36, G36, A36, B36, C37, D37, E37, F37, G37, A37, B37, C38, D38, E38, F38, G38, A38, B38, C39, D39, E39, F39, G39, A39, B39, C40, D40, E40, F40, G40, A40, B40, C41, D41, E41, F41, G41, A41, B41, C42, D42, E42, F42, G42, A42, B42, C43, D43, E43, F43, G43, A43, B43, C44, D44, E44, F44, G44, A44, B44, C45, D45, E45, F45, G45, A45, B45, C46, D46, E46, F46, G46, A46, B46, C47, D47, E47, F47, G47, A47, B47, C48, D48, E48, F48, G48, A48, B48, C49, D49, E49, F49, G49, A49, B49, C50, D50, E50, F50, G50, A50, B50, C51, D51, E51, F51, G51, A51, B51, C52, D52, E52, F52, G52, A52, B52, C53, D53, E53, F53, G53, A53, B53, C54, D54, E54, F54, G54, A54, B54, C55, D55, E55, F55, G55, A55, B55, C56, D56, E56, F56, G56, A56, B56, C57, D57, E57, F57, G57, A57, B57, C58, D58, E58, F58, G58, A58, B58, C59, D59, E59, F59, G59, A59, B59, C60, D60, E60, F60, G60, A60, B60, C61, D61, E61, F61, G61, A61, B61, C62, D62, E62, F62, G62, A62, B62, C63, D63, E63, F63, G63, A63, B63, C64, D64, E64, F64, G64, A64, B64, C65, D65, E65, F65, G65, A65, B65, C66, D66, E66, F66, G66, A66, B66, C67, D67, E67, F67, G67, A67, B67, C68, D68, E68, F68, G68, A68, B68, C69, D69, E69, F69, G69, A69, B69, C70, D70, E70, F70, G70, A70, B70, C71, D71, E71, F71, G71, A71, B71, C72, D72, E72, F72, G72, A72, B72, C73, D73, E73, F73, G73, A73, B73, C74, D74, E74, F74, G74, A74, B74, C75, D75, E75, F75, G75, A75, B75, C76, D76, E76, F76, G76, A76, B76, C77, D77, E77, F77, G77, A77, B77, C78, D78, E78, F78, G78, A78, B78, C79, D79, E79, F79, G79, A79, B79, C80, D80, E80, F80, G80, A80, B80, C81, D81, E81, F81, G81, A81, B81, C82, D82, E82, F82, G82, A82, B82, C83, D83, E83, F83, G83, A83, B83, C84, D84, E84, F84, G84, A84, B84, C85, D85, E85, F85, G85, A85, B85, C86, D86, E86, F86, G86, A86, B86, C87, D87, E87, F87, G87, A87, B87, C88, D88, E88, F88, G88, A88, B88, C89, D89, E89, F89, G89, A89, B89, C90, D90, E90, F90, G90, A90, B90, C91, D91, E91, F91, G91, A91, B91, C92, D92, E92, F92, G92, A92, B92, C93, D93, E93, F93, G93, A93, B93, C94, D94, E94, F94, G94, A94, B94, C95, D95, E95, F95, G95, A95, B95, C96, D96, E96, F96, G96, A96, B96, C97, D97, E97, F97, G97, A97, B97, C98, D98, E98, F98, G98, A98, B98, C99, D99, E99, F99, G99, A99, B99, C100, D100, E100, F100, G100, A100, B100, C101, D101, E101, F101, G101, A101, B101, C102, D102, E102, F102, G102, A102, B102, C103, D103, E103, F103, G103, A103, B103, C104, D104, E104, F104, G104, A104, B104, C105, D105, E105, F105, G105, A105, B105, C106, D106, E106, F106, G106, A106, B106, C107, D107, E107, F107, G107, A107, B107, C108, D108, E108, F108, G108, A108, B108, C109, D109, E109, F109, G109, A109, B109, C110, D110, E110, F110, G110, A110, B110, C111, D111, E111, F111, G111, A111, B111, C112, D112, E112, F112, G112, A112, B112, C113, D113, E113, F113, G113, A113, B113, C114, D114, E114, F114, G114, A114, B114, C115, D115, E115, F115, G115, A115, B115, C116, D116, E116, F116, G116, A116, B116, C117, D117, E117, F117, G117, A117, B117, C118, D118, E118, F118, G118, A118, B118, C119, D119, E119, F119, G119, A119, B119, C120, D120, E120, F120, G120, A120, B120, C121, D121, E121, F121, G121, A121, B121, C122, D122, E122, F122, G122, A122, B122, C123, D123, E123, F123, G123, A123, B123, C124, D124, E124, F124, G124, A124, B124, C125, D125, E125, F125, G125, A125, B125, C126, D126, E126, F126, G126, A126, B126, C127, D127, E127, F127, G127, A127, B127, C128, D128, E128, F128, G128, A128, B128, C129, D129, E129, F129, G129, A129, B129, C130, D130, E130, F130, G130, A130, B130, C131, D131, E131, F131, G131, A131, B131, C132, D132, E132, F132, G132, A132, B132, C133, D133, E133, F133, G133, A133, B133, C134, D134, E134, F134, G134, A134, B134, C135, D135, E135, F135, G135, A135, B135, C136, D136, E136, F136, G136, A136, B136, C137, D137, E137, F137, G137, A137, B137, C138



Musical score for "The Rose Tree" in 3/4 time. The score is written for two parts: Treble Part and Fundamental Bass. The Treble Part begins with a treble clef and a key signature of one sharp (F#). The Fundamental Bass part begins with a bass clef and a key signature of one sharp (F#). The score is divided into three systems. The first system contains measures 1 through 4. The second system contains measures 5 through 8. The third system contains measures 9 through 12, ending with a double bar line. The notes are as follows:

 Treble Part:

 Measure 1: G4 (quarter), A4 (quarter), B4 (quarter)

 Measure 2: C5 (quarter), B4 (quarter), A4 (quarter)

 Measure 3: G4 (quarter), F#4 (quarter), E4 (quarter)

 Measure 4: D4 (half), E4 (half)

 Measure 5: G4 (quarter), A4 (quarter), B4 (quarter)

 Measure 6: C5 (quarter), B4 (quarter), A4 (quarter)

 Measure 7: G4 (quarter), F#4 (quarter), E4 (quarter)

 Measure 8: D4 (half), E4 (half)

 Measure 9: G4 (quarter), A4 (quarter), B4 (quarter)

 Measure 10: C5 (quarter), B4 (quarter), A4 (quarter)

 Measure 11: G4 (quarter), F#4 (quarter), E4 (quarter)

 Measure 12: D4 (half), E4 (half)

XIII
 dissonance prepared
 Treble

XIV
 dis. prep.
 Treble

XV
 dis. prep.
 Treble

XVI
 dissonance resolved.
 Treble

XVII
 dis. res.
 Treble

XVIII
 dis. res.
 Treble

XIX
 dis. res.
 Treble

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XXI
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XXII
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XXIII
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XXIV
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[illegible]

L.II L.III L.IV L.V
 chromatic modulation descending chromatic modulation ascending
 T.B. T.B. The Treble The Treble

MUSICAL GLASSES. See **HARMONICA.**

MUSIVUM AURUM, or **MOSAIC GOLD**, a substance formed by the combination of tin with sulphur. The process described by the Marquis de Bullion is probably the most convenient for this preparation: it consists in forming an amalgam of 8 oz. of tin and 8 of mercury. For this purpose, a copper-mortar is heated, and mercury poured into it: and when it has acquired a certain degree of heat, the melted tin is poured in, and the mixture agitated and triturated till cold. Six ounces of sulphur, and four of sal ammoniac, are then mixed; and the whole put into a matras, which is placed on a sand-bath, and heated to such a degree as to cause a faint ignition in the bottom of the matras. The fire must be kept up for three hours. The aurum musivum obtained in this way is generally beautiful: but if instead of placing the matras on the sand, it be immediately exposed upon the coals, and strongly and suddenly heated, the mixture will take fire, and a sublimate will be formed in the neck of the vessel, which consists of the most beautiful aurum musivum. Neither mercury nor sal ammoniac, however, is necessary to the production of aurum musivum. For if 8 oz. of tin dissolved in the muriatic acid, and precipitated by the carbonate of soda, be mixed with 4 oz. of sulphur, a fine aurum musivum will be produced. This aurum musivum is not, however, capable of increasing the effects of the electrical machine; which shews that the composition owes its virtue in that respect to the mercury it contains, which is in the proportion of 6 to 1 in the first process. The chief uses of aurum musivum are those of giving a beautiful colour to bronze, and of increasing the effects of the electrical machine by being rubbed on the cushions. Baron Kienmayer has described another amalgam, composed of two parts of mercury, one of zinc, and one of tin. The zinc and the tin are to be fused and mixed together with the mercury; and the mixture agitated in a wooden box, rubbed internally with chalk. The mass is then to be reduced to a fine powder, and employed in that state, or mixed with grease. The effect of this amalgam in increasing the power of electrical machines is very great. Tin when alloyed with copper forms bronze, or bell-metal. The amalgam of tin is used to silverize looking-glasses.

MUSK, a dry, light, and friable substance, of a dark blackish colour, tinged with purple; it is a kind of perfume of a very strong scent, and only agreeable when in a very small quantity, or moderated by the mixture of some other perfume. It is found in a kind of bag or tumour which grows under the belly of the moschus. See **MOSCHUS**. Musk has a bitter, somewhat acrid, taste; and emits a fragrant odour which, at a distance, is very agreeable: the best is imported from the East, in round thin bladders, about the size of a pigeon's egg, which are covered with short brown hairs. The substance itself is dry, and consists of small, round, grains, of a reddish-brown or dark rusty colour, somewhat unctuous, but perfectly free from sand or similar adulterations. It pays on importation, the sum of 2s. 2½d. per ounce troy; and the same duty when it is taken out for home-consumption (if sold by the East India Company,) beside 2l. per cent. on its value. This strong scented drug is greatly esteemed in the east, on account of its medicinal properties; though it has not, till lately, been employed as a perfume in Britain; and is still more rarely used as a medicine. Musk, however, appears to be possessed of considerable efficacy; especially in convulsive hiccoughs and fits, if administered in doses, consisting of from eight to ten grains. It is likewise an excellent anti-spasmodic, and has sometimes been prescribed with advantage, in slow, or nervous fevers, to the quantity of a scruple, taken three or four times in twenty-four hours.

MUSK, ARTIFICIAL, is a chemical preparation thus denominated, on account of its possessing all the essential properties of the genuine drug. It was first invented by Maggraf, and has been lately recommended to public notice by Professor Hufeland: it is prepared in the following manner:—One drachm of rectified oil of amber is first poured into a wine-glass, on which a drachm and a half of the concentrated nitric acid, or smoking aquafortis, should be gradually and cautiously dropped. The mixture, on agitating it, grows hot, and emits offensive vapours, against which the nostrils must be guarded: when it has stood twenty-four hours, the compound produces a yellow resinous matter, concreting at the top; and which resembles musk in its smell, while a strong acid

liquor remains at the bottom. The resin is now to be repeatedly washed, both in cold and in hot water, till it be totally divested of its sour taste. Thus a substance is obtained, which is not only cheaper than the common musk, but is at the same time free from those impurities with which the latter is too frequently adulterated. Artificial musk is, doubtless, a more powerful medicine than the natural, and has been successfully prescribed by Hufeland, in the epidemic chin-cough, as well as other nervous and spasmodic affections. Nor have its effects been less salutary in cases of diabetes and difficulty of breathing: having effected a cure when other medicines had failed of success. As this substance is of a resinous consistence, it will be most conveniently given in emulsions: hence ten or twelve grains of it should be triturated in a mortar, together with a few blanched almonds, and diluted with five or six ounces of distilled water. Of this mixture, two teaspoonfuls may be given every two hours to a child between one and two years old; and in progressive doses, so that a youth from twelve to fourteen years of age, will require double, and an adult about three times, the quantity above stated. Without the aid of any other medicine, it generally produces a sudorific effect; diminishes and alleviates the fits of coughing; and often produces eruptions resembling the true nettle-rash: thus, a favourable crisis takes place, and the disease speedily disappears.

MUSK-ANIMAL. See **MOSCHUS.**

MUSKET, or **MUSQUET**, a fire-arm borne on the shoulder, and used in war; formerly fired by the application of a lighted match, but at present with a flint. The length of the barrel is fixed to three feet eight inches from the muzzle to the touch-pan; its bore is such as may receive a bullet of 14 in a pound, and its diameter differs not above one-50th part from that of the bullet. The common musket is of the caliber of 22 balls to the pound, and receives balls from 22 to 24. Muskets were anciently borne in the field by the infantry, and were used in England so lately as the beginning of the civil wars. At present they are little used, except in the defence of places; fuses or firelocks having taken their place and name. See **FUSIL**, and **FIRELOCK**. Muskets were first used at the siege of Rhegen 1521. The Spaniards were the first who armed part of their foot with these weapons. At first they were very heavy, and could not be used without a rest. They had match-locks, and did execution at a great distance. On their march the soldiers carried only the rests and ammunition, having boys to bear their muskets after them. They were very slow in loading, not only by reason of the unwieldiness of their pieces, and because they carried the powder and ball separate, but from the time it took to prepare and adjust the match; so that their fire was not near so brisk as ours is now. Afterwards a lighter match-lock musket came in use; and they carried their ammunition in bandeliers, to which were hung several little cases of wood covered with leather each containing a charge of powder. The muskets with rests were used as late as the beginning of the civil wars in the time of Charles I. The lighter kind succeeded them, and continued till the beginning of the 18th century, when they also were disused, and the troops throughout Europe armed with firelocks. These are usually made of hammered iron. For the dimensions, construction, and practice, of various species of guns, muskets, &c. See **CANON**, **CARABINE**, **CARRONADE**, **GUN**, **MORTAR**, **HOWITZER**, **ORDNANCE**, and **PROJECTILES**.

MUSKETIO. See **CULEX.**

MUSKETO ISLANDS, islands of the United States on the coast of Maine.

MUSKETOON, [*musqueton*, Fr.] a kind of short thick musket, whose bore is the 38th part of its length; it carries 5 oz. of iron, or 7½ of lead, with an equal quantity of powder. This is the shortest kind of blunderbusses. It is of the same length with the carbine; the barrel polished and clean within.

MUSKOGEE, **MUSKOGULGE**, or **CREEK INDIANS**, a numerous nation, or rather a confederacy of various tribes, of North American Indians, who inhabit a hilly country in the middle parts of Georgia; which however is very fertile, being well-watered, and abounding with rivulets and creeks, whence their European name of Creeks. These tribes consist of the Abetas, Alibamas, Apalachees, Cawittaws, Chacshoomas, Conshacks, Coosactees, Coosas, Natchez, Oakmulges, Oconees, Okohoyes, Pakanas, Taensas, Talepoosas, Weetumkas, and some others; who united to defend themselves against their common enemies, the

Chacklaws, Chickasaws, &c. Their union has rendered them victorious and formidable to the surrounding nations. They are tall, well made, active, sprightly, industrious, sagacious, and polite; warm and faithful friends, but inveterate enemies. The men are frugal, temperate, tender husbands, indulgent parents, and very hospitable to strangers.

MUSLIN bears a downy knot on its surface. There are several sorts of muslins brought from the East Indies, and more particularly from Bengal; such as doreas, betelles, mulmuls, tanjeebs, &c. Muslin is manufactured in Britain, and brought to very great perfection.

MUSQUAKIES, a nation of N. American Indians, who inhabit the banks of Lake Michigan. They have 200 warriors.

MUSQUETOE. See CULLA.

MUSQUITIONS, a nation of N. American Indians, who inhabit the banks of the Wabash, in the North Western Territory of the United States; near the Ojatanons and Pinkashaws.

MUSSELENDIA, in botany, a genus of the monogynia order, and pentandria class of plants; natural order, Contorta. Corolla funnel-form; stigmas two, thickish; berry oblong, inferior; seeds disposed in four rows. There are three species, natives of the East Indies and China.

MUSSEL, in zoology. See MYTILUS.

MUSSELBURGH, a sea-port-town of Scotland, in Mid-Lothian, at the mouth of the Esk, 4 miles N. of Dalkeith, and 6 E. of Edinburgh.

MUSULMAN, or MUSYLMAN, is a title by which the Mohammedans distinguish themselves; signifying in the Turkish language, "true believer, or orthodox." See MOHAMMEDANISM. In Arabic, the word is written Moslem, Mosleman, or Mosolman. The appellation was first given to the Saracens, as is observed by Leunclavius. There are two kinds of Mussulmans, very averse to each other, the one called Sunnites, and the other Shiites. The Sunnites follow the interpretation of the Koran given by Omar; the Shiites are the followers of Ali. The subjects of the king of Persia are Shiites; and those of the grand signior, Sunnites. See ALCORAN, and SONNA. Some authors say, that the word Mussulman signifies saved, that is, predestinated; and that the Mohammedans give themselves the appellation, as believing they are all predestinated to salvation. Martinus is more particular as to the origin of the name; which he derives from the Arabic *muslem*, *muslem*, "saved, snatched out of danger;" the Mohammedans, he observes, establishing their religion by fire and sword, massacred all those who would not embrace it, and granted life to all that did, calling them Mussulmans, q. d. erepti è periculo; whence the word, in course of time, became the distinguishing title of all those of that sect, who have affixed to it the signification of true believers.

MUST, a liquid of a sweet taste expressed from grapes fully ripe; or the liquor pressed from the fruit before it has worked or fermented. See WINE. Dr. Thomson says, "it is composed of five ingredients; viz. water, sugar, jelly, extract, and tartareous acid, partly saturated with potass. The quantity of sugar is very considerable; it may be obtained in crystals by evaporating must to the consistence of syrup, separating the tartar which precipitates during the evaporation, and setting the must aside for some months. The crystals of sugar are gradually formed." Syst. Chem. iv. 314.

MUSTAGAM, a sea-port of Algiers, with a castle; 140 miles W. of Algiers. Lon. 0. 3. W. Lat. 36. 30. N.

MUSTARD. See SINAPIS.

MUSTARD, BASTARD. See CLEOME.

MUSTARD-SEED is one of the strongest of the pungent, stimulating, diuretic medicines, that operate without exciting much heat. It is sometimes taken unbruised, to the quantity of a spoonful at a time, in paralytic, cachectic, and serous disorders. It is applied also as an external stimulant, to benumbed and paralytic limbs; to parts affected with fixed rheumatic pain; and to the soles of the feet, in the low stage of acute diseases, for raising the pulse; in this intention, a mixture of equal parts of the powdered seeds and crumbs of bread, with the addition sometimes of a little bruised garlic, are made into a cataplasm with a sufficient quantity of vinegar. Mustard-seed yields, upon expression, a considerable quantity of oil, which is by some recommended externally against rheumatism and palsies, though it has nothing of that quality by

which the seeds themselves prove useful in those disorders; the oil being mild and insipid as that of olives, and the pungency of the seed remaining entire in the cake left after expression; nor is any considerable part of the pungent matter extracted by rectified spirit. The bruised seeds give out readily to water nearly the whole of their active matter: added to boiled milk they curdle it, and communicate their pungency to the whey. The powder of mustard-seed may be made into the consistence of a loch with warm water, in which a little sea-salt has been dissolved. Of this a common spoonful, sometimes two, diluted with tepid water, are given on an empty stomach; it operates as well as an emetic, and proves an excellent remedy in most nervous disorders, according to Dr. Monro. Med. Ess. Edinb. vol. ii. art. 19. p. 303. note.

MUSTELA, a genus of quadrupeds of the order of Ferae. Six cutting teeth in each jaw; those of the upper jaw, erect, sharp-pointed, and distinct; of the lower jaw, blunter, huddled together, two placed within the line of the rest; tongue smooth. Linnæus places both the Otters and Weasels in this genus; but Mr. Pennant with greater accuracy, assigns the latter to the genus VIVERRA, which see. There are 28 species.

M. ERMINEA, the ERMINE, has the tail tipped with black. This species inhabits the north of Europe, Asia, and America, and as far as the N. parts of Persia and China; living in heaps of stones on the banks of rivers, in the hollows of trees, and in forests, especially of beech, preying on squirrels and lemmings. In manners and food they resemble the common weasel, but do not frequent houses, haunting chiefly woods and hedges, especially such as border on brooks and rivulets. In general appearance they come very near the martin, but are shorter in the body, being scarcely ten inches long from nose to rump, and the tail about 5½; the hair is likewise shorter and less shining. In the northern regions, the fur of the ermine becomes entirely white during winter, except the outer half of the tail, which remains black. The skins sell in Siberia from 2*l.* to 3*l.* sterl. per 100; but were anciently in much greater request than now. In summer, the upper part of the body is of a pale tawny brown colour; the edges of the ears, and ends of the toes, are yellowish white; the throat, breast, and belly, are white; in winter, in the temperate regions, it is sometimes mottled with brown and white; but in severe winters becomes entirely white.

M. FERO, the FERRET, has red and fiery eyes; the colour of the whole body is a very pale yellow; the length from nose to tail is about 14 inches, the tail five. See Plate C. In their wild state they inhabit Africa; whence they were brought into Spain, to free that country from rabbits with which it was overrun; and from Spain the rest of Europe has been supplied. They cannot bear cold, nor subsist even in France unless in a domestic state. They have not the same capacity of finding subsistence as other wild animals, but must be nourished within doors, and cannot exist in the fields; for those who are lost in the burrows of rabbits perish during winter. Like other domestic animals, they vary in colour. The female ferret is less than the male, and when in season, is so extremely ardent, that she dies if her desires are not gratified. Ferrets are brought up in casks or boxes, where they are furnished with beds of hemp or flax. They sleep very much. They are used for hunting rabbits; and as in this country they are apt to degenerate, warreners cross the breed, by an intercourse between a female ferret and a male polecat, by leaving the former, when in season, near the haunts of the latter: the produce is of a much darker colour than the ferret, having a great resemblance to the polecat. This animal is naturally a mortal enemy to the rabbit. When a dead rabbit is for the first time presented to a young ferret, he flies upon it, and bites it with fury; but if it be alive, he seizes it by the throat or the nose, and sucks its blood. When let into the burrows of rabbits, he is muzzled, that he may not kill them in their holes, but only oblige them to come out, to be caught in the nets. If the ferret is let in without a muzzle, he is in danger of being lost: for, after sucking the blood of the rabbit, he falls asleep; and even smoking the hole is not a certain method of recalling him: because the holes have often several entries which communicate with each other, and the ferret retires into one of those when incommoded with the smoke. Ferrets are also used for catching birds in the holes of walls, or old trees. The ferret, though easily tamed, and rendered docile, is extremely irascible; his odour is always disagreeable; but

but when irritated, it becomes more offensive. His eyes are lively, and his aspect is inflammatory; all his movements are nimble: and he is at the same time so vigorous, that he can easily master a rabbit, though four times larger than himself.

M. LUTRA BRASILIENSIS, the **BRASILIAN OTTER**, is black, with a yellow spot below the chin; the tail is flat, naked, and reaches only to the feet. It is about the size of a middling dog, but weighs from 40 to 100lb. the head and teeth resemble those of a cat; the eyes are small, round, and black; the feet have five toes each, with sharp claws. They inhabit Brasil, Guiana, and the rivers of South America; live in societies, on fish, crabs, &c. and are very fierce, but may be tamed when young.

M. LUTRA PISCATORIA, the **COMMON OTTER**, has naked feet, and the tail is about half the length of the body. It is in general about two feet long, from the tip of the nose to the base of the tail. The fur is of a deep brown colour, with two small white spots on each side of the nose, and one beneath the chin. See **PLATE C.** This animal inhabits Europe, N. America, and Asia as far as Persia. It frequents rivers, lakes, and fish-ponds; and preys on fish, frogs, and fresh water crustaceous animals, being exceedingly destructive to fish-ponds. The otter shews great sagacity in forming its habitation; it burrows under ground on the banks of a river or lake: it always makes the entrance of its hole under water; working upwards to the surface of the earth, and forming, before it reaches the top, several holes, that, in case of high floods, it may have a retreat: for, though amphibious, no animal loves more to lie dry: it makes a minute orifice for the admission of air; and the more effectually to conceal its retreat, makes even this air-hole in some thick bush. The otter is capable of being tamed: he will follow his master like a dog, and even fish for him, and return with his prey. Though he does not cast his hair, his skin is browner, and sells dearer in winter than in summer; and makes a very fine fur. His flesh has a disagreeable fishy taste. His retreats exhale a noxious odour from the remains of putrid fishes; and his own body has a bad smell. The dogs chase the otter spontaneously, and easily catch him when at a distance from the water or from his hole. But, when seized, he defends himself, bites the dogs cruelly, sometimes with such force as to break their leg-bones, and never quits his hold but with life. The beavers, however pursue the otters, and will not allow them to live on the same banks.

MUSTER, a review of troops under arms, to see if they be complete and in good order; to take an account of their numbers, the condition they are in, viewing their arms and accoutrements, &c.

MUSTER-MASTER GENERAL, or **COMMISSARY GENERAL OF THE MUSTERS**; one who takes account of every regiment, their number, horses, arms, &c. reviews them, sees that the horses be well mounted, and all the men well armed and accoutred, &c.

MUSTER-ROLLS, lists of soldiers in each company, troop, or regiment, by which they are paid, and the strength of the army is known.

MUSTIOGANNIM, a town of Algiers, with a citadel, 36 miles N. E. of Oran. Lon. 1. 20. E. Lat. 36. 0. N.

MUTA, in Roman antiquity, the goddess of dumbness. See **FERALIA**.

MUTATION, in the ancient music, is applied to the changes or alterations that happen in the order of the sounds which compose the melody.

MUTATIONES, among the Romans, post-stages or places where the public couriers were supplied with fresh horses. They were wholly designed for the use of these couriers, or messengers of state; in which respect they differ from mansions. See **MANSIO**.

MUTCHKIN, a liquid measure used in Scotland; containing four gills, being the fourth part of a Scots pint.

MUTE, in grammar, the simple consonants are ordinarily distinguished into mutes and liquids, or semi-vowels. See **ALPHABETS**, **CONSONANT**, **LIQUID**, &c. The mutes in the Greek alphabet are nine; three of which, viz. α , τ , ρ , are termed tenues: three β , γ , δ , termed medix: and three θ , ϕ , χ , aspirates. See **ASPIRATE**, &c. The mutes of the Latin alphabet are also nine, viz. B, C, D, G, J, K, P, Q, T.

MUTE, in law, a person that stands dumb or speechless, when

he ought to answer, or to plead. If any person being arraigned on any indictment or appeal for felony, or on any indictment for piracy, shall upon such arraignment stand mute, or will not answer directly to the felony or piracy, he shall be convicted of the offence, and the court shall thereupon award judgement and execution, in the same manner as if he had been convicted by verdict or confession; and by such judgement shall have all the same consequences as a conviction by verdict or confession. 12 G. III. c. 20. And the law is the same with respect to an arraignment for petit treason or larceny; for before this act, persons standing mute in either of these cases, were to have the like judgement as if they had confessed the indictment. 2 Inst. 177.

MUTILATION, [*mutilatio*, from *mutilo*, Lat.] deprivation of a limb, or any essential part.

MUTILATION, is also extended to statues and buildings, where any part is wanting, or the profection of any member, as a cornice or an impost, is broken off.

MUTILATION, is particularly used for castration: See **CASTRATION**, and **EUNUCH**. The practice of this sort of mutilation is of various kinds: The Hottentots are said to cut away one testicle from their children, upon supposition that they are thereby made lighter and more active for running. In some countries, poor people completely mutilate their boys, to prevent the misery and want which would attend their offspring. Those who have nothing in view but the improvement of a vain talent, or the formation of a voice which disfigures nature, as was the case formerly in Italy, are contented with cutting away the testicles. But in some countries of Asia, especially among the Turks and in part of Africa, jealousy inspires such distrust that they would not think their wives safe in the custody of such eunuchs: They employ no slaves in their seraglios who have not been deprived of all the external parts of generation. Amputation is not the only means of accomplishing this end. Formerly, the growth of the testicles was prevented, and their organization destroyed, by simple rubbing, while the child was put into a warm bath made of a decoction of plants. Some pretend that by this species of castration the life is in no danger. Amputation of the testicles is not attended with much danger; but complete amputation of the external parts of generation is often fatal. This operation can only be performed on children from seven to ten years of age. Eunuchs of this kind, owing to the danger attending the operation, cost in Turkey five or six times the price of others. Chardin relates, that this operation is so painful and dangerous after 15 years of age, that hardly a fourth part of those by whom it is undergone escape with life. Peter della Valle, on the contrary, informs us, that in Persia, those who suffer this cruel and dangerous operation, as a punishment for rapes and other crimes of this kind, are easily cured though far advanced in life: and that nothing but ashes is applied to the wound. It is impossible to reflect on the motives for making eunuchs without execration of the barbarians who practise it; and yet this abominable cruelty is not infallibly attended with that advantage which they expect from it. Of 2000 victims to the art, hardly three are found who unite good talents with good organs. The other languishing and inactive wretches are outcasts from both sexes, paralytic members in the community, an useless burden upon the earth, by which they are supported and nourished. A high tribute of applause is due to that virtuous pontiff, Pope Clement VIII. who, listening to the voice of modesty and humanity, abolished this detestable and infamous practice. Mutilation he declared was the most abominable and disgraceful of crimes.

MUTILATUS FLOS. See **BOTANY**.

MUTILLA, in zoology, a genus of animals of the order insecta hymenoptera. There are 35 species; the most remarkable is,

M. OCCIDENTALIS, the **VELVET ANT**, an inhabitant of North America. It has six legs, with short crooked antennae; the abdomen large, with a black list crossing the lower part of it, and another black spot at the joining of the thorax; excepting which, the whole body and head resembles crimson velvet. The trunk or shell of the body is of such a strong and hard texture, that though trod upon by men and cattle they receive no harm. They have a long sting in their tails, which causes inflammation and great pain for half an hour to those who are stung by them, which usually happens to negroes and others that go barefooted.

MUTINA,

MUTINA, in ancient geography, a noble city of Gallia Cispadana. It is now called Modena. See **MODENA**.

MUTINY, opposition to authority. "Any officer or soldier who shall presume to use traitorous or disrespectful words against the sacred person of his majesty, or any of the royal family, is guilty of mutiny.—Any officer or soldier who shall behave himself with contempt or disrespect towards the general or other commander-in-chief of our forces, or shall speak words tending to their hurt or dishonour, is guilty of mutiny.—Any officer or soldier who shall begin, excite, cause, or join in, any mutiny or sedition, in the troop, company, or regiment, to which he belongs, or in any other troop or company in our service, or on any party, post, detachment, or guard, on any pretence whatsoever, is guilty of mutiny.—Any officer or soldier who, being present at any mutiny or sedition, does not use his utmost endeavours to suppress the same, or coming to the knowledge of any mutiny, does not without delay give information to his commanding officer, is guilty of mutiny.—Any officer or soldier who shall strike his superior officer, or draw, or offer to draw, or shall lift up any weapon, or offer any violence against him, being in the execution of his office, on any pretence whatsoever, or shall disobey any lawful command of his superior officer, is guilty of mutiny."

MUTISIA, in botany, a genus of the syngenesia polygamia superflua class and order. Natural order, *Discoideæ*. Calyx cylindric, imbricate; corollas of the ray oval oblong; of the disk trifid; down feathered; receptacle naked. There is but one species, viz. *M. clematis*, found in New Granada.

MUTIUS, Caius, surnamed Codrus, and afterwards Scævola, was one of the illustrious Roman family of the Mutii, and rendered his name famous in the war between Porsenna king of Tuscany and the Romans. That prince resolving to restore the family of Tarquin II. went to besiege Rome. B. C. 507. Mutius resolved to sacrifice himself for the safety of his country; and boldly entering the enemy's camp, killed Porsenna's secretary, whom he took for Porsenna himself. Being seized and brought before Porsenna, he told him boldly, that 300 young men like himself had sworn to kill him; but since this hand has missed thee, continued he, it must be punished; then putting his right hand on the burning coals, he let it burn with such a constancy as astonished the beholders. The king, amazed at the intrepidity of this young Roman, ordered that he should have his freedom and return to Rome, and soon after concluded a peace with the Romans. From this action Mutius obtained the surname of Scævola, or left-handed, which was continued in his family.

MUTTON, the flesh of sheep. It is by some preferred to the flesh of all other quadrupeds. It has indeed one advantage over them of being more generally suited to different climates; whereas beef requires a very nice intermediate state, which it seems to attain chiefly in England.

MUTUAL is distinguished by Vangelas from reciprocal; mutual being understood of what is between two only; and reciprocal, what is between more than two: but this distinction is little regarded in common use.

MUTULE, in architecture, a kind of square modillion set under the cornice of the Doric order.

MUTUNUS, or **MUTINUS**, in the ancient mythology, a deity among the Romans, the same as the Priapus of the Greeks.

MUTUUM, in the civil law, denotes a loan simply so called; or a contract introduced by the law of nations, whereby a thing consisting in weight, as bullion; in number, as money; or in measures, as corn, timber, wine, &c. is given to another upon condition that he shall return another thing of the same quantity, nature, and value, on demand. This therefore is a contract without reward, so that where use or interest arises, there must be some particular article in the contract whereon it is founded.

MUYDEN, a town of Holland in the department of Amstel, 6 miles E. of Amsterdam.

MUZZLE OF A GUN, or **MORTAR**, the extremity at which the powder and ball is put in.

MUZZLE-RING, the metalline circle or moulding that surrounds the mouth of the piece.

MYA, the **GAPER**, in zoology, a genus of the order of vermes testacea. Animal ascidia; shell bivalve, generally gaping at one end; hinge with broad thick strong teeth, seldom more than one, and not inserted into the opposite valve. The animals of this genus

perforate into the sand and clay at the bottom of the sea, burying themselves and their shells wholly or in part. There are about twenty-five species.

M. DECLIVIS, the **SLOPING MYA**, has a brittle half transparent shell, with a hinge slightly prominent near the open, and sloping downwards. It inhabits the rivers of Europe. It is frequent about the Hebrides; the fish are eaten there by the gentry.

M. MARGARITIFERA, the **PEARL MUSCLE**, has a very thick, coarse, opaque shell; often much decorticated; oblong; bending inward on one side, or arcuated; black on the outside; the usual length from five to six inches, breadth 2½. This species inhabits great rivers, especially those which water the mountainous part of Great Britain.—This shell is noted for producing quantities of pearl. There have been regular fisheries for this precious article in several of our rivers. Sixteen have been found within one shell. They are the disease of the fish, analogous to the stone in the human body. On being squeezed, they will eject the pearl, and often cast it spontaneously in the sand. The convey was noted for them in the days of Cambden. It is said, that Sir Richard Wynne of Gwydir, chamberlain to Catharine, queen to Charles II. presented her majesty with a pearl found in a muscle in this river, which is still in the regal crown. They are called by the Welsh cregin diluw; or deluge-shells, as if left there by the flood.

MYAGRUM, **GOLD OF PLEASURE**; in botany, a genus of the siliculosa order, and tetradynamia class of plants; natural order, *Siliculosæ*. Silicule terminated by an oblong style; cell generally one-seeded. There are ten species.

M. SATIVUM, which grows naturally in corn-fields in the south of France and Italy, and in some parts of Britain, is an annual plant, with an upright stalk a foot and an half high, sending out two or four side-branches, which grow erect; the flowers grow in loose spikes at the end of the branches, standing upon short foot-stalks an inch long; they are composed of four small yellowish petals, in form of a cross; these are succeeded by oval capsules, which are bordered and crowned at the top with the style of the flower, having two cells filled with red seeds. This is cultivated in Germany for the sake of the expressed oil of the seeds, which the inhabitants use for medicinal, culinary, and economical purposes. The seeds are a favourite food with geese. Horses, goats, sheep, and cows, eat the plant.

MYCALE, a promontory of Asia opposite Samos.

MYCALE, a city and mountain of Caria.

MYCENÆ, in ancient geography, a town of Argolis, in Peloponnesus. The kingdom of the Argives was divided into two portions by Acrisius and his brother Proetus. Argos and Mycenæ were their capitals.

MYCETITES DISCOIDES, in natural history, a name given by Dr. Woodward to those kinds of fossil coralloide bodies which most writers had called, after Dr. Plott, *PORPITÆ*. These are usually small, and of a roundish, but flattened figure; hollowed on one side with a sort of umbilicus, and striated on the other; they are found on the plowed lands in Oxfordshire, and some other of our midland counties, and in other places, buried in the solid strata of stone; they are sometimes yellowish, sometimes brownish, and are from the breadth of an inch to a fourth part or less of that size; when broken, they are usually found to consist of a kind of spar, not unlike that of which the shelly coats of the echinits, or the lapides indicis, and other spines of echini consist in their fossil state; and in some of them the ridges and striæ are thick set with little knobs and tubercles. The basis in some of these is flat, as it is in others rising in form of a circular elevation from the umbilicus, and others have a circular cavity in the same place.

MYCONE, an island in the Archipelago, about 36 miles in circuit.

MYCONE, the capital of the above island, containing about 3000 inhabitants. Long. 25. 51. E. Lat. 37. 28. E.

MYCONOS, or **MYCONUS**, in ancient geography, one of the **CYCLADES**, near Delos, under which the giants and Centaurs slain by Hercules are feigned to lie buried. It is now called Mycone.

MYCTERIA, the **JABIRU**, in ornithology, a genus of birds of the order, gralla. Bill long, bending upwards, and acute; nostrils small, linear; tongue none; feet with four toes. There are two species.

M. AMERICANA,

M. AMERICANA, the **AMERICAN JABIRU**, is about the size of a turkey. The bill is long, stout, and of a black colour: the whole plumage is white, except the head, and about two-thirds of the neck, which are bare of feathers and of a blackish colour; the remainder is also bare, and of a fine red; on the hind head are a few greyish feathers; the legs are strong, of a great length, and covered with black scales; wings and tail even at the end. This species is found in all the savannas of Cayenne, Guiana, and other parts of South America. They are migratory and gregarious.

M. ASIATICA, the **INDIAN JABIRU**, is of a large size. The general colour of the plumage is white: the lower half of the back, the prime quills, and the tail, are black; the legs are pale red. This species inhabits the East Indies, and feeds on snails.

MYGDONIA, in ancient geography, a district of Macedonia, N. of the Sinus Thermaicus, and E. of the river Axios, which separates it from Bottiaea, and W. of the Strymon.

MYGDONIA, a district of Mesopotamia, so named from that of Macedonia, extending far E. along the Euphrates, from Zeugma down to Thapsacus. Nisibis was reckoned to it.

MYGINDA, in botany, a genus of the tetragynia order, and tetrandria class of plants. Calyx four-parted; petals four; fruit a globose plum. It has three species natives of the West Indies.

MYIAGRUS DEUS, in the heathen Mythology, a name given sometimes to Jupiter, and sometimes to Hercules, on occasion of their being sacrificed to, for driving away the vast numbers of flies which infested the sacrifices on certain public occasions.

MYLAE, in ancient geography, a Greek city situated on an isthmus of a cognominal peninsula, on the N. E. side of the island.

MYLAE, a town built by the people of Zancle. Mylaeus, the epithet, as *Myllus Campus*, mentioned by Polybius: now called Melazzo. See **MELAZZO**.

MYLASSA, or **MYLASSA**, in ancient geography, a noble city of Caria in Asia Minor, situated about nine miles from the Sinus Ceramicus. It was the capital of Hecatomnus, king of Caria, the father of Mausolus.

MYLITTA, a name of Venus among the Assyrians. In her temples the women were obliged to prostitute themselves to strangers. Herodot. L. i. c. 131, 139.

MYLOGLOSSUM. See **ANATOMY**.

MYLOHYOIDEUS. See **ANATOMY**.

MYLOPHARYNGEUS. See **ANATOMY**.

MYOGRAPHY, [*μυογραφία*], a description of the muscles.

MYOLOGY, [from *μῦς*, a muscle, and *λογία*, discourse,] that branch of anatomy which treats of the muscles. See **ANATOMY**.

MYOMANCY, [*μυμαντία*, a mouse, *μαντια*, divination,] a kind of divination, or method of foretelling future events by means of mice. Some think myomancy one of the most ancient kinds of divination; and say it is on this account that Isaiah, lvi. 17, reckons mice among the abominable things of the idolaters. But, besides that it is not certain that the Hebrew word *עכבר*, used by the prophet, signifies a mouse; it is evident it is not the divination by that animal, be that what it will, that is spoken of, but the eating of it.

MYOPES, [*μυωπες*], persons, who, by a natural defect, have the cornea and crystalline humour of the eye, too convex. This figure, which increases the quantity of refraction, tends to render the rays of such pencils as are formed in the eye more convergent, so that the point where they meet falls short of the retina. Myopes see distinctly those objects only which are near the rays, which meet the eye more divergent, and therefore, being refracted, concur in a more distant point, viz. on the retina. This imperfection being the reverse of that which affects the eye of presbyta, is remedied by the use of a glass slightly concave. See **OPTICS**.

MYOPIA, **SHORT-SIGHTEDNESS**, [*μυωπία*, from *μῦς*, to wink, and *ωπ*, the eye,] a species of vision wherein objects are seen only at small distances. See **MEDICINE**, and **OPTICS**.

MYOPORUM, in botany, a genus of the didynamia angiosperma class and order. Natural order, Personate. Calyx five-parted; corolla bell-shaped, with a spreading almost equal five-parted border; berry one or two seeded; seeds two-celled. It has four species, plants of the South Sea islands.

MYOSOTIS, **SCORPION-GRASS**; a genus of the monogynia order, and pentandria class of plants; natural order, Asperifoliae. Corolla salver-shaped, quinquefid, emarginated; the opening shut by small arches. There are seven species,

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M. SCORPIOIDES, the **MOUSE-EAR**, is a native of Britain, growing naturally in dry fields, and on the margins of springs and rills. It has naked seeds, and the points of the leaves callous. It varies considerably in different situations.

MYOSURUS, **MOUSE-TAIL**; in botany, a genus of the polygynia order, and pentandria class of plants; natural order, Multisiliqua. Calyx five-leaved, the leaves cohering at the base; nectaria five, subulated, resembling petals; seeds numerous. It has but one species.

MYOMUS, the **DORMOUSE**, in zoology, a genus of quadrupeds of the order glires; formerly included by Linnaeus under the genus *Mus*. There are two fore-teeth in each jaw; upper ones cuneated, under compressed; whiskers long; tail hairy, and round, growing thicker towards the extremity; fore and hind-legs of equal length; fore-feet with four toes. There are four species.

M. DRYAS, the **WOOD DORMOUSE**, is of a reddish brown or tawny grey colour on the upper, and a dirty white on the under parts of the body; having a black line from ear to ear across the eyes. See plate C.

M. GLIS, the **HOARY DORMOUSE**, is of a pale ash-colour on the upper parts of the body, and whitish on the under; and is about the size of the common squirrel, but thicker in the body. It inhabits France, the S. of Europe, and the S. W. of Russia about the Volga. This animal, which is the *glis* of Aristotle, *μυογλής* of Opius, and *glis* of Pliny, was held in great esteem among the Romans, as a luxurious delicacy: they were fed in places called *gliraria*, constructed for the purpose, and they are still eaten by the modern Italians. It forms a nest in the hollow of some tree, in which it sleeps all day; feeds in the night on nuts, walnuts, the seeds of apples, &c. and grows very fat in autumn.

M. MUSCARDINUS, the common **DORMOUSE**, is about the size of the domestic mouse, but of a plumper appearance; the nose is more blunt; the head, sides, belly, and tail, are of a tawny red colour, the throat white.

MYRIAGRAMME, **MYRIALITRE**, and **MYRIAMETRE**, terms used in the new French system of measures. See **MEASURE**, **MILLIGRAMME**, **MILLILITRE**, &c.

MYRIARE, and **MYRIASTERE**, terms used in the new French system of measures. See **MEASURE**, **MILLIARE**, &c.

MYRICA, **GALE**, or **SWEET-WILLOW**; in botany, a genus of the tetrandria order, and diœcia class of plants; natural order, Amentaceæ. Ament with a crescent-shaped scale; corolla none: female, styles two; berry one-seeded. There are nine species of this plant.

M. CERIFERA, **WAX-BEARING MYRICA**, or **CANDLEBERRY MYRTLE**, is a native of North America. It is a small tree about 10 or 12 feet high, with crooked stems branching forth near the ground irregularly. The leaves grow irregularly on them all round; sometimes by pairs, sometimes alternately; but generally at unequal distances. They are of a lanceolated figure; and some are serrated at the top, while others have their edges wholly entire. There are both male and female trees of this species; the flowers are small, of a whitish colour, and make no figure; neither does the fruit, which is a small, dry, blue berry; though produced in clusters, make any show. It is from the leaves this tree receives its beauty and value; for these being bruised, with the bark of the young shoots, emit the most delightful and refreshing fragrance, exceeded by no myrtle, or any other aromatic shrub. A variety of this species grows in Carolina, where the inhabitants collect from its berries a wax of which they make candles; whence it is called the candleberry-tree. It delights in a moist soil. The wax is procured in the following manner: In November and December, when the berries are ripe, a man with his family will remove from home to some island or sand-bank near the sea, where these trees most abound, taking with them kettles to boil the berries in. He builds a hut with palmetto-leaves for the shelter of himself and family during his residence there, which is commonly four or five weeks. The man cuts down the trees, while the children strip off the berries into a pot; and having put water to them, they boil them till the oil floats, which is then skimmed off into another vessel. This is repeated till no more oil appears. When cold, this hardens to the consistence of wax, and is of a dirty green colour. Then they boil it again, and clarify it in brass-kettles; which gives it a transparent greenness. These candles burn a long time, and yield a grateful smell. They usually add a fourth part of tallow which makes them burn clearer. See Plate XCIX.

M. COMMUNIS, the **GALE**, **DUTCH MYRTLE**, or **SWEET WILLOW**, grows naturally upon bogs in many places both of Scotland and England. It rises about four feet high, with many shrubby stalks, which divide into several branches, garnished with stiff spear-shaped leaves of a light yellowish green, smooth, and a little sawed at their points. The female flowers or catkins are produced from the sides of the branches, growing upon separate plants from the male, which are succeeded by clusters of small berries, each having a single seed. The leaves, flowers, and seeds, of this plant, have a strong fragrant smell, and a bitter taste. They are used for destroying moths and cutaneous insects; internally, in infusions, as a stomachic and vermifuge; and as a substitute to hops for preserving malt-liquors, which they render more inebriating; it is said that this quality is destroyed by boiling. Both these species may be propagated by seeds or layers.

MYRMECLA, a genus of the class and order tetrandria monogynia. Calyx tubular, five-toothed; corolla one-petaled; germ five glands at the base; stigma bilamellate; capsule two-valved. There is one species, a shrub of Guiana.

MYRIOPHYLLUM, **WATER MILFOIL**; in botany, a genus of the polyandria order, and monœcia class of plants: natural order Inundata. Male calyx tetraphyllous; no corolla; stamina eight: the female calyx tetraphyllous; pistils four; no style; seeds four, naked. It has two species.

MYRISTICA, the **NUTMEG-TREE**; in botany, a genus of plants of the class diccia, and order syngenesia; natural order, Lauri. There are three species, having several varieties.

M. FATUA, the **WILD NUTMEG**, grows in Tobago, and rises to the height of an apple-tree; has oblong, lanceolated, downy leaves, and hairy fruit: the nutmeg of which is aromatic, but when given inwardly is narcotic, and occasions drunkenness, delirium, and madness, for a time.

M. MOSCHATA, the **NUTMEG-TREE**, attains the height of 30 feet, producing numerous branches which rise together in stores, and are covered with bark, which on the trunk is a reddish brown, but that on the young branches is of a bright green colour. The leaves are nearly elliptical, pointed, undulated, obliquely nerved, on the upper side of a bright green, on the under whitish, and stand alternately upon footstalks: the flowers are small, and hang upon slender peduncles, proceeding from the axillæ of the leaves: they are both male and female upon separate trees. **M. De La Marck** has described and figured this and other species of the myristica with tolerable accuracy. See Plate XCIX. A sprig with fructification. *a.* The drupe bursting open. *b.* The full-grown fruit cut lengthways. *c.* The nutmeg enveloped with its covering mace. *d.* The fatty membrane or mace spread out. *e.* The nutmeg. *f.* The same with its external tegument removed at one end. The kernels, called nutmegs, are well known, and have been long used both for culinary and medical purposes. Distilled with water, they yield a large quantity of essential oil, resembling in flavour the spice itself; after the distillation, an insipid sebaceous matter is found swimming on the water; the decoction inspissated, gives an extract of an unctuous, very slightly bitterish taste, and with little or no astringency. Rectified spirit extracts the whole virtue of nutmegs by infusion, and elevates very little of it in distillation; hence the spirituous extract possesses the flavour of the spice in an eminent degree. Nutmegs, when heated, yield to the press a considerable quantity of limpid yellow oil, which on cooling concretes into a sebaceous consistence. In the shops we meet with three sorts of unctuous substances, called oil of mace, though really expressed from the nutmeg. The best is brought from the East Indies in stone-jars; this is of a thick consistence, of the colour of mace, and has an agreeable fragrant smell; the second sort, which is paler coloured, and much inferior in quality, comes from Holland in solid masses, generally flat, and of a square figure: the third, which is the worst of all, and usually called common oil of mace, is an artificial composition of sebum, palm-oil, and the like, flavoured with a little genuine oil of nutmeg. When the fruit is ripe, the natives ascend the trees, and gather it by pulling the branches to them with long hooks. Some are employed in opening them immediately, and in taking off the green shell or first rind, which is laid together in a heap in the woods, where in time it putrefies. As soon as the putrefaction has taken place, there spring up a kind of mushrooms, called boleti moschatyni, of a blackish colour, and much valued by the natives, who consider

them as delicate eating. When the nuts are stripped of their first rind they are carried home, and the mace is carefully taken off with a small knife. The mace, which is of a beautiful red, but afterwards assumes a darkish or reddish colour, is laid to dry in the sun for the space of a day, and is then removed to a place less exposed to his rays, where it remains for eight days, that it may soften a little. They afterwards moisten it with sea-water, to prevent it from drying too much, or from losing its oil. They are careful, however, not to employ too much water, lest it should become putrid, and be devoured by the worms. The medicinal qualities of nutmeg are esteemed aromatic, anodyne, stomachic, and restringent; and it has been much used in diarrhoeas and dysenteries. To many people the aromatic flavour of nutmeg is very agreeable; they however should be cautious not to use it in large quantities, as it is apt to affect the head, and even to manifest an hypnotic power, in such a degree as to prove dangerous. **Bontius** speaks of this as a frequent occurrence in India; and **Dr. Culien** relates a remarkable instance of this soporific effect, which fell under his own observation, and hence concludes that in apoplectic and paralytic cases this spice may be very improper. He observes, that a person by mistake took two drachms or a little more of powdered nutmeg: he felt it warm in his stomach, without any uneasiness; but in about an hour after he had taken it he was seized with a drowsiness, which gradually increased to a complete stupor and insensibility; and not long after he was found fallen from his chair, lying on the floor of his chamber in the state mentioned. Being laid a-bed he fell asleep; but waking a little from time to time, he was quite delirious; and he thus continued alternately sleeping and delirious for several hours. By degrees, however, both these symptoms diminished; so that in about six hours from the time of taking the nutmeg he was pretty well recovered from both. Although he still complained of head-ach, and some drowsiness, he slept naturally and quietly the following night, and next day was in his ordinary health. Mace possesses qualities similar to those of the nutmeg, but is less astringent, and its oil is supposed to be more volatile and acrid. Nutmeg-trees grow in several islands in the eastern ocean. The wood-pigeon of the Moluccas is a great planter of these trees. The Dutch long monopolized the trade.

MYRMECOPHAGA, the **ANT-BEAR**, in zoology, a genus of quadrupeds of the order bruta. No teeth in the mouth; tongue long, cylindrical; head terminating in a long snout or muzzle; body covered with pretty long hair. There are six species, viz.

M. CAPENSIS, the **CAPE ANT-BEAR**, has four claws on the fore-paws; a long snout; large pendent ears; and a tail, which is shorter than the body, and taper at the point. It inhabits the country at the Cape of Good Hope.

M. DIDACTYLA, the **LITTLE ANT-BEAR**, hath a conic nose bending a little down; ears small, and hid in the fur; two hooked claws on the fore-feet, the exterior being much the largest; four on the hind-feet; the head, body, limbs, and upper part and sides of the tail, covered with long soft silky hair, or rather wool, of a yellowish brown colour; from the nose to the tail it measures $7\frac{1}{2}$ inches; the tail $8\frac{1}{2}$, the last four inches of which on the under side are naked. It is thick at the base, and tapers to a point. It inhabits Guinea, climbs trees in quest of a species of ants which build their nests among the branches: and has a prehensile power with its tail.

M. JURATA, the **GREAT ANT-BEAR**, has a long slender nose, small black eyes; short round ears; a slender tongue two feet and an half long, which lies double in the mouth; the legs slender; four toes on the fore-feet, five on the hind; the two middle claws on the fore-feet very large, strong, and hooked; the hair on the upper part of the body is half a foot long, black mixed with grey; the fore-legs are whitish, marked above the feet with a black spot; the tail is clothed with very coarse black hair a foot long; the length from the nose to the tail about four feet; the tail two feet and an half. This animal inhabits South America, and the kingdom of Congo in Africa. It covers it-self with its tail when asleep and to guard against rain. Its flesh is eaten by the natives of America. At a distance it has the appearance of a fox, and therefore some travellers have called it the American fox. He has strength sufficient to defend himself from a large dog, or even from the jaguar or Brazilian cat. When attacked, he at first fights on end,

ent, and, like the bear, annoys his enemy with the claws of his fore-feet, which are very terrible weapons. He then lies down on his back, and uses all the four feet, in which situation he is almost invincible; and continues the combat to the last extremity. Even when he kills his enemy, he quits him not for a long time after. He is enabled to resist better than most other animals, because he is covered with long bushy hair; his skin is remarkably thick; his flesh has little sensation; and he is very tenacious of life. See Plate C.

M. TETRADACTYLA, the **MIDDLE ANT-BEAR**, has four toes on the fore-feet, and five on the hind; the length from the nose to the tail one foot seven inches, and the tail 10 inches. It inhabits South America. See Plate C.

MYRMELEO, the **ANT-LION**, in zoology, a genus of insects of the neuroptera order. Mouth with a horny, acute mandible and jaw; feelers six; antennae thicker at the tip; wings deflected; tail of the male armed with a forceps, composed of two straight filaments. There are sixteen species.

M. FORMICALEO, the **ANT-EATER**. The perfect insect is oblong, and of a brown colour. Its head is broad, with two large eyes on the sides, and two antennae beneath. The neck is rather long, cylindrical, and narrower than the head. This insect in its complete or fly-state, bears a great resemblance to a small dragon-fly, from which it may be distinguished by its antennae. It is not found in this country, but occurs in many parts of the Continent. See Plate LXXVI. In its larva state it is very fond of ants, which it hunts after, whence its name. The larvæ proceed from the eggs which the perfect insect had deposited in very fine dry sand, in a place sheltered from rain, either within a cleft of a wall or of the ground, or at the foot of a wall generally exposed to the south sun. There they are hatched, and make their usual abode. Their colour is grey, and their body, which is covered with small protuberances, is of an oval form. The posterior extremity terminates in a point, and is of use to sink down into the sand; for it only walks retrogressively, though furnished with six feet. Before the head is placed a dentated forceps, sharp and hollow within, with which the creature catches and sucks flies and other insects, but especially ants. This forceps serves as a mouth or rostrum, as well as for an offensive weapon. The animal's retrograde march not allowing it to run after the insects on which it is to feed, it uses a stratagem. It dives down into the sand, and turning about in a circle, hollows out concentric furrows, gradually deeper and deeper, casting at a distance with its horns the sand it takes from that place. Thus it digs a hole in shape like a funnel, at the bottom of which it takes its station, concealed in the sand, nothing but the open extended forceps appearing above it. Mischief overtakes every insect that happens to fall into that hole. The myrmelion, who is apprised of it by the grains of sand rolling down to the bottom, overwhelms him with a shower of dust, which it ejects with its horns, then drags the insect to the bottom of the hole, where it seizes him with its forceps, and sucks its vitals. It does not even spare other myrmelions, who in their motions to and fro chance to fall into it. When the larva is come to its full growth, it digs no more holes; it moves backwards and forwards, tracing irregular furrows on the sand, and at length spins itself a cod, shaped like a ball, the outer part of which is formed of the sand in which it lived, and the inward is lined with fine white silk. Within this cod it turns to a chrysalis, which is curved into a semicircle, and wherein may be distinguished all the parts of the perfect insect that is to issue from it. It is more oblong than the larva, but much shorter than the perfect insect. After a certain period, the chrysalis casts off its slough, turns to a winged insect, and breaks through the cod in order to take its flight. A figure of the *M. barbarus* is given in Plate LXXVI.

MYRMIDONES, or **MYRMIDONS**, in antiquity, a people on the S. borders of Thessaly, who accompanied Achilles to the Trojan war. They received their name from Myrmidon, a son of Jupiter and Eurymedusa, who married one of the daughters of Aeolus, son of Hellen. His son Actor married Aegina the daughter of Asopus. He gave his name to his subjects, who dwelt near the river Peneus in Thessaly. According to some, the Myrmidons received their name from their having arisen from ants or pismires, upon a prayer put up for that purpose by king Aeacus to Jupiter, after his kingdom had been despoiled by a severe pestilence. According to Strabo, they received it from their industry, because they imitated the diligence of the ants, and like them

were indefatigable, and were continually employed in cultivating the earth.

MYRMILLONES, a species of gladiators at Rome, who fought against the Retarii. Their arms were a sword, head-piece, and shield. On the top of the head-piece they wore a fish-embossed, called *Myrmex*, whence their name is supposed to be derived.

MYROBALANS, [from *myrr*, ointment, and *balans*, an acorn,] a kind of medicinal fruit brought from the Indies, of which there are five kinds. They are all slightly purgative and astringent.

MYRODENDRUM, a genus of the class and order polyandria monogynia. Corolla five-petaled; stigma, capitate, five-lobed; pericarpium five-celled. There is one species, a tree of Guiana.

MYRODIA, a genus of the monadelphia polyandria class and order. Calyx, single one leaved; corolla five-petaled; pistil one column of anthers undivided; drupe dry, two nuts. There are two species, shrubs of the West Indies.

MYROSLA, a genus of the monandria monogynia class and order. Calyx double, outer three leaved, inner three-parted; corolla five-parted; capsule three-cornered. There is one species, a shrub of Surinam.

MYROXYLON, a genus of the monogynia order, and decandria class of plants. Calyx superior, petals five, one larger than the rest; germ longer than the corolla; legume one-seeded. There is but one species; viz.

M. PERUIFERUM, a native of Peru and the warmer parts of America. This shrub yields the balsam of Peru, which is extracted from it by coction in water. This balsam, as brought to us, is nearly of the consistence of thin honey, of a reddish brown colour, inclining to black, an agreeable aromatic smell, and very hot biting taste. Distilled with water, it yields a small quantity of a fragrant essential oil of a reddish colour, and in a strong fire, without addition, a yellowish red oil. Balsam of Peru is a very warm aromatic medicine, considerably hotter and more acrid than copaiva. Its principal effects are to warm the habit, to strengthen the nervous system, and attenuate viscid humours. Hence its use in some kinds of asthmas, gonorrhoeas, dysenteries, and disorders proceeding from a debility of the solids or a sluggishness and inactivity of the juices. It is also employed externally, for cleansing and healing wounds and ulcers, and sometimes against palsies and rheumatic pains. There is another sort of balsam of Peru of a white colour, and considerably more fragrant than the former. This is very rarely brought to us. It is said to be the produce of the same plant which yields the common or black balsam, and to exude from incisions made in the trunk, while the former is obtained by boiling.

MYRRH, [*myrrha*, Lat. *myrrhe*, Fr.] a gummy, resinous, concrete juice, obtained from an oriental tree. It comes to us in globes or drops, of various colours and magnitudes. The best sort is somewhat transparent, friable, in some degree unctuous to the touch; its reddish yellow colour is often streaked internally with whitish semicircular or irregular veins. There are sometimes found among it hard shining pieces, of a pale yellowish colour, resembling gum-arabic, of no taste or smell; sometimes masses of bdellium, darker coloured, more opaque, internally softer than the myrrh, and differing from it both in smell and taste. It was this gum which was mingled with the wine given to our Lord to drink at his passion, to deaden his pains, and produce a stupor (See Mark xv. 23.) The gall mentioned on the same occasion by St. Matthew is probably the same with myrrh; for any thing bitter was usually distinguished by the name of gall. The Hebrews were accustomed to give those that were executed some stupefying draught. The difficulty which arises from the seeming difference betwixt the two evangelists, by some is solved by saying, that St. Matthew, writing in Syriac, made use of the word marra, which signifies "myrrh, bitterness, or gall;" but the Greek translator has taken it for gall, and St. Mark for myrrh. Others will have it, that our Saviour's drink was mingled with myrrh, as a stupefying drug; but suppose that the soldiers, out of wanton cruelty, infused gall; which was the reason, why, when he had tasted, he refused to drink. The ancients reckoned two kinds of myrrh: the one liquid, which they called stacte or starte; the other was solid, and went by the name of troglodyte myrrh. The medical effects of this aromatic bitter are to warm and strengthen the viscera: it frequently occasions a mild diaphoresis, and promotes the fluid secretions in general. Hence

He. ce it proves serviceable in languid cases, diseases arising from simple inactivity, those female disorders which proceed from a cold, mucous, sluggish indisposition of the humours, suppressions of the uterine discharges, cachectic disorders, and where the lungs and thorax are oppressed by viscid phlegm.

MYRRHA, in fabulous history, the daughter of **CINYRAS**, and mother of **ADONIS**. See these articles.

MYRSINE, **AFRICAN BOX-TREE**; in botany, a genus of the monogynia order, and pentandria class of plants; natural order, **Bicornes**. Corolla half-five-cleft, converging; germ filling the corolla; berry one-seeded, with a five-celled nucleus. There are two species.

MYRTIFORM, in anatomy, is applied to several parts, from their resembling myrtle-berries.

MYRTLE, in botany. See **MYRTUS**.

MYRTOUM MARE, a part of the **Ægean sea**, lying between **Eubœa**, **Peloponnesus**, and **Attica**.

MYRTUS, the **MYRTLE**; in botany, a genus of the monogynia order, and icosandria class of plants; natural order, **Hesperideæ**. Calyx quinquefid, superior; petals five; berry two or three seeded. There are 36 species composed of shrubs and small trees.

M. COMMUNIS, the **COMMON MYRTLE-TREE**, rises with a shrubby, upright, firm stem, branching numerously all around into a close full head, rising eight or ten feet high; very closely garnished with oval, lanceolate, entire, mostly opposite leaves, from half an inch to an inch and a half long, and one broad, on short foot-stalks; and numerous, small, pale flowers from the axillæ, singly on each footstalk, having diphyllous involucrems; each flower succeeded by a small, oval, dark purple berry. This species has many varieties.

M. PIMENTA, **PIMENTO**, **JAMAICA PEPPER**, or **ALL-SPICE-TREE**, grows above thirty feet in height and two in circumference; the branches near the top are much divided and thickly beset with leaves, which by their continual verdure always give the tree a beautiful appearance; the bark is very smooth externally, and of a grey colour; the leaves vary in shape and in size, but are commonly about four inches long, veined, pointed, elliptical, and of a deep shining green colour; the flowers are produced in bunches or panicles, and stand upon subdivided or trichotomous stalks, which usually terminate the branches; the calyx is cut into four roundish segments; the petals are also four, white, small, reflex, oval, and placed opposite to each other between the segments of the calyx; the filaments are numerous, longer than the petals, spreading, of a greenish white colour, and rise from the calyx and upper part of the germen; the antheræ are roundish, and of a pale yellow colour; the style is smooth, simple, and erect; the stigma is obtuse; the germen becomes a round succulent berry, containing two kidney-shaped flatish seeds. See **PLATE XCIX**. This tree is a native of New Spain and the West Indian islands. In Jamaica it grows very plentifully; and in June, July, and August, puts forth its flowers, which, with every part of the tree, breathe an aromatic fragrance. The berries when ripe are of a dark purple colour, and full of a sweet pulp, which the birds devour greedily, and muting the seeds, afterwards propagate these trees in all parts of the woods. It is thought that the seeds passing through them, in this manner, undergo some fermentation, which fits them better for vegetating than those gathered immediately from the tree. The pimento is a most beautiful odoriferous ever-green, and exhibits a fine variety in the stove at all seasons. It flowers with great beauty and luxuriance.

MYRIA, a country of Asia Minor, generally divided into Major and Minor.

1. **MYRIA MAJOR** had **Æolia** on the S. the **Ægean Sea** on the W. and **Phrygia** on the N. and E. Its chief cities were **Cyzicum**, **Lampsacus**, &c.

2. **MYRIA MINOR** was bounded on the N. and W. by the **Propontis** and **Bithynia**, and **Phrygia** on the N. and S. borders.

MYSON, a native of Sparta, one of the seven wise men of Greece. When **Anacharsis** consulted the oracle of **Apollo**, to know which was the wisest man in Greece, he received for answer, he who is now plowing his fields. This was **Myson**.

MYSOORE, or the **MYSOOREAN DOMINIONS**, a kingdom of Asia, in the East Indies, consisting of the territories usurped or subdued by **Hyder Ali**, and transmitted to his son **Tippoo Saib**, the late sultan: from whom they were taken by the British in 1799. They

consist of nine provinces; viz. 1. **Mysore Proper**. 2. **Bedenore**, or **Ikeri**, now **Hydernagur**, conquered by **Hyder** between 1763 and 1765. 3. **Soonda**, extending to the frontiers of **Goa**, along a sea-coast of 60 miles. 4. **Malabar**, conquered by **Hyder** in 1765-6, stretching along the shore from **Declah S.** to **Cochin** about 200 miles, and comprehending, in an area of perhaps 6000 square miles, the Sanery's territory of **Calicut**, with the petty states of **Cartinad**, **Cotiotie**, **Cherica**, or **Cananore**, on the N. and the tributary kingdom of **Cochin** on the S. 5. **Barah Mahl**, or twelve pergunnahs, was one of the earliest annexations of **Hyder** to the Mysorean dominion, though in the war of 1768 it was over-run and for a while in possession of the company's troops. 6. Petty states of **Hindoo rajahs**, situated on the W. and N. of the **Hendery** and **Tumbhudra** rivers, to the confines of **Goa**, and the **Marhattah** territories of **Toorgul**, **Raibang**, and **Meritch**, forming the jagheer of **Purseram Bow** beyond the S. branch of the **Kistnah**. 7. **Carnatic Balagaut Bejapoor**, consisting, under the **Mogul**, of one circar of the same name, and of which the capital was **Serah**. It comprehended 51 pergunnahs, of which **Bangalore**, **Colar**, &c. on the S. were seized by **Hyder** immediately when he possessed himself of **Mysore**. 8. **Carnatic Balagaut Hydrabad**, comprehending the five circars of **Sidhout**, **Kahnam**, **Gaujecottah**, **Gooty**, and **Gorunkonda**, which were subdivided into 66 pergunnahs. 9. **Adoni** or circar of **Intiazghur** on both sides of the **Hendery**, S. of the **Tumbhudra** or **Tungabuda** river, as far as and inclusive of **Bellary**, together with a small portion of the circar of **Ghazipur** or **Nundial**, dismembered from the nabobship of **Karnool**, all situated in the **soubah** of **Bejapour**, comprehend the whole of the late **Tippoo's** conquests and annexation to the Mysorean empire, acquired since the death of **Hyder**, and subsequently to the treaty of **Mangalore** in 1784.

MYSOORE PROPER, called also **SEKINGPATAM** from its capital, forming the independent state of a **Hindoo rajah** for near 200 years from its dismemberment, as a province of the **Bejenagur** empire, fell into the hands of **Hyder Ali** about 1763, by cutting off the **Dalaway**, or regent usurper of the government, and seizing the reins of administration himself; but without leaving even the shadow of any authority to a nominal rajah of his own creation, excepting in the formularies of justice or finance, and preserving on one side of the pagoda coin the impression of two swamies or divinities of the **Hindoos**, while the other was made to bear the initial letter of his proper name **Hyder**. The whole country, when reduced into the form of a province dependent on the Mysorean dominion of **Tippoo**, is bounded on the W. by the **Balagaut hills** of **Koork**, and those called **Anemally**, bordering the whole coast of **Malabar**; on the E. it borders with the **Carnatic Payengaut** and its dependencies along the **Coromandel coast**; and, on the N. with the pergunnahs of **Serah**, **Bangalore**, and **Colar**, belonging to the **Carnatic Balagaut-Bejapour**, in a longitudinal line little short of 200 English miles. From this latter boundary, in a form nearly triangular, it stretches 240 miles towards the S. where it terminates in a point at the extremity of **Dindigul**, near the pass of **Goodalore**, through the **Anemally hills**, on the confines of **Travancore**, and within 100 miles of **Cape Comorin**.

MYSTAGOGICA, in the ancient church, the higher part of instruction given to those already initiated, and who had undergone the catechesis. See **CATECHESIS**.

MYSTAGOGUE, [*μυσταγωγος*], one who interprets divine mysteries; also one who keeps church-relics, and shews them to strangers.

MYSTAGOGUES, in the heathen mysteries. See **MYSTERIES**.

MYSTERY, in its modern acceptation, imports something above human intelligence, something awfully obscure and enigmatical; any thing artfully made difficult; the secret of any business or profession. The word *μυστήριον* is evidently deduced from *μύσσειν*; which comes from *Mistar*, or *Mistur*, [*Heb. מִסְתָּר*], any place or thing hidden or concealed. The pagan religion was full of mysteries. The avarice and ambition of the pagan priests doubtless gave birth to the institution of them. The ministers of that superstition alleged that some articles of their ritual were too profound to be understood by the vulgar; others too sacred to be communicated to men in a situation subordinate or contemptible. Things sacred and venerable, they alleged, would contract a taint and pollution by an intercourse with untutored souls. These were

were the ostensible motives for making that odious distinction between the popular religion and that contained in the sacred and mysterious ritual. Of all the legislators of antiquity, the Cretan alone was prudent enough to see the absurdity of this, and to adopt a liberal plan. Diodorus the Sicilian informs us, that the mysteries of Eleusis, Samothracia, &c. which were elsewhere buried in profound darkness, were among the Cretans taught publicly, and communicated to all the people. Minos, however, was a successful legislator, and his pretended intercourse with Jupiter Idæus extended his influence, and established his authority. He was therefore not under the necessity of calling in the mysteries to his assistance. Mysteries were the offspring of Egyptian priestcraft. They were instituted with a view to aggrandise that order of men, to extend their influence, and enlarge their revenues. To accomplish these objects, they applied every engine to besot the multitude with superstition and enthusiasm. They taught them, that themselves were the distinguished favourites of heaven; and that celestial doctrines had been revealed to them, too holy to be communicated to the profane vulgar, and too sublime to be comprehended by them. After the mysteries were instituted, and had acquired a high reputation, legislators, magistrates, judges, and monarchs, joined in the imposture, with the same views. Priests and princes were actuated by the same spirit. The combination was equally advantageous to both. The celebrated Mosheim is of opinion, that the mysteries were entirely commemorative; that they were instituted to preserve the remembrance of heroes and great men, who had been deified in consideration of their martial exploits, useful inventions, public virtues, and the benefits conferred on their contemporaries. In opposition to this singular opinion, it may be urged, that the method of preserving the memory of great and illustrious men, generally adopted, was the establishing festivals, celebrating games, offering sacrifices, singing hymns, dances, &c. We can recollect no secret mysteries, instituted for that purpose, at least in their original intention. The mysteries were performed in secret; they were intended to be communicated only to a few; of course, had they been instituted to immortalize the memory of heroes and great men, the authors would have acted the most foolish and inconsistent part imaginable. Instead of transmitting the fame of their heroes with éclat to posterity, they would thus have consigned it to eternal oblivion. The mysteries were therefore the offspring of bigotry and priestcraft; they originated in Egypt, the native land of idolatry. In that country the priesthood ruled predominant. The kings were ingrafted into their body before they could ascend the throne. They were possessed (says Diodorus the Sicilian,) of a third part of all the land of Egypt. All the orientals, but especially the Egyptians, delighted in mysterious and allegorical doctrines. Every maxim of morality, every tenet of theology, every dogma of philosophy, was wrapt up in a veil of allegory and mysticism. This propensity conspired with avarice and ambition to dispose them to a dark and mysterious system of religion. The Egyptians (says Plutarch) were a gloomy race of men; they delighted in darkness and solitude. Their sacred rites were generally celebrated with melancholy airs, weeping, and lamentation. This gloomy bias must have stimulated them to a congenial mode of worship. Both the nature of the institution and the genius of the people confirm this position; and historians, ancient and modern, declare the fact. The rites of Osiris were performed with loud shrieks and lamentations when he was put into the coffin; and with the most extravagant mirth, when he was raised from the dead, or supposed to be found again. Their hymns were always composed in melancholy affecting strains; and consisted of lamentations for the loss of Osiris, the mystic flight of Bacchus, the wandering of Isis, and the sufferings of the gods. The Canaanites, who were kindred to the tribe of the Mizraim or Egyptians, imitated them in their sacred rites. At Byblus, Berytus, Sidon, and Tyre, they used mournful dirges for the death of Adonis or Tammuz, who was the same with the Egyptian Osiris, *i. e.* the sun. The Egyptians, then, instituted a mode of worship congenial with their natural gloomy disposition. The recess of the sun towards the southern hemisphere was the death of Osiris; the wanderings of Isis, in search of her husband and brother, allegorically imported the longings of the earth for the return of the fructifying influences of the solar heat. When that luminary returned towards the summer-solstice, and grain, trees, fruits, herbs, and flowers, adorned the

face of nature, another festival was celebrated of a different complexion. All Egypt was dissolved in the most extravagant mirth and jollity. During the celebration of these festivals, the priests formed allegorical representations of the sun and the earth. They personified both, and allegorized their motions, aspects, relations, accessions, recesses, &c. into real adventures, peregrinations, sufferings, contests, battles, victories, defeats, &c. These, in time, were held as real occurrences; and became essential articles of the popular creed. From this source were derived the conquests of Dionysus or Bacchus, so beautifully exhibited by Nonnus in his *Dionysiaca*; the wanderings of Io, wonderfully adorned by Æschylus, &c. Whether the Egyptians deified mortal men in the earliest ages has been much controverted. Jablonski endeavours to prove the negative. Plutarch tells us that Isis, Osiris, Horus, Anubis, and Typhon, were once mortal persons, who were exalted into demons after their death. Diodorus, in his history of Isis and Osiris, Pan, Hermes, &c. represents them as human personages; and says, that the Egyptians imagined, that after their decease they transmigrated into stars. From these authorities, we may believe that the Egyptians deified those who had distinguished themselves by prowess, wisdom, arts, and inventions. This was a constant practice among the Greeks. The exploits of those heroes had been disguised by allegorical traditions. They had been magnified beyond all dimensions, to astonish and intimidate the vulgar, and to gratify their propensity towards the marvellous. All these secrets were developed in the mysteries. The catechumens were informed of every particular relating to the birth, the life, the exploits, the adventures, misfortunes, and decease, of those heroic personages. The magicians of Egypt were abundantly qualified for exhibiting angels in machines. The souls of virtuous men, who had not been eminent enough to merit the honour of deification, were shewn in all the perfection of Elysian felicity; and the souls of tyrants, and of the children of Typhon, (the devil of the Egyptians) were shewn in Tartarus, suffering all the extremes of infernal punishment. From these exhibitions the mystagogues took occasion to read their pupils suitable lectures on the happy tendency of a virtuous conduct, and the misery consequent upon a contrary course. They set before them immortal renown, deification, and elysium, on the one hand, and eternal infamy and misery on the other. This may be deemed the chief advantage accruing from this institution. The catechumens were also taught many secrets of physiology. This Pharnutius every where affirms, especially in his last book *De Nat. Deor.* towards the end. Plutarch too says, that most of the Egyptian fables were allegorical details of physical operations. Eusebius acquaints us, that the physiology, not only of the Greeks, but likewise that of the barbarians, was nothing but a science of nature, a concealed and dark theology, involved in fable, whose hidden mysteries were so veiled over with allegories, that the ignorant million were as little capable of comprehending what was said, as what was suppressed in silence. Dionysius of Halicarnassus says, that the fables of the Greeks detail the operations of nature by allegories. Proclus makes the same observation. The Egyptians, says he, taught the latent operations of nature by fables. These physiological secrets were expounded to the initiated; and that the Egyptian priests were deeply skilled in physiological science, can scarcely be questioned, when we are told that Jannes and Jambres rivalled Moses with their enchantments. But the vulgar were excluded from all those secrets which were reserved for the nobility and sacerdotal tribes. These allegorical traditions originated in Egypt. It was the general bias of the oriental genius. The Egyptians, however, were the greatest proficient in that science. The original subjects of these institutions were the articles specified above: but in process of time numerous new rites, ceremonies, usages, and even doctrines, were superinduced, which were utterly unknown to the original hierophants, or officiating priest. Their subjects were at first simple and easy to be comprehended; in time they became complex, intricate, and unintelligible. To celebrate those mysteries with the greater secrecy their temples were so constructed as to favour the artifice of the priests. The fanes in which they performed their rites and ceremonies, were subterraneous apartments, constructed with such wonderful dexterity, that every thing that appeared in them breathed an air of solemn secrecy. Their walls were covered with hieroglyphic paintings and sculpture, and the altar was situated in the centre of the apartment. Modern travellers

travellers have discovered vestiges of them, and Nardon, Shaw, Pococke, &c. describe those dark abodes. In those subterranean mansions, which the priests had planned with the most consummate skill, the kings, princes, and great men of the state, encountered the dangers and hardships contrived to prove their prudence, fortitude, patience, abstinence, &c. These were appointed to try their merit; and by these the hierophants decided whether they were duly qualified. Upon such occasions those magical tricks were exhibited, for which the magicians of Egypt were so much celebrated. The strange and astonishing sights, the alternate successions of light and darkness, the hideous spectres, the frightful howlings re-echoed by these infernal domes, the scenes of Tartarus and Elysium, exhibited alternately and in quick succession, must have made a deep and lasting impression on the mind of the affrighted votary. From the scenes exhibited in the Egyptian mysteries, especially those of Isis and Osiris, the Greeks seem to have copied their ideas of the infernal regions, and the subterranean mansions of departed souls. Many colonies of Egyptians settled in Greece. From these the *araboi*, or early bards of Greece, learned them imperfectly. Of course, we find Homer's account of the infernal regions, and of the state of departed souls, lame and incoherent. Succeeding bards obtained more distinct information. Euripides, Aristophanes, Plato, &c. paved the way for Virgil, who borrowed his ideas from all of them. These, under his plastic hand, in the sixth *Æneid*, grew into a system beautiful, regular, uniform, and consistent. The materials were created to his hand; he had only to collect, polish, arrange, and connect them. Egypt was then the native land of mysteries as well as of idolatry. Every god and goddess respectively had their mysteries; but as those of Isis and Osiris were the most celebrated, they became principal objects of pursuit, as well as of imitation, to the neighbouring nations. These were carried into Persia by Zoroaster, or Zerdusht, and consecrated to Mithras. Orpheus imported them into Thrace; Cadmus brought them into Bœotia, where they were sacred to Bacchus. Inachus established them at Argos in honour of Juno; Cyniras in Cyprus, where they were dedicated to Venus. In Phrygia they were sacred to Cybele, the mother of the gods. This progress of the mysteries is rendered the more probable, when we consider, that a great part of Greece was planted with colonies from Egypt, Phœnicia, Palestine, &c. Orpheus, if not an Egyptian, was at least of oriental extraction. Inachus, Cadmus, and Melampus, are universally allowed to have been Egyptians. Erichtheus, in whose reign the Eleusinian mysteries were established, was an Egyptian by birth, or sprung from Egyptian ancestors. The Egyptians, then, in those early ages, did not view the Greeks in the light of aliens, but as a people nearly related either to themselves, or their brethren the Phœnicians. Although every particular deity had his own peculiar mysterious sacred rites, yet Mithras, Osiris, and Ceres, were deemed the most august, and were universally worshipped. Mithras, or, according to the Persian, Mitr, was one of the great gods of the Asiatics. His worship was for many ages confined to Persia. Afterwards it was propagated so far and wide, that some have imagined they had discovered vestiges of it even in Gaul. Mitr, according to Dr. Hyde, signifies love, and likewise the sun. It is by others reckoned a cognate of the Hebrew word *Muthir*, excellence. That there was an analogy between the Hebrew and old Persian, is generally admitted. Mithras was the sun among the Persians; and in honour of that luminary this institution was established. Mithras, according to Plutarch, was the middle god between Oromaz and Ahriman, the two supreme divinities of Persia. But the fact is, the solar planet was the visible emblem of Oromaz, the good genius of the Persian tribes, and the same with the Osiris of the Egyptians. The grand festival of Mithras was celebrated six days, in the middle of the month Mitr, which began Sept. 30, and ended Oct. 30. Zoroaster worshipped Mithras, or the Sun, in a certain natural cave, which he formed into a temple, and filled up in a manner exactly mathematical. There Mithras was represented as presiding over the lower world with all the pomp of royal magnificence. In it were the symbols of Mithras and of the world, philosophically and mathematically exhibited. Mithras was sometimes represented as mounted on a bull, which he kills with a sword. On some bas reliefs still existing, he appears as a young man with his tiara turned upward, clothed with a short tu-

nic and breeches, after the Persian fashion, or with a small cloke. Over the cave were seen the chariots of the sun and moon, and divers constellations. In one of those caves the ceremonies of initiation were performed; but before the candidate could be admitted, he was forced to undergo a course of probationary exercises, so numerous and so rigorous, that few had courage and fortitude to go through them. He was obliged to live a life of virtue and abstinence for seven years previous to his initiation. Some months before it, he was obliged to submit to an austere fast of fifty days. He was to retire several days to a deep and dark dungeon, where he was successively exposed to all the extremes of heat and cold. Meantime he frequently underwent the bastinado, which the priests applied without mercy. Some say this fustigation continued two whole days, and was repeated no less than fifteen times. In the course of these probationary exercises, the candidate was generally reduced to a skeleton; and some actually perished in the attempt. Upon the eve of the initiation, the aspirant braced on his armour, to encounter giants and savage monsters. In those spacious subterranean mansions a mock hunting was exhibited. The priests and all the subordinate officers, transformed into lions, tigers, leopards, bears, wolves, &c. assailed him with loud howlings, roaring, and yelling, and every instance of ferine fury. In those mock combats, the hero was often in danger of being really worried, and always came off with bruises and wounds. Lampridius informs us, that when the emperor Commodus was initiated, he killed one of the priests who attacked him in the form of a wild beast. The Persians worshipped Mithras by a perpetual fire: hence the votary was obliged to undergo a fiery trial, by passing seven times through the sacred fire, and each time plunging himself in cold water. Some have made these probationary penances amount to eighty; others only to eight. The candidate, having undergone all these torturing trials with fortitude, was declared a proper subject for initiation. But before his admission he was to bind himself by the most horrible oaths and imprecations, never to divulge an article of all that should be communicated to him. What *amazylia* or ineffable secrets were imparted to the initiated, it is impossible to discover. But we may rest assured, that the traditions concerning the origin of the universe; the nature, attributes, perfections, and operations, of Oromazdes; the baleful influences of Ahriman; and the benign effects of the government of Mithras, were unfolded and inculcated. The phenomena of nature, discovered by the magi, were also exhibited; and the application of their effects, to astonish and deluge the vulgar, were taught. Virtue was warmly recommended, and vice represented in the most frightful colours. Those initiations are mentioned by Lampridius, Justin, and Tertullian. The last of these speaks of a kind of baptism, which washed from the souls of the initiated all the stains they had previously contracted; and mentions a particular mark which was imprinted upon them. There was presented to the initiated a crown suspended on the point of a sword; but they were taught to say, Mithras is my crown; to intimate, that they looked upon the service of that deity as their chief honour. After the Telete, or rites which confer perfection, were finished, the pupil was brought out of the cave or temple, and with great solemnity proclaimed a Lion of Mithras; a title which imported strength and intrepid courage in the service of the deity. They were now consecrated to the god, and were supposed to be under his immediate protection; which animated them to the most daring enterprises. The worship of Mithras was introduced into the Roman empire, towards the end of the republic, where it made very rapid progress. When Christianity began to make a figure in the empire, the champions for paganism proposed the worship of this power of benevolence, to counterbalance that worship which the Christians paid to Jesus Christ, the true Son of righteousness. But this mode was soon abolished, together with the other rites of paganism. The pagan mysteries continued in high reputation to the age of St. Jerome. The emperor Valentinian intended to have suppressed them; but Zozimus says, he was diverted from his design by the proconsul of Greece. At length Theodosius I. prohibited the celebration of these and all the other sacra of Paganism. They had maintained their ground near 2000 years; during which space, the celebration of them never had been interrupted but once. When Alexander the Great massacred the Thebans and raised their city, the Athenians were so much affected with this melancholy event, that they neglected the celebration

celebration of that festival. There were many other mysterious institutions among the ancient Pagans, but the above were the most celebrated. The Samothracian mysteries, instituted in honour of the Cabiri, were likewise of considerable celebrity, and were supposed to confer the same blessings with the Eleusinian, but were not of equal celebrity. The Cabiri were Phœnician and likewise Egyptian deities. Bochart has explained their origin, number, names, and some part of their worship. The Orphic mysteries were likewise famous among the Thracians. Orpheus learned them in Egypt, and they were nearly the same with the Bacchanalia of the Greeks. There were likewise the mysteries of Jupiter Idaeus in great request among the Cretans, and those of Cybele celebrated in Phrygia. To enumerate and detail all these would require a volume.

MYSTERY, under the Jewish and Christian dispensations, is applied to such truths and proceedings as human reason by its own power cannot penetrate. The religion of the Jews is supposed to be full of mysteries. The whole nation, according to St. Augustin, was a mystery, as it represented or was a type of the people of Christ, and the Christian religion. Whatever was commanded or forbidden them was figurative, and their sacrifices, priesthood, &c. included mysteries. The prophecies concerning Jesus Christ in the Jewish books, are likewise figurative and mysterious. The Christian religion has also its mysteries; but in the scripture-language the word mystery is used with some latitude, and denotes whatever is not to be known without a divine revelation, and all the secret things which God has discovered by his ministers the prophets, by Jesus Christ and his apostles. The mysteries of the Christian church are, the incarnation of the Word, the hypostatical union of the divine and human nature, the miraculous birth, death, and resurrection, of the Son of God, the doctrine of the Trinity, &c. See the article INCARNATION, &c. St. Paul often speaks of the mysteries of the Christian religion; as "the mystery of the gospel," "the mystery of the cross of Christ," "the mystery which was kept secret since the world began;" and he calls the preachers of the gospel, the "stewards of the mysteries of God."

MYSTERY, in English antiquity, is a term formerly applied to our dramatic exhibitions. It is well known, says Mr. Percy, in his "Reliques of Ancient English Poetry," that dramatic poetry in this and most other nations of Europe owes its origin, or at least its revival, to those religious shews which in the dark ages were usually exhibited on the more solemn festivals. At those times they were wont to represent in the churches, the lives and miracles of the saints, or some of the more important histories of Scripture. And as the most mysterious subjects were frequently chosen, such as the incarnation, passion, and resurrection, of Christ, &c. these exhibitions acquired the name of mysteries. At first they were probably a kind of dumb shews, intermingled with a few short speeches: at length they grew into a regular series of connected dialogues, formally divided into acts and scenes. Specimens of these, in their most improved state, may be seen in Dodsley's Old Plays, and in Osborne's Harleian Miscellany. As the old mysteries frequently required the representation of some allegorical personage, such as Death, Sin, Charity, Faith, and the like, by degrees the rude poets of those unlettered ages, towards the fifteenth century, began to form complete dramatic pieces, consisting entirely of such personifications. These they intitled moral plays, or moralities. The mysteries were very inartificial, representing the scripture-stories singly according to the letter. But the moralities are not devoid of invention; they exhibit outlines of the dramatic art; containing something of a fable or plot, and even attempting to delineate characters and manners.

MYSTERY, in mathematics. Mathematicians have been accused of introducing mysteries in geometry, which ought to have none. See the *Annalist*; and Mr. Maclaurin's *Fluxions*, in the introduction and other places. See also PARADOX.

MYSTIC, in geography, a river in Massachusetts, which runs into Boston harbour.

MYSTIC. See MYSTICI.

MYSTICAL implies something mysterious or allegorical. Some commentators on the sacred writings, besides a literal find also a mystical meaning. The sense of scripture, say they, is either that immediately signified by the words and expressions in the common use of language; or it is mediate, sublime, typical, and mystical. The literal sense they again divide into proper literal, which is contained in the words taken simply and properly; and metaphorical literal, where the words are to be taken in a figurative and metaphorical sense. The mystical sense of scripture they divide into three kinds: the first corresponding to faith, and called allegorical; (see ALLEGORY); the second to hope, called analogical; the third to charity, called the tropological sense. And sometimes they take the same word in scripture in all the four senses; the word Jerusalem, literally signifies the capital of Judea; allegorically, the church militant; tropologically, a believer; and analogically, heaven. So that passage in Genesis 1. "let there be light, and there was light," literally signifies corporeal light; by an allegory, the Messiah; in the tropological sense, grace; and analogically, beatitude, or the light of glory.

MYSTICI, or MYSTICS, a kind of religious sects, distinguished by their professing pure, sublime, and perfect devotion, with an entire disinterested love of God, free from all selfish considerations. The mystics, to excuse their fanatic ecstasies and amorous extravagancies, allege that passage of St. Paul, "The Spirit prays in us by sighs and groans that are unutterable." Now if the Spirit, say they, pray in us, we must resign ourselves to its motions, and be swayed and guided by its impulse, by remaining in a state of mere inaction. Passive contemplation is that state of perfection to which the mystics all aspire. This mystic science sprung up towards the close of the third century. The authors are not known; but the principles proceeded from the known doctrine of the Platonic school, which was also adopted by Origen and his disciples, that the divine nature was diffused through all human souls, or that the faculty of reason, from which proceed the health and vigour of the mind, was an emanation from God into the soul, and comprehended in it the principles and elements of all truth, human and divine.

MYSTRUM, a liquid measure among the ancients, containing a fourth part of the cyathus, and weighing two drachms and a half of oil, and two drachms two scruples of water or wine. It nearly answers to our spoonful.

MYTENS, MARTIN, painter of portraits and history, was born at Stockholm in 1695, and at 11 years of age shewed an extraordinary genius. His first excursion was to Holland, and from thence he proceeded to London, where he practised miniature and enamel painting. In 1717 he visited Paris, and proved so fortunate as to obtain the favour of the duke of Orleans, and to have the honour to paint the portrait of that prince, and also the portraits of Louis XV. and the Czar Peter. In 1721 he arrived at Vienna; and having with great applause painted the portraits of the emperor, the empress, and the most illustrious persons at that court, during a residence of above two years, he proceeded on his intended journey to Italy. Having visited Venice, and spent two years at Rome; he afterwards settled at Vienna, where he died in 1755.

MYTHOLOGY.

MYTHOLOGY, [*μυθολογια*, from *μυθος*, a fable, and *λογος*, a discourse,] any kind of fabulous doctrine; in its more appropriated sense, it means those fabulous details concerning the objects of worship, which were invented and propagated by men who lived in the early ages of the world, and by them transmitted to succeeding generations, either by written records or by oral tradition.

The theology and mythology of the ancients are therefore almost inseparably connected. With respect to fable, it is a creature of the human imagination, and derives its birth from that love of the marvellous which is congenial to the soul of man. The appearances of nature which every day occur, objects, actions, and events, which succeed each other, seem too familiar and uninteresting

resting to gratify curiosity or to excite admiration. But when the most common phenomena in nature or life are new-modelled by a warm imagination; when they are diversified, compounded, embellished, or arranged into forms which seldom or never occur in the ordinary course of things; novelty generates admiration, a passion always attended with delightful sensations. Here then is the source of fiction and fable. Many circumstances contributed to extend and establish the empire of fable. The legislator laid hold on this bias of human nature, and employed fable and fiction as the most effectual means to civilize a rude world. Philosophers, theologians, poets, musicians, made use of this vehicle to convey their instructions to the savage tribes. They knew that truth, simple and unadorned, is not possessed of charms powerful enough to captivate the heart of man in his present degenerate state. This consideration naturally led them to employ fiction and allegory. Though almost every nation on the globe has fabricated its own system of mythology, the Orientals have distinguished themselves by the boldness, the inconsistency, and the extravagance, of their mythology. The genial warmth of those happy climes, the fertility of the soil, which afforded every necessary, and often every luxury, of life, without great laborious exertions; the face of nature perpetually blooming around them, the skies smiling with uninterrupted serenity; all contributed to inspire the orientals with a glow of fancy and vigour of imagination rarely met with in less happy regions. Hence every object was swelled beyond its natural dimensions. Nothing was great or little in moderation, but every sentiment was heightened with incredible hyperbole. The magnificent, the sublime, the vast, the enormous, the marvellous, first sprung up, and were brought to maturity, in those native regions of fable; and were thence transplanted into the western countries. As the allegorical taste of the eastern nations had sprung from their propensity to fable, so allegory in process of time contributed to multiply fables and fiction almost infinitely. The latent import of the allegorical doctrines being in a few ages lost, what was originally a moral or theological tenet, assumed the air of a personal adventure. The propensity towards personification, almost universal among the orientals, was another fruitful source of fable and allegory. That the people of the east were strongly inclined to personify inanimate objects and abstract ideas, will be readily granted, when it is considered, that in the formation of language they have generally annexed sexes to names. Hence the distinction of grammatical genders, which originated in the eastern parts of the world. The general use of hieroglyphics in the east also contributed largely to extend the empire of mythology. As the import of the figures employed was arbitrary, mistakes must have been often committed in ascertaining what they were intended to represent. When the development of these arbitrary signs was attended with uncommon difficulty, the expounders were obliged to have recourse to conjecture. The wise men of the east delighted in obscure enigmatical sentences. Their dark sayings, often occur in the most ancient records. The sages of antiquity used to vie with each other for the prize of superior wisdom, by propounding riddles, and mysterious questions, as subjects of investigation. The contest between Solomon and Hiram, and that between Amasis king of Egypt and Polycrates tyrant of Samos, are well known. As the import of those enigmatical propositions was often lost, nothing remained but fancy and conjecture, which always verged towards fable. This was another source of mythology. The Pagan priests, especially in Egypt, were probably the first who reduced mythology to a system. The sacerdotal tribe, among that people, were the grand depositories of learning and religion. They monopolized all the arts and sciences; and precluded the laity from all intellectual improvement. This was done to keep the laity in subjection, and to enhance their own importance. The language of Ethiopia became their sacred dialect, and hieroglyphics their sacred character. Egypt, of course, became a kind of fairy land, where all was jugglery, magic, and enchantment. The initiated alone were admitted to the knowledge of the occult mystical exhibitions, which constituted the essence of their religion. (See MYSTERIES.) The Egyptians, and indeed all the ancients, deemed the mysteries of religion too sacred to be communicated to the herd of mankind, naked and unreserved. Egypt was the land of graven images; allegory and mythology were the veils which concealed religion from the vulgar. In the earliest stage

of society we cannot suppose fable to have existed among men. Fables are always tales of other times, but at this period other times did reach far enough backward to afford those fruits of the imagination time to arrive at maturity. Fable requires a considerable space of time to acquire credibility, and to rise into reputation. The Chinese and Egyptians, the two most ancient nations whose annals have reached our times, were unacquainted with fabulous details in the most early periods of their monarchies. It has been shewn almost to a demonstration, by a variety of learned men, that both these people, during some centuries after the general deluge, retained and practised the primitive Noachic religion, in which fable could find no place; all was genuine unsophisticated truth. As soon as the authentic tradition concerning the creation was either lost, or adulterated, fiction began to prevail. The Egyptian Thoth, Thyoth, or Mercurius Trismegistus, and Mochus, the Phœnician, undertook to account for the formation and arrangement of the universe, upon principles purely mechanical. Here fable began to usurp the place of historical truth. Accordingly, all the historians of antiquity, who have given a general detail of the affairs of the world, have ushered in their narration with a fabulous cosmogony. Here imagination ranged unconfined over the boundless extent of the primary chaos. To be convinced of this, we need only look into Sanchoniathon's Cosmogony, Euseb. Præp. Evang. l. 1, and Diodorus Sic. l. 1. From this it follows, that the first fables owed their birth to the erroneous opinions of the formation of the universe. The Chinese, if any credit be due to their annals, or to the missionaries of Rome, who copied from them, were the first of the nations. Their fabulous records reach upwards many myriads of years before the creation. The events during that period, if any had been recorded, must have been equally fabulous. These, however, are buried in eternal oblivion. The missionaries represent the Chinese as having retained the religion of Noah many centuries after the foundation of their empire. Upon this supposition, their cosmogony must have been genuine. Fohi is said to have laid the foundation of that empire about 4000 years ago. This emperor, according to the Chinese, was conceived in a miraculous manner. He was half a man and a serpent. His intellectual powers were truly hyperbolic. In one day he discovered 50 different species of poisonous herbs. He taught his countrymen the art of agriculture. He invented boats and nets for fishing, the art of fabricating porcelain, the management of silkworms, the manufacturing of silk, &c. He composed that incomparable body of laws which are still the wonder of the Chinese. This whole detail is fabulous, but the Chinese, in ascribing the invention of all the useful arts to Fohi, resemble the other nations of antiquity. The Indians ascribe every invention to Budha, Vishnou, or Foe; the Persians to Zoroaster; the Chaldeans to Oannes; the Egyptians to Thoth; the Phœnicians to Melicerta; the Greeks to the family of the Titans; and the Scandinavians to Odin, &c. About B. C. 551, appeared the famous Chinese philosopher, Confucius, or Confucius. Concerning the birth of this prince of philosophers, the Chinese have the following legend. His mother walking in a solitary place was impregnated by the vivifying influence of the heavens. The babe, thus produced, spake and reasoned as soon as he was born. Confucius, however, wrought no miracles, performed no romantic exploits, but lived an austere ascetic life, inculcated morality, and died, remarkable only for superior wisdom, religious, moral, and political. About A. D. 601, flourished the sectary Lao-kium. His mother carried him 30 years in her womb, and was at last delivered of him under a plum-tree. This philosopher was the Epicurus of the Chinese. His disciples, who were denominated Tao-sse, *i. e.* heavenly doctors, were the first who corrupted the religion of the Chinese. Their doctrine was embraced by many of the emperors. One of these, called You-ti, had lost a favourite mistress, whom he loved with the most extravagant passion. By the magical skill of one of these doctors, he obtained an interview with his deceased mistress, a circumstance which rivetted the whole order in the affection of the deluded prince. This fable is a counterpart of that of Orpheus and Eurydice. The worship of the idol Foe was transplanted from India into China about A. D. 63. The doctrine and worship of Foe made a most rapid progress all over China, Japan, Siam, &c. The priests of Foe are called among the Siamese, Talapoints; by the Tartars, Lamas; by the Chinese, Ho-chang; and by the people of Japan, Bonzes. By this last appellation

pellation they are generally known in Europe. (See BONZES, &c.) An incredible number of fables were invented and propagated by the disciples of Foe, concerning their master. If the earlier ages of the Chinese history are barren of mythological incidents, the later periods, after the introduction of the worship of Foe, furnish an inexhaustible store of miracles, monsters, fables, intrigues, exploits, and adventures, of the most villainous complexion. Indeed, most of them are so absurd, ridiculous, impious, and profane, that our readers will easily dispense with a detail, from which they could reap neither entertainment nor instruction. Such as are disposed to rake into this abominable puddle, we refer to the reverend fathers Du Halde, Couplet, Amiot, Kircher, &c. in whose writings they will find wherewithal to satisfy, and even to surfeit, their appetite. The Hindoos, like the other nations of the east, for a long time retained the worship of the true God. At length, however, idolatry broke in, and, like an impetuous torrent, overwhelmed the country. The genuine history of the origin of the universe was either utterly lost, or disguised under a variety of fictions. We are told that Brimha, the supreme divinity of the Hindoos, created four persons, whom he appointed to rule over all the inferior creatures. Afterwards he joined his efficient power with Bishon and Rudger; and by their united exertions they produced ten men, whose general appellation is Monies, that is, the inspired. According to another mythology, Brimha produced four other persons, one from his breast, one from his back, one from his lip, and one from his heart. These children were denominated Bangs. Another tradition, respecting the origin of the four great tribes is mentioned under the article HINDOOS; and accounts for the four casts or septs into which the Hindoo nation has from time immemorial, been divided. The Hindoos have likewise some mythological opinions which seem to relate to the general deluge. They tell us, that desiring the preservation of herds and of brahmans, of genii and of virtuous men, of vedas of law, and of precious things, the Lord of the universe assumes many bodily shapes; but though he pervades, like the air, a variety of beings, yet he is himself unvaried, since he has no quality in him subject to change. At the close of the last calpa, there was a general destruction, occasioned by the sleep of Brahma, whence his creatures in different worlds were drowned in a vast ocean. Brahma being inclined to slumber after so many ages, the strong demon Hayagri-va stole the vedas which flowed from his lips. When Meri, the preserver of the universe, discovered this deed of the prince of Dainavas, he took the shape of a minute fish called Sap-hari. After various transformations, and an enormous increase of size in each of them, the Lord of the universe loving the righteous man called, Mana, or Statgavrata, who had still adhered to him under all these various shapes, and intending to preserve him from the sea of destruction caused by the depravity of the age, thus told him how he was to act; "In seven days from the present time, O thou Tamer of enemies! the three worlds will be plunged in an ocean of death; but in the midst of the destroying waves a large vessel sent by me for thy use shall stand before thee." The remaining part of the mythology so nearly resembles the Mosaic history of Noah and the general deluge, that it appears to have been borrowed from it. To dry up the waters of the deluge, the power of the Deity descends in the form of a boar, the symbol of strength, to draw up and support on his tusks the whole earth, which had been sunk beneath the ocean. The same power is represented as a tortoise sustaining the globe, which had been convulsed by the violent assaults of demons, while the gods churned the sea with the mountain Mandar, and forced it to disgorge the sacred things and animals, together with the water of life which it had swallowed. All these stories relate to the same event, shadowed by a moral, a metaphysical, and an astronomical, allegory; and all seem connected with the hieroglyphical sculptures of the ancient Egyptians. The Hindoos divide the duration of the world into four Yugs, or Jagues, each consisting of a prodigious number of years. According to the mythology of the Hindoos, the system of the world is subject to various dissolutions and resuscitations. At the conclusion of the Collee Jogue, say they, a grand revolution will take place, when the solar system will be consumed by fire, and all the elements reduced to their original constituent atoms. Upon the back of these revolutions, Brimha is sometimes represented as a new-born infant, with his toe in his mouth, floating on a camala or water-flower, sometimes only on a

leaf of that plant, on the surface of the vast abyss. At other times he is figured as coming forth of a winding shell; and again as blowing up the mundane foam with a pipe at his mouth. One of the principal doctrines which Foe and his disciples propagated, was the metempsychosis or transmigration of souls; which has given rise to the multitude of idols revered in every country where the worship of Foe is established. Quadrupeds, birds, reptiles, and the vilest animals, had temples erected for them; because, say they, the soul of the god, in his numerous transigrations, may have at one time or other inhabited their bodies. Both transmigration and the worship of animals seem, however, to have been imported from Egypt into India. The former was early established among the Egyptians. It was, indeed, the only idea they they had of the soul's immortality. The worship of animals seems to have been still more ancient. That colonies of Egyptians did actually penetrate into India and settle there, many centuries before the nativity, is an undoubted fact. From the Hieroglyphical representations of the Egyptian deities seem to have originated those monstrous idols, which from time immemorial have been worshipped in India, China, Japan, Siam, and the remotest parts of Asiatic Tartary. Foe is often called Budha, Buddha, and sometimes Vishnou. Vast numbers of fables were propagated by his disciples concerning him, after his death. They pretended that he was still alive; that he had been already born 8000 times, and that he had successively appeared under the figure of an ape, a lion, a dragon, an elephant, a boar, &c. These were called the incarnations of Vishnou. At length he was confounded with the supreme God; and all the titles, attributes, operations, perfections, and ensigns, of the Most High were ascribed to him. Sometimes he is called Amida, represented with the head of a dog, and worshipped as the guardian of mankind. He sometimes appears as a princely personage, issuing from the mouth of a fish. At other times, he has a lunette on his head, in which are seen cities, mountains, towers, trees, and all that the world contains. These transformations were evidently derived from allegorical or hieroglyphical emblems, and form an exact counterpart to the symbolical worship of the Egyptians. The enormous mass of mythological traditions which have deluged the vast continent of India, would fill many volumes. Those who wish fully to gratify their curiosity may consult Thevenot's and Hamilton's Travels, Aquetil's Zendavesta, Halhed's Introduction to his translation of the Code of Gentoo Laws, Col. Dow's History of Hindostan, Grose's Voyage to the East Indies, Asiatic Researches, vol. I. and II. &c. The mythology of the Persians, is, if possible, still more extravagant than that of the Hindoos. It supposes the world to have been repeatedly destroyed, and repopled by creatures of different formation, who were successively annihilated or banished for their disobedience to the supreme Being. The monstrous griffin Sinergh tells the hero Caberman that she had already lived to see the earth seven times filled with creatures and seven times a perfect void; that, before the creation of Adam, this globe was inhabited by two races of beings called Peri and Dives, whose characters formed a perfect contrast. The Peri are described as beautiful and benevolent; the Dives as deformed, malevolent, and mischievous, differing from infernal demons only in this, that they are not yet confined to hell. They are ever ranging over the world, to scatter discord and misery among men. The Peri resemble the fairies of Europe; and the Dives the giants and magicians of the middle ages. The Peri and Dives wage incessant wars; and when the Dives make any of the Peri prisoners, they shut them up in iron-cages, and hang them on the highest trees, to expose them to the fury of every chilling blast. When the Peri are in danger of being overpowered by their foes, they solicit the assistance of some mortal hero; which produce a series of mythological adventures, highly ornamented to the strains of the Persian bards, and furnishes an inexhaustible fond of the most diversified machinery. One of the most celebrated adventurers in the mythology of Persia, is Tahmuras, one of their most ancient monarchs. This prince performs a variety of exploits, while he endeavours to recover the fairy Merjan. He attacks the Dive Demrush in his own cave; where, having vanquished the demon, he finds vast piles of hoarded wealth, which he carries off with the fair captive. The battles, labours, and adventures, of Rostan, another Persian worthy, are celebrated by the Persian bards with the same extravagance of hyperbole with which the labours of Hercules have been sung by the

poets of Greece and Rome. The adventures of the Persian heroes breathe all the wildness of achievement recorded of the knights of Gothic romance. The enchantments, transformations, &c. exhibited in both, are characteristic symptoms of one common original. Persia is the genuine classic ground of eastern mythology, and the source of the ideas of chivalry and romance; from which they were propagated to the regions of Scandinavia, and the remotest corners of Europe towards the west. Perhaps the tales of the wars of the Peri and Dives originated from a vague tradition concerning good and bad angels; and probably, the fable of the wars between the gods and giants, so famous in the mythology of Greece and Rome, was imported into the former country from the same quarter. For a more particular account of the Persian mythology, our readers may consult Dr. Hyde *De Relig. vet. Pers. Medor. &c.* D. Heibelot's *Bibl. Orient.* and Mr. Richardson's introduction to his *Persian and Arabic Dictionary*. The mythology of the Chaldeans commences at a period myriads of years prior to the era of the Mosaic creation. Their cosmogony, exhibited by Berosus, priest of Belus, deeply versed in the antiquities of his country, is a most extravagant piece of mythology. It has been copied by Eusebius (*Chron. l. i. p. 5*); as well as by Syncellus, from Alexander Polyhistor. According to this historian, there were at Babylon written records preserved with the greatest care, comprehending a period of fifteen myriads of years. Those writings likewise contained a history of the heavens, earth, and sea, and of the origin of mankind. "In the beginning (says Berosus, copying from Oannes,) there was nothing but darkness and an abyss of water, wherein resided most hideous beings produced from a two-fold principal. Men appeared with two wings; some with two and some with four faces. They had one body, but two heads; the one of a man the other of a woman. Other human figures were furnished with the legs and horns of goats. Some had the feet of horses behind, but before were fashioned like men, resembling hippocentaurs." The remaining part of this mythology is much of the same complexion; indeed so extravagant, that we suppose our readers will dispense with the sequel. "Of all these (says the author) were preserved delineations in the temple of Belus at Babylon. The person who was supposed to preside over them was called Omereia. This word, in the Chaldean language, is Thalath, which the Greeks call *Θαλασσα*, but it properly imports the moon. Matters being in this situation their god (says Eusebius) came and cut the woman asunder; and out of one half of her he formed the earth, and out of the other the heavens; and he destroyed the monsters of the abyss." This whole mythology is an allegorical history copied from hieroglyphical representation, the real purport of which could not be decyphered by the author. Such, in general, were the consequences of the hieroglyphical style of writing. Oannes, the great civilizer and legislator of the Chaldeans, (according to Apollodorus, who copied from Berosus,) was an amphibious animal of a heterogeneous appearance. He was endowed with reason and a very uncommon acuteness of parts. His body resembled a fish. Under the head of a fish he had also another head, and feet, below similar to those of a man, subjoined to the tail of the fish. His voice and language were articulate and perfectly intelligible, and there was a figure of him extant in the days of Berosus. He made his appearance in the Red Sea, where it borders upon Babylonia. This monstrous being conversed with men by day; but at night he plunged into the sea, and remained in the water till next morning. He instructed the Babylonians in the use of letters and the knowledge of all the arts and sciences. Mr. Bryant thinks, that Oannes was actually Noah; who settled in Shinar or Chaldea after the deluge, and who, in consequence of his connection with that event, might be properly represented under the emblem of the Man of the Sea. The nativity of Venus, the goddess of beauty and love, is another piece of mythology famous among the Babylonians and Assyrians. An egg, say they, of a prodigious size, dropt from heaven into the Euphrates. Some doves settled upon this egg, after the fishes had rolled it to the bank. In a short time this egg produced Venus, who was afterwards called *Dea Syria*, the Syrian goddess. From this tradition, (says Hyginus) pigeons and fishes became sacred to this goddess among the Syrians, who always abstained from eating them. Of this imaginary being we have a very exact and entertaining history, in the treatise "*De Dea Syria*," ascribed to Lucian. In this mytho-

logical tradition there seems an allusion to the celebrated Mundane egg; and a connection between the sea and the moon. This same deity was the Atergatis of Ascalon, described by Diodorus the Sicilian; the one half of her body a woman, and the other a fish. This was a hieroglyphic figure of the moon, importing the influence of that planet upon the sea and the sex. The oriental name of this deity evidently points to the moon; for it is compounded of two Hebrew words; viz. *Adar*, magnificent, and *Gad*, a troop; which import the queen of the host of heaven. The fable of Semiramis is nearly connected with the preceding. Diodorus Siculus has preserved the mythological history of this deity, which he and all the writers of antiquity have confounded with the Babylonian princess of that name. That historian informs us, that Semiramis; in the Syrian dialect, signifies a wild pigeon; but we apprehend that this term was a name of the moon, as it is compounded of two words of an import applicable to that planet; viz. *Sem*, a sign, and *ramah*, high. It was a general practice among the orientals to denominate their sacred animals from that deity to which they were consecrated. Hence the moon being called Semiramis, and the pigeon being sacred to her divinity, the latter was called by the name of the former. We refer our readers for farther information on this subject, to Diod. Sic. l. ii. Hyginus Poet. Astron. fab. 197. Pharoutus de Nat. Deor. Ovid, *Metam. l. iv.* Athan. in *Apol.* Tzetzes *Chil. ix. cap. 275.* Seld. de *Diis Syr. Syrit. ii. p. 183.* The Egyptians confounded the revolutions of the heavenly bodies with the reigns of their most early monarchs. Hence the incredible number of years in the reigns of their eight superior gods, who, according to them, filled the Egyptian throne successively in the most early periods of time. To these, according to their system, succeeded twelve demigods, who likewise reigned an amazing number of years. These imaginary reigns were merely the periodical revolutions of the heavenly bodies. Hence the fabulous antiquity of that kingdom. The imaginary exploits and adventures of these gods and demigods furnished an inexhaustible fund of mythological romances. To the demigods succeeded the kings of the cynic cycle, personages equally chimerical with the former. The import of this epithet has perplexed critics and etymologists. We apprehend it is an oriental word importing royal dignity, or elevation of rank; and intimating that the monarchs of that cycle were more powerful than their successors. After these princes came another race, denominated *Nekyes*, a title likewise implying royal, splendid, glorious. These cycles figure high in the mythological annals of Egypt, and have furnished materials for a variety of learned disquisitions. The wars and adventures of Osiris, Orus, Typhon, and other allegorical personages; the wanderings of Isis; the transformations of the gods into various animals; their birth, education, peregrinations, and exploits;—compose a body of mythological fictions, so complicated, so ridiculous, and often so absurd, that all attempts to explain them have hitherto proved unsuccessful. All those extravagant fables are the offspring of hieroglyphical or allegorical emblems, devised by the priests and sages of that nation, to conceal the mysteries of their religion from the inferior ranks. See MYSTERIES. The worship of brutes and of certain vegetables, universal among the Egyptians, was another exuberant source of mythological adventures. The Egyptian priests, many of whom were profound philosophers, observed a kind of analogy between the qualities of certain animals and vegetables, and those of some of their subordinate divinities. These they consecrated to the deities to whom they were supposed to bear this analogy, and in time they considered them as the visible emblems of those divinities. By these the vulgar addressed their archetypes; and in time, forgetting the emblematical character of those brutes and vegetables, addressed their devotion immediately to them. After these animals were consecrated as the visible symbols of the deities, they began to use their figures to represent those deities. Hence Jupiter Ammon was represented under the figure of a ram, Apis under that of a cow, Osiris of a bull, Pan of a goat, Thoth of an ibis, Bubastis or Diana of a cat, &c. Their Thoth, or Mercurius Trismegistus, was the inventor of this unhappy system. He was esteemed the original author of letters, geometry, astronomy, music, architecture; of all the elegant and useful arts, and of all the branches of science and philosophy. He first discovered the analogy between the divine affections, influences, appearances, operations, and the corresponding properties, qualities,

qualities, and instincts, of certain animals, and the propriety of dedicating particular vegetables to particular deities. The priests, whose province it was to expound the mysteries of that allegorical hieroglyphical religion, gradually lost all knowledge of the primary import of the symbolical characters. To supply this defect, and to veil their own ignorance, they had recourse to fable and fiction. They heaped fable upon fable, till their religion became an accumulated chaos of mythological absurdities. We refer the reader who wishes for further information to the following authors; Herodotus, lib. ii. Diodorus Siculus, lib. i. Plut. Isis and Osiris; Jamblichus de Myst. Egypt. Horapollo Hieroglyph. Egypt. Macrob. Sat. cap. 23. Kircher's Oedip. Voss. de Orig. et Prog. Idol. Mr. Bryant's Analysis of Anc. Mythol. M. Gebelin Monde prim.; and above all, to the learned Jablonski's Panth. Egyptiorum. The adventures of Jupiter, Juno, Mercury, Apollo, Diana, Mars, Minerva, Venus, Bacchus, Ceres, Proserpine, Pluto, Neptune, and the other descendants of the ambitious family of the Titans, furnish the greatest part of the mythology of Greece. They left Phœnicia, about the age of Moses; they settled in Crete, whence they made their way into Greece, which was then inhabited by savages. The arts and inventions which they communicated to the natives; the mysteries of religion which they inculcated; the laws, customs, polity, and good order, which they established; in short, the blessings of humanity and civilization, which they everywhere disseminated, in process of time inspired the unpolished inhabitants with a kind of religious admiration. Those ambitious mortals improved this admiration into divine homage. The greater part of that worship, which had been formerly addressed to the luminaries of heaven, was now transferred to those illustrious personages. They claimed and obtained divine honours from the deluded rabble of enthusiastic Greeks. Hence sprung an inexhaustible fund of the most inconsistent fictions. A considerable part of the mythology of the Greeks sprung from their ignorance of the oriental languages. They disdained to study the languages spoken by people whom, in their pride, they styled barbarians. This aversion to every foreign dialect was highly detrimental to their progress in the sciences. The same neglect or aversion has proved an irreparable injury to the republic of letters in all ages. The Aoids, or strolling bards, laid hold on those oriental legends which they sophisticated with their own additions, to accommodate them to the popular taste. These wonderful tales figured in their rhapsodical compositions, were greedily swallowed by the credulous vulgar. Those fictions were constantly augmented with fresh materials, till in time their original import was either forgotten or buried in impenetrable darkness. A multitude of these Hesiod has collected in his Theogonia, or generation of the gods, which unhappily became the religious creed of the illiterate part of the Greeks. The far-famed oracle of Dodona was copied from that of Ammon of Thebes in Egypt: The oracle of Apollo at Delphos was an emanation from the same source: The celebrated Apollo Pythius of the Greeks was no other than Ob or Aub of the Egyptians, who denominated the basilisk or royal snake Ov Cai, because it was held sacred to the sun. Ob or Aub is still retained in the Coptic dialect, and is one of the many names, or epithets of that luminary. In short, the ground-work of the Grecian mythology is to be traced in the east. Only a small part of it was fabricated in the country; and what was imported pure and genuine was miserably sophisticated by the hands through which it passed, to accommodate it to the Grecian taste. The Roman mythology was borrowed from the Greeks. That people had addicted themselves for many centuries to war and civil polity. Science and philosophy were either neglected or unknown. At last they conquered Greece, the native land of science, and then "*Græcia capta ferum victorem cepit arte, et intulit agresti Latio.*" This being the case, their mythology was, upon the whole, a transcript from that of Greece. They had indeed previously gleaned a few fables from the Pelasgi and Etruscans. The mythology of the Celtic nations is in a great measure lost. There may still remain some vestiges of the Druidical superstition in the remotest parts of the Highlands and islands of Scotland; and in the uncivilized places of Ireland. These, we presume, would afford little entertainment, and less instruction. We shall, therefore, refer our readers to Ossian's Poems, and Colonel Valency's Collections of Irish Antiquities, for satisfaction on that subject. The mythology of the Norwegians, Danes, Swedes, Icelanders, &c. are uncon-

monly curious and entertaining. The Edda and Voluspa contain a complete collection of fables which have not the smallest affinity with those of the Greeks and Romans. They are wholly of an oriental complexion, and seem almost congenial with the tales of the Persians. The Edda was compiled in Iceland in the thirteenth century. It is a kind of system of the Scandinavian mythology; and has been reckoned a commentary on the Voluspa, which was the Bible of the northern nations. Odin, Othin, Wodan or Woden, was the supreme divinity of those people. His exploits and adventures furnish the far greatest part of their mythological creed. That hero is supposed to have emigrated from the east; but from what country, or at what period, is not known. His achievements are magnified beyond all credibility. He is represented as the god of battles, and as slaughtering thousands at a blow. His palace is called Valhal: it is situated in the city of Midgard, where, according to the fable, the souls of heroes who had bravely fallen in battle enjoy supreme felicity. Sleerner, the horse of Odin, is celebrated along with his master. Hela, the hell of the Scandinavians, affords a variety of fables equally shocking and heterogeneous. Loke, the evil genius or devil of the northern people, nearly resembles the Typhon of the Egyptians. Signa or Sinna is the consort of Loke; from which name the English word sin is derived. The giants Weymur, Ferbanter, Belupher, and Hellunda, perform a variety of exploits, and are exhibited in the most frightful attitudes. They perform the counterpart of the giants of the Greek and Roman mythologists. Without enlarging on these ridiculous and uninteresting fables, we shall give a brief account of the contents of Voluspa, which is indeed the text of the Scandinavian mythology. The word Voluspa imports, the prophecy of Vola or Föla. This was perhaps a general name for the prophetic ladies of the north, as Sybil was appropriated to women endowed with the like faculty in the south. Certain it is, that the ancients generally connected madness with the prophetic faculty. Of this we have two celebrated examples: the one in Lycophron's Alexandra, and the other in the Sybil of the Roman Poet. The word vola signifies mad or foolish; whence the English words fool, foolish, folly. Spa signifies to prophesy, and is still current in Scotland, in the word Spae, which has the same signification. The Voluspa consists of between 200 and 300 lines. The prophetess having imposed silence on all intelligent beings, declares that she is about to reveal the works of the Father of nature, the actions and operations of the gods, which no mortal ever knew before herself. She then begins with a description of the chaos; and then proceeds to the formation of the world, the creation of the different species of its inhabitants, giants, men, and dwarfs. She then explains the employments of the fairies, or destinies, whom the northern people call nor-nies; the functions of the deities, their most memorable adventures, their disputes with Loke, and the vengeance that ensued. She at last concludes with a long and animated description of the final state of the universe, and its dissolution by a general conflagration. In America, the only mythological countries were Mexico and Peru. The other parts of that large continent were originally inhabited by savages, and most of them as remote from religion as from civilization. The two vast empires of Mexico and Peru had existed about 400 years only before the Spanish invasion. In neither of them was the use of letters understood; and of course the ancient opinions of the natives relating to the origin of the universe, the changes which succeeded, and every other monument of antiquity, were obliterated and lost. Clavigero has indeed enumerated a vast canaille of sanguinary gods worshipped by the Mexicans; but produces nothing either entertaining or interesting with respect to their mythology. The information to be derived from any other quarter is little to be depended upon. It passes through the hands of bigotted missionaries or other ecclesiastics, who were so deeply tinctured with fanaticism, that they viewed every action, every sentiment, every custom, every religious opinion and ceremony of those half-civilized people, through a false medium. They often imagined resemblances between the rite of those savages and the dogmas of Christianity, which nowhere existed but in their own heated imagination. Further information respecting mythological subjects will be found in this work, under the respective names of the numerous gods, demigods, and heroes, who were celebrated in the ancient Grecian and Roman mythology. See JUPITER, APOLLO, HERCULUS, MARS, &c.

MYTILUS, the **MUSSEL**, in ichthyology, a genus of animals of the order vermes testacea. Animal an ascidia; shell bivalve, often affixed to some substance by a beard; hinge without a tooth, marked by a longitudinal hollow line. Of these animals there are about 60 species, some of them inhabiting the seas, others the rivers and ponds. Several of them are remarkable for the beauty of their internal shell, and for the pearls which are sometimes found in them.

M. ANATINUS, the **DUCK MUSSEL**, has a shell more oblong and less convex than the swan; is very brittle and semitransparent; the space round the hinges like the swan; the length about five inches, breadth two. It is found in Europe in fresh waters. Both it and the swan are devoured by swans and ducks: whence their names: crows also feed on these mussels, as well as on different other shell-fish; and when the shell is too hard for their bills, they fly with it to a great height, drop the shell on a rock, and pick out the meat when the shell is fractured by the fall.

M. CYGNEUS, the **SWAN MUSSEL**, with a thin brittle shell, very broad and convex, marked with concentric striae: attenuated towards one end, dilated towards the other; decorticated about the hinge; the colour a dull green; the length six inches, breadth three and a half. It is an inhabitant of the European rivers, frequenting chiefly their mouths.

M. EDULIS, the **EDIBLE MUSSEL**, has a strong shell, slightly incurved on one side, and angulated on the other. The end near the hinge is pointed; the other rounded. When the epidermis is taken off it is of a deep blue colour. It is found in immense beds, both in deep water and above low-water mark. The finest mussels in Britain are those called Hambleton hookers, from a village called Hambleton. They are taken out of the sea, and placed in the river Wier, within reach of the tide, where they grow very fat and delicious. This species inhabits the European and Indian seas. Between the tropics it is largest, and smallest within the polar circle. This species has, from its being for the most part fastened to the rocks, being supposed by many wholly incapable of progressive motion; but this Mr. Reaumur has shewn to be an erroneous opinion. It is a common practice in France, at such seasons of the year as do not afford sun enough to make salt, to throw the common sea-mussels, which the fishermen catch about the coasts, into the brine-pits, to render their flesh more tender

and delicate, as the rain which falls at these seasons makes the water of the pits much less salt than the sea-water. The mussels are on this occasion thrown carelessly in, in several different parts of the pits; yet, at whatever distances they have been thrown in, the fishermen, when they come to take them out, always find them in a cluster together; and as there is no current of water in these places, nor any other power of motion which can have brought the mussels together, it is evident that they must voluntarily have marched from the places where they were at first, to have met thus together. This progressive motion is performed by means of what we call the tongue of the mussel, from its shape; but, from its use in this case, it appears rather to merit the name of a leg, or an arm, as by laying hold of any distant substance, and then forcibly contracting itself again, it draws along the whole body of the animal. The same part, when it has moved the animal to a proper place, serves also to fix it there, being the organ by which it spins the threads which we call its beard, by which it is held to a rock, or to another mussel.

M. MARGARITIFERUS, the **PEARL-BEARING MUSSEL**, has the shell compressed and flat, nearly orbicular, the base transverse, and imbricated with dentated coats. It dwells in the ocean of either India. This is the mater perlarum of Rumphius, or mother-of-pearl shell. On the inside it is exquisitely polished, and of the whiteness and water of pearl itself. It has also the same lustre on the outside after the external laminae have been taken off by aquafortis and the lapidary's mill. Mother of pearl is used in inlaid works, and in several toys, as snuff-boxes, &c.

MYTTOTON, a coarse kind of food, used by the labouring people among the Greeks, and sometimes among the Romans. It was made of garlic, onions, eggs, cheese, oil, and vinegar, and reckoned very wholesome.

MYUS, in ancient geography, one of the twelve towns of Ionia; seated on the Mæander, at the distance of thirty stadia from the sea.

MYXINE, the **IIAC**, a genus of insects of the order of vermes intestini: body slender, carinated beneath; the two jaws pinnated; an adipose or rayless fin round the tail and under the belly. There is but one species, *M. glutinosa*.

MYXOLYDIAN, in ancient music, the first species of the diapason.

N.

N, a semivowel, has in English an invariable sound; as *no, name, net*; it is sometimes after *m* almost lost; as, *condemn, condemn*. **N** is the fourteenth in Hebrew, and the thirteenth in Greek, Latin, English, and other modern alphabets. It is the tenth consonant, and the third liquid. **N** is a nasal consonant: its sound is that of a *d*, passed through the nose; so that when the nose is stopped by a cold, or the like, it is usual to pronounce *d* for *n*. The Abbé Dangeau observes, that in the French, the *n* is frequently a mere nasal vowel, without any thing of the consonant in it. He calls it the Slavonic vowel. The Hebrews call it *nun*, which signifies child, as being supposed the offspring of *m*; partly on account of the resemblance of sound, and partly of the figure. Thus from the *m*, by omitting the last column, is formed *n*; and thus from the capital **N**, by omitting the first column, is formed the Greek minuscule *ν*. Hence for biennies, &c. the Latins frequently use *bimus*, &c. and convert the Greek *ν*, at the end of a word, into *π*, as *φάρμακον*, pharmacum, &c. In compositions the Latins change **N** before *p*, *b*, and *m*, into *m*, and frequently into *l* and *r*; as in *in-ludo*, *illudo*; *in-rigo*, *irrigo*, &c. in which they agree with the Hebrews, who, in lieu of *nun*, frequently double the

next consonant; and the Greeks do the same; as when for *Manlius*, they write *Μανλιος*, &c. The Greeks also, before *κ*, *γ*, *χ*, *ρ*, changed the *ν* into *γ*; in which they were followed by the ancient Romans; who, for *Angulus*, wrote *Aggulus*; for *anceps*, *ageps*, &c. The Latins retrench the *n* from Greek nouns ending in *ων*; as *Λιον*, *Leo*; *Δρακων*, *Draco*; on the contrary, the Greeks add it to the Latin ones ending in *ο*; as *Κατων*, *Νερων*, *Cato*, *Nero*. As a numeral, **N** was used among the ancients, for 900; according to Baronius,

N, quoque nongentos numero designat habendos. And when a line was struck over it, *N̄*, it implied 9,000. As an abbreviation, **N. L.** was used among the ancient lawyers for *non liquet*, *i. e.* the cause is not clear enough to pass sentence upon. **N.** or **N°** in commerce, &c. is used as an abbreviation of *numero*, number.

NAAMAN, [נָמָן, Heb. *i. e.* Fair.] A brave Syrian General, of whose miraculous cure of a leprosy, by washing in the Jordan, upon the advice of Elishah, a very interesting account is recorded 2 Kings v. The Rabbis have a tradition, that it was Naaman, who drew the bow at a venture, and killed Ahab. See 1 Kings xxii. 34.

NAAS, a town of Ireland in Kildare, Leinster, 15 miles S. W. of Dublin. Lon. 6. 50. W. Lat. 53. 10. N.

NABIS, a tyrant of Sparta, who reigned about B. C. 204, and exceeded all other tyrants so far, that, in comparison, Dionysius and Phalaris were merciful. He contrived an instrument of torture in the form of a statue of a beautiful woman, whose rich dress concealed a number of iron-spikes in her bosom and arms. When any one therefore opposed his demands, he would say, "If I have not talents enough to prevail with you, perhaps my woman Apega may persuade you." The automaton statue then appeared; which Nabis taking by the hand, led up to the person, who, being embraced by it, was thus tortured into compliance. To render his tyranny less unpopular, Nabis made an alliance with Flaminius the Roman general, and pursued with the most inveterate enmity the war against the Achæans. He besieged Gythium, and defeated Philopœmen in a naval battle. His triumph was short; Philopœmen soon repaired his losses, and Nabis was defeated, and killed as he attempted to fly; about B. C. 194.

NABLUM, or NEBEL, [Heb.] was an instrument of music among the Jews. It had strings like the harp, and was played upon by both hands. See Plate CXVIII. In the Septuagint and Vulgate, it is called nablum, psalterion, lyra; and sometimes cithara.

NABO, or NEBO, in mythology, a deity of the Babylonians, who possessed the next rank to Bel. It is mentioned by Isaiah, ch. xlviii. Vossius supposes that Nabo was the moon, and Bel the sun: but Grotius thinks that Nabo was some celebrated prophet of the country, which opinion is confirmed by the etymology of the name, signifying, according to Jerom, "one that presides over prophecy."

NABOB, properly NAVAB, the plural of Nailb, a deputy. As used in Bengal, it is the same as Nazim. It is a title also given to the wives and daughters of princes, as well as to the princes themselves.

NABONASSAR, or ÆRA OF NABONASSAR, a method of computing time from the commencement of Nabonassar's reign. The epocha of Nabonassar is of the greater importance, as Ptolemy and other astronomers account their years from it.

NABONASSAR, the first king of the Chaldeans or Babylonians; memorable for the Jewish æra which bears his name, which is generally fixed in 3257, beginning on Wednesday, February 26th, in the 3967th of the Julian period, B. C. 747. The Babylonians revolting from the Medes, who had overthrown the Assyrian monarchy, did, under Nabonassar, found a dominion, which was much increased under Nebuchadnezzar. It is probable, that this Nabonassar is that Baladan in 2 Kings xx. 12, father of Merodach, who sent ambassadors to Hezekiah, 2 Chron. xxii.

NABOPOLASSAR, king of Babylon; he joined with Astyages the Mede, to destroy the empire of Assyria; which having accomplished, they founded the two empires of the Medes under Astyages, and the Chaldeans under Nabopolassar, 627 B. C.

NADIR, [Arabic,] in astronomy, that point of the heavens which is diametrically opposite to the zenith, or point directly over our heads. The zenith and nadir are the two poles of the horizon.

NAEFELS, a town of Switzerland, in the canton of Glaris, four miles N. of Glaris.

NÆNIA, the goddess of funerals at Rome. Her temple was without the gates of the city. The songs which were sung at funerals were also called nœnia.

NAERDEN, a town of Holland, in the dep. of Amstel, and late province of Holland. Long. 5. 3. E. Lat. 51. 22. N.

NÆVIUS, a famous augur in the reign of Tarquin, who, to convince the king and the Romans of his preternatural power, cut a flint with a razor, and turned the ridicule of the populace to admiration. Tarquin rewarded his merit by erecting him a statue in the comitium, which was extant in the age of Augustus. The razor and flint were buried near it under an altar, and it was usual among the Romans to make witnesses in civil causes swear near it. This miraculous event of cutting a flint with a razor, though believed by some writers, is treated as fabulous by Cicero, who himself had been an augur.

NÆVIUS, CNEIUS, a famous poet of Campania, who was bred a soldier; but quitted arms, for poetry, which he prosecuted with great diligence. He composed a history in verse, and a great

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number of comedies: but it is said, that his first performance of this last kind so displeased Metellus on account of the satirical strokes it contained, that he procured his being banished from the city; on which he retired to Utica in Africa, where he died, B. C. 202. Some fragments of his works are extant.

NÆVUS, a mole on the skin, generally called Nævus Maternus, or mother's mark. All preternatural tumours on the skin, in the form of a wart or tubercle, are called excrescences; by the Greeks they are called acrothymia; and when they are born with a person, they are called navi materni, or marks from the mother. A large tumour depending from the skin is denominated sarcoma. These appear on any part of the body: some of them differ not in their colour from the rest of the skin; whilst others are red, black, &c. Their shapes are various; some resembling strawberries, others grapes, &c. Heister advises their removal by means of a ligature, a cautery, or a knife, as circumstances best suit.

NAGARA, or NAGERA, a town of Spain, in Old Castile, and territory of Rioja. Lon. 2. 20. W. Lat. 42. 25. N.

NAGORE, a circar and town of Hindostan, in Agimere, 40 miles N. W. of Agimere, and 92 N. W. of Jypour. Lon. 74. 10. E. Lat. 27. 8. N.

NAGORECOT, or NAGRACUT, a town of India, the capital of a kingdom of the same name in the dominions of the Great Mogul. Lon. 78. 10. E. Lat. 33. 12. N.

NAGYAG, a mountainous district of Transylvania, abounding with metals; among which there are 13 different kinds of gold-ores, mineralised by sulphur, arsenic, antimony, iron, zinc, &c.

NAGYBANJA, a town of Hungary, famous also for gold and silver mines.

NAHOR, the son of Terah, and brother of Abraham. He resided at Haran, called also Nahor, in Mesopotamia, and married Milcah, his niece, by whom he had eight sons: viz. 1. Huz or Uz, the progenitor of the Uzites or Ausites, who inhabited the land of Uz, on the W. side of the Euphrates, where Job dwelt. 2. Buz, the ancestor of the Buzites, from whom Elihu was descended. 3. Kemuel, the father of the Kemelites and of the Arameans or Syrians. 4. Chesed, the father of a tribe of Chaldeans. 5. Hazo, the ancestor of the Hazoys, Huzeans, or Chosseans, in Chusistan, in Persia. 6. Pildash, whom Dr. Hyde makes the ancestor of the Persians. 7. Jidlaph, and 8. Bethuel, the father of Laban and Rebekah. Nahor had also other four sons by his concubine Reumah. Gen. xi. xxii. 21—24.

NAIADES, in mythology, inferior deities who presided over rivers, springs, wells, and fountains. The Naiades generally inhabited the country, and resorted to the woods or meadows near the stream over which they presided. They are represented as young and beautiful virgins, often leaning upon an urn, from which flows a stream of water. Egle was the fairest of the Naiades, according to Virgil. Their name is derived from *ναίω*, to flow.

NAIANT, in heraldry, a term used in blazoning fishes, when borne in an horizontal posture, as if swimming.

NAIAS, in botany, a genus of the monandria order, and diœcia class of plants. Male calyx cylindric, bifid; corolla quadrid; no filament; female calyx and corolla none; pistil one; capsule, ovate, one-celled. It has but one species.

NAID, the interior of the great desert of Arabia, inhabited by a few scattered tribes of Arabs.

NAILS, UNGUES, in anatomy. See ANATOMY.

NAILS, in building, &c. small spikes of iron, brass, &c. which being driven into wood, serve to bind several pieces together, or to fasten something upon them. The several sorts of nails are very numerous: as, 1. back and bottom nails, which are made with flat shanks to hold fast, and not open the wood. 2. Clamp-nails, for fastening the clamps in buildings, &c. 3. Clasp-nails, whose heads clasping and sticking into the wood, render the work smooth, so as to admit a plane over it. 4. Clench-nails, used by boat and barge-builders, and proper for any boarded buildings that are to be taken down; because they will drive without splitting the wood, and draw without breaking; of this there are many sorts. 5. Clout-nails, used for nailing on clouts to axle-trees. 6. Deck-nails, for fastening of decks in ships, doubling of shipping, and floors laid with planks. 7. Dog-nails, for fastening hinges on doors, &c. 8. Flat-points, much used in shipping, and proper where there is occasion to draw and hold fast, and no convenience

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of clenching. 9. Jobent-nails, for nailing thin plates of iron to wood, as small hinges on cup-boards, &c. 10. Lead-nails, for nailing lead, leather, and canvas, to hard wood. 11. Port-nails, for nailing hinges to the ports of ships. 12. Pound-nails, which are four-square, and are much used in Essex, Norfolk, and Suffolk, and scarcely any where else, except for pailing. 13. Ribbing-nails, principally used in ship-building, for fastening the ribs of ships in their places. 14. Rose-nails, which are drawn four-square in the shank, and commonly in a round tool, as all common twopenny nails are; in some countries all the larger sort of nails are made of this shape. 15. Rother-nails, which have a full head, and are chiefly used in fastening rother-irons to ships. 16. Round-head-nails, for fastening on hinges, or for any other use where a neat head is required: these are of several sorts. 17. Scupper-nails, which have a broad head, and are used for fastening leather and canvas to wood. 18. Sharp nails; these have sharp points and flat shanks, and are much used, especially in the West-Indies, for nailing soft-wood. 19. Sheathing-nails, for fastening sheathing-boards to ships. 20. Square nails, which are used for hard wood, and nailing up wall-fruit. 21. Tacks, the smallest of which serve to fasten paper to wood, the middling for wool-cards, &c. and the larger for upholsterers and pumps. Nails are said to be toughened when too brittle, by heating them in a fire-shovel, and putting some tallow or grease among them.

NAIL, is also a measure of length, containing the sixteenth part of a yard.

NAILS, in Hebrew antiquity, were made use of by the ancient Jews for cancelling bonds: and the ceremony was performed by striking them through the writing. This seems to be alluded to in scripture, where God is said by our crucified Saviour to have "blotted out the hand-writing of ordinances that was against us, and to have taken it out of the way, nailing it to his cross." Col. ii. 14.

NAILING OF CANNON. When circumstances make it necessary to abandon cannon, or when the enemy's artillery are seized, and it is not possible to take them away, it is proper to nail them up, to render them useless; which is done by driving a large nail or iron-spike into the vent of a piece of artillery, to render it unserviceable. There are various contrivances to force the nail out, as also sundry machines invented for that purpose, but they have never been found of general use; so that the best method is to drill a new vent. Gaspar Vimercaus was the first who invented the nailing of cannon. He was a native of Bremen, and made use of his invention first in nailing up the artillery of Sigismund Malatesta.

NAIN, **LEWIS SEBASTIAN DE**, one of the most learned and judicious critics and historians France has produced. He was the son of a master of the requests, and born at Paris in 1637. At 10 years old he went to school at Port Royal, and became one of the best writers of that institution. Sacy, his intimate friend, prevailed with him in 1676 to receive the priesthood: which his humility would not suffer him to aspire to. Buzanval, Bishop of Beauvois, wished to have him for his successor; but Nain was regardless of dignities. He died in 1698, aged 61. His principal works are, 1. *Memoirs on the first six Ages of the Church*, 16 vols. 4to. 2. *The History of the Emperors*, 6 vols. 4to. These works are deduced from original sources, and composed with the utmost fidelity.

NAIN, an ancient city of the tribe of Issachar, in Galilee, at the foot of Mount Hermon, on the N. Near the gates of this city, our Saviour restored to life the only son of a widow, and here Mary Magdalen came and mourned for her sins at his feet. At present Nain is only a hamlet, inhabited by Christians, Mohammedans, and Jews.

NAIRES, **NAIERS**, or **NAYERS**, in modern history, a name given by the Malabarians to the military of their country, who form a very numerous class, out of which the sovereigns of Malabar choose their body-guard.

NAIRN, a county of Scotland, comprehending the W. part of Murray. It is bounded on the N. by Murray frith, on the W. and S. by Inverness, and E. by Elgin. It is 20 miles long, and 14 broad. The air is temperate and salubrious, and the winters are remarkably mild. The face of the country is mountainous but agreeable; there are several fertile valleys, which produce good crops; but in general it is best adapted for pasturage. Here are

also large woods of fir, and other trees, with great plenty of game.

NIRN, a river of Scotland, which separates the county of Murray from that of Inverness, crosses that of Nairn, and falls into the Frith of Murray near Nairn.

NAIRN, a town in the above county, supposed to be the Turais of Ptolemy.

NAIS, a genus of the vermes mollusca. Body creeping, long, linear, pellucid, depressed; peduncles or feet with small bristles on each side. There are ten species. *N. digitata* is found with single lateral bristles, tail lacinate, in stagnant waters, or the sandy sediment of rivers, with its head attached to the stalk of aquatic plants; it is about four lines long.

NAISSANT, in heraldry, is applied to any animal issuing out of the midst of some ordinary, and shewing only his head, shoulders, fore-feet, and legs, with the tip of his tail; the rest of his body being hid in the shield, or some charge upon it: in which it differs from issuant, which denotes a living creature arising out of the bottom of any ordinary or charge.

NAISSUS, in ancient geography, a town of Dardania, a district of Mesia Superior, said to be the birth-place of Constantine the Great, and where he often resided: now called Nissa, a city of Servia. Lon. 23° E. Lat. 43° N.

NAKED, in architecture, is the surface or plain from whence the projectures arise. Thus, we say the foliage of a capital ought to answer to the naked of a column, and that a pilaster ought to exceed the naked of the wall by so many inches.

NAKED SEEDS, in botany, those that are not inclosed in any pod or case.

NAKIB, in the oriental dignities, an officer who is a deputy to the cadiliskier, or chancellor of Egypt, appointed by the grand signior.

NAKOUS, an Egyptian musical instrument, made like two plates of brass, and of all sizes, from two inches to a foot in diameter; they hold them by strings fastened to their middles, and strike them together so as to beat time. They are used in the Coptic churches and in the Mohammedan processions.

NALA SUNKRA, a branch of the Indus, which separates from the main stream 14 miles S. W. of Nulferpoor.

NAMA, in botany, a genus of the digynia order, and pentandria class of plants; natural order, Succulentæ. Calyx five-leaved; corolla five-parted; capsule one-celled, two-valved. It has but one species, an annual plant of Jamaica.

NAME, denotes a word whereby men have agreed to express some idea; or which serves to denote or signify a thing or subject spoken of. See **GRAMMAR**, and **NOUN**.

NAMPHIO, or **NANFIO**, an island in the Grecian Archipelago, 15 miles in circumference. It lies N. of Santorino. Lon. 26. 10. E. Lat. 36. 27. N.

NAMPTWICH, or **NANTWICH**, a town of Cheshire, situated on the Weaver, 14 miles S. E. of Chester. Lon. 2. 25. W. Lat. 53. 6. N.

NAMUR, a late province of the Austrian Netherlands, lying between the Sambre and Meuse, now annexed to France, and forming the department of the Sambre and Meuse.

NAMUR, a large, rich, and very strong town of France, capital of the department of the Sambre and Meuse, as it was of the late county of Namur. Lon. 4. 54. E. Lat. 50. 28. N.

NANCI, or **NANCY**, a town of France, in the department of the Meurthe, and late capital of Lorraine, situated on the Meurthe. Lon. 6. 17. E. Lat. 48. 42. N.

NANDINA, in botany, a genus of the monogynia order, and hexandria class of plants. Calyx many-leaved, imbricate; corolla six-petaled. There is but one species, *N. Domestica*, a native of Japan.

NANGASAKI, a sea-port of Japan, on the W. coast of the isle of Ximo, surrounded with sharp rocks and barren mountains. Lon. 128. 52. E. Lat. 32. 36. N.

NANI, **JOHN BAPTIST**, a noble Venetian historian, born in 1616. His father was procurator of St. Mark, and ambassador from Venice to Rome. Pope Urban VIII. a just valuer of merit, soon perceived that of young Nani. He was admitted into the college of senators in 1641, and was soon after nominated ambassador in France. He procured considerable succours for the war of Candia against the Turks; and became, after his return to Venice,

Venice, superintendent of the war-office and of finances. He was afterwards ambassador to the empire; where he rendered great services to his country. He was again sent into France in 1660 to solicit fresh succours for Candia; and on his return was appointed procurator of St. Mark. He died Nov. 5, 1678, aged 63. The senate had appointed him to write the history of the republic; which he executed to the satisfaction of the Venetians, although the work was less admired by foreigners, (who were not proper judges of the accuracy with which he stated the facts, and of the purity of his diction,) for the simplicity of his style. In writing his history of Venice he has given an universal history of his times, especially with respect to the affairs of the French in Italy. This history, which is continued from 1613 to 1671, was printed at Venice in 2 vols. 4to. in 1662 and 1679.

NAN-KING, a city of China, and capital of the province of Kiang-nan, is said to have been formerly one of the most beautiful and flourishing cities in the world. When the Chinese speak of its extent, they say, if two horsemen should go out by the same gate, and ride round it on full speed, taking different directions, they would not meet before night. This account is evidently exaggerated; but it is certain, that Nan-king surpasses in extent all the other cities of China. We are assured that its walls are five leagues and a half in circumference. It is situated three miles from the river Yang-tse-kiang. Lon. $118^{\circ} 42' 0''$ E. Lat. $32^{\circ} 4' 40''$ N.

NAN-TCHANG, the capital of Kiang-si, a province of China. This city has no trade but that of porcelain, which is made in the neighbourhood of Jao-tcheou.

NANTES, an ancient, rich, and very considerable city of France, in the department of the Lower Loire, and late province of Bretagne, with an university. Lon. $1. 31. W.$ Lat. $47. 13. N.$

NANTIKOKES, a nation of N. American Indians, who formerly lived in Maryland.

NANTUCKET, an island of Massachusetts, E. of Martha's Vineyard, and 24 miles S. of Cape Cod. It is 15 miles long and from 34 to 11 broad. It contains about 23000 acres, and lies between Lon. $69. 36.$ and $70^{\circ} 13' 30'' W.$ and between Lat. $41. 13.$ and $42^{\circ} 22' 30'' N.$

NANTUCKET, the capital of the above island; 123 miles S. W. of Boston, and 382 N. E. of Philadelphia.

NANTIZ, a town of France, in the department of Aveiron; 12 miles E. of Milhau.

NAN-YANG, two cities of China of the 1st rank: 1. in Honan, comprehending eight towns. 2. in Quang-tong, containing only two, but by far the largest and most flourishing in trade, &c.

NAPÆA, in botany, a genus of the diœcia monadelphia class and order. Natural order, Columnifera. Calyx five-cleft; petals five: male, stamina monadelphous, very many fertile; styles several barren: female, stamina monadelphous, very many barren; styles several, longer than the stamina; capsule orbicular, depressed, ten-celled; seeds solitary. There are two species, *N. lævis*, smooth napæa, and *N. scabra*, rough napæa, natives of North America; from their bark a kind of hemp may be procured.

NAPHTHA, an inflammable substance of the bituminous kind; it is light, transparent, and very inflammable. There are several varieties, found chiefly in Italy, and particularly near Modena. Kempfer, however, says, that great quantities are collected in several parts of Persia; naturalists attribute the formation of the liquid bitumens to the decomposition of those that are solid, by the action of the subterraneous fires. Naphtha is said to be the lightest, which the fire first disengages: naphtha is very volatile, and so combustible, that it catches fire, if any thing burning be brought near it. In Persia, this and the other bitumens are employed for the purpose of giving light in lamps by means of wicks. See **BITUMEN**, **PETROLEUM**, &c. Naphtha has lately been employed in the experiments on the new metals obtained by the decomposition of potass and soda. See **POTASSIUM**, and **SODIUM**.

NAPIER, JOHN, baron of Merchiston, inventor of the logarithms, was the eldest son of Sir Archibald Napier of Merchiston, and born in 1550. After going through the ordinary courses of philosophy at the university of St. Andrew's, he made the tour of France, Italy, and Germany. Upon his return to his native country, his fine accomplishments soon rendered him conspicuous, and might have raised him to the highest offices in the state; but declining all civil employments, and the bustle of the court, he retired to pursue literary researches, in which he made an uncom-

mon progress, and a variety of useful discoveries. He applied himself chiefly to the study of mathematics, and of the Holy Scriptures. In both these he discovered the most extensive knowledge and profound penetration. His essay upon the book of the Apocalypse, indicates the most acute investigation, and an uncommon strength of judgement; though time has discovered, that his calculations concerning particular events had proceeded upon fallacious data. This work has been printed abroad in several languages; particularly at Rochelle in 1693, 8vo. revised by himself. Nothing, says Lord Buchan, could be more agreeable to the Rochellers, or to the Huguenots of France at this time, than the author's annunciation of the pope as Antichrist, which in this book he has set forth with much zeal and erudition. But what has principally rendered his name famous, was his great and fortunate discovery of the Logarithms in trigonometry, by which the ease and expedition in calculation have so wonderfully assisted the science of astronomy, and the arts of practical geometry and navigation. That he had begun about 1593 the train of inquiry which led him to that great achievement in arithmetic, appears by a letter to Crugerus from Kepler in 1624; wherein, mentioning the Canon Mirificus, he writes thus: "Nihil autem supra Neperianam rationem esse puto: etsi Scotus quidem literis ad Tychohem, anno 1594, scriptis jam spem fecit Canonis illius mirifici;" which allusion agrees with the story mentioned by Wood in his *Athenæ Oxon.* and explains it in a way perfectly consonant to the rights of Napier as the inventor. When Napier had communicated to Mr. Henry Briggs, mathematical professor in Gresham college, his wonderful canon for the logarithms, that learned professor set himself to apply the rules in his *Imitatio Napieræ*; and in a letter to Archbishop Ussher in 1615, he writes thus: "Napier, baron of Merchiston, hath set my head and hands at work with his new and admirable logarithms. I hope to see him this summer, if it please God: for I never saw a book which pleased me better, and made me more wonder. Lord Buchan quotes a passage from the life of Lilly the astrologer, which gives a very picturesque view of the meeting betwixt Briggs and Napier at Merchiston near Edinburgh. He was nobly entertained by baron Napier; and every summer after that, while he lived, Mr. Briggs went purposely to Scotland to visit him. There is a passage in the life of Tycho Brahe by Gassendi, which might lead the reader to suppose that Napier's method had been explored by Herwart at Hoenburg: it is in Gassendi's *Observation on a Letter from Tycho to Herwart* of the 31st August 1599. But Herwart alludes to his work afterwards published in 1610, which solves triangles by prostaphæresis; a mode totally different from that of the logarithms. Kepler dedicated his *Ephemerides* to Napier, in 1617; and it appears from many passages, in his letter, that he held Napier to be the greatest man of his age in the department to which he applied his abilities. "And indeed, (says the Earl,) if we consider that Napier's discovery was not like those of Kepler or of Newton, connected with any analogies or coincidences which might have led him to it, but the fruit of unassisted reason and science, we shall be vindicated in placing him in one of the highest niches in the temple of fame. Kepler had made many unsuccessful attempts to discover his canon for the periodic motions of the planets, and hit upon it at the last, as he himself candidly owns on the 15th of May 1618; and Newton applied the palpable tendency of heavy bodies to the earth to the system of the universe in general; but Napier sought out his admirable rules by a slow scientific progress, arising from the gradual evolution of truth." The last literary exertion of this eminent person was the publication of his *Rhabdology and Promptuary* in 1617, which he dedicated to the Chancellor Seton: and soon after died at Merchiston on the 3d of April O. S. 1617, in his 68th year, and 23d of his happy invention. The titles of his published works are, 1. *A plain Discovery of the Revelation of St. John.* 2. *Mirifici ipsius Canonis Constructio et Logarithmorum, ad naturales ipsorum Numeros Habitudines.* 3. *Appendix de Otio atque præstantiore Logarithmorum Specie constituenda, in qua scilicet Unitas Logarithmusest.* 4. *Rhabdologie, seu Numerationis per Virgulas, Libri duo.* 5. *Propositiones quedam eminentissimæ, ad Triangula sphærica mira Facultate resolvenda.* 6. *Letter to Anthony Bacon* (the original of which is in the archbishop's library at Lambeth), intitled, "Secret Inventions, profitable and necessary in these days for the defence of this island, and withstanding strangers enemies

to God's truth and religion;" which the earl of Buchan has published in the Appendix to his Account of Napier's writings. This letter is dated June 2, 1596, about which time it appears the author had set himself to explore his logarithmic canon. This eminent person was twice married. By his first wife, who was a daughter of Sir James Stirling of Keir, he had one son, who succeeded to the estate. By his second wife, a daughter of Sir James Chissolm of Cromlix, he had a numerous issue.

NAPIER'S RODS, or BONES, an instrument invented by baron Napier, whereby the multiplication and division of large numbers is much facilitated.

NAPIER'S RODS, CONSTRUCTION OF. Suppose the common table of multiplication to be made upon a plate of metal, ivory, or pasteboard, and then conceive the several columns (standing downwards from the digits on the head) to be cut a-under; these are called Napier's rods for multiplication. But then there must be a good number of each; for as many times as any figure is in the multiplicand, so many rods of that species (*i. e.* with that figure on the top of it) must we have; though six rods of each species will be sufficient for any example in common affairs: there must be also as many rods of cyphers. The figures on every rod are written in an order different from that in the table. Thus the little square space or division in which the several products of every column are written, is divided into two parts by a line across from the upper angle on the right to the lower on the left; and if the product is a digit, it is set in the lower division; if it has two places, the first is set in the lower, and the second in the upper, division; but the spaces on the top are not divided; also there is a rod of digits, not divided, which is called the index-rod, and of this we need but one single rod. See the figure of all the different rods, and the index, separate from one another, on Plate CXVIII. fig. 8.

NAPIER'S RODS, METHOD OF USING. 1. *Multiplication.*—First lay down the index-rod; then on the right of it set a rod, whose top is the figure in the highest place of the multiplicand: next to this again set the rod, whose top is the next figure of the multiplicand; and so on in order to the first figure. Then is your multiplicand tabulated for all the nine digits; for in the same line of squares standing against every figure of the index-rod, you have the product of that figure; and therefore you have no more to do but to transfer the products and sum them. But in taking out these products from the rods, the order in which the figures stand obliges you to a very easy and small addition; thus, begin to take out the figure of the lower part, or unit's place, of the square of the first rod on the right; add the figure in the upper part of this rod to that in the lower part of the next, and so on; which may be done as fast as you can look on them. To make this practice as clear as possible, take the following example: To multiply 4768 by 385. Having set the rods together for the number 4768 (*ibid.* No. 2.) against 5 in the index, I find this number, by adding according to the rule 23840
Against 8, this number 38144
Against 3, this number 14304

Total product 1835680

To make the use of the rods more regular and easy, they are kept in a flat square box, whose breadth is that of ten rods, and the length that of one rod, as thick as to hold six (or as many as you please), the capacity of the box being divided into ten cells, for the different species of rods. When the rods are put up in the box (each species in its own cell, distinguished by the first figure of the rod set before it on the face of the box near the top), as much of every rod stands without the box as shews the first figure of that rod: also upon one of the flat sides without and near the edge, upon the left hand the index-rod is fixed; and along the foot there is a small ledge; so that the rods, when applied, are laid upon this side, and supported by the ledge, which makes the practice very easy; but in case the multiplicand should have more than nine places, that upper face of the box may be made broader. Some make the rods with four different faces, and figures on each for different purposes.—2. *Division.* First tabulate your divisor; then you have it multiplied by all the digits, out of which you may choose such convenient divisors as will be next less to the figures in the dividend, and write the index answering in the quotient, and

so continually till the work is done. Thus 2179788, divided by 6123, gives in the quotient 356. Having tabulated the divisor 6123, you see that 6123 cannot be had in 2179; therefore take five places, and on the rods find a number that is equal or next less to 21797, which is 18369; that is, three times the divisor: wherefore set 3 in the quotient, and subtract 18369 from the figures above, and there will remain 3428; to which add 8, the next figure in the dividend, and seek again on the rods for it, or the next less, which you will find to be five times; therefore set 5 in the quotient, and subtract 30615 from 34288, and there will remain 3673; to which add 8, the last figure in the dividend, and finding it to be just six times the divisor, set 6 in the quotient.

6123)2179788(356
18369...

34288
30615

36738
36738

00000

NAPLES, a kingdom of Italy, comprehending the ancient countries of Samnium, Campania, Apulia, and Magna Græcia. It is bounded on all sides by the Mediterranean and Adriatic, except on the N.E. where it joins the ecclesiastical state. Its greatest length from S.E. to N.W. is about 280 English miles, and its breadth from N.E. to S.W. from 96 to 120. The climate of Naples is extremely hot, especially in July, August, and September. In winter there is seldom any ice or snow, except on the mountains. On account of its fertility it is justly termed an earthly paradise; for it abounds with all sorts of grain, the finest fruits and garden-productions of every kind, with rice, flax, oil, and wine, in the greatest plenty and perfection. It affords also saffron, manna, alum, vitriol, sulphur, rock-crystal, marble, and several sorts of minerals, together with fine wool and silk. The horses are famous, and the flocks and herds very numerous. Besides these products, of which a considerable part is exported, there are manufactures of snuff, soap, and glass-ware. Waistcoats, caps, stockings, and gloves, are also made of the filaments of a shell-fish, which are warmer than those of wool, and of a beautiful glossy green. In this kingdom likewise is found the Phrygian stone, or *petra fungifera*, which, being laid in a damp shady place, will yield mushrooms, sometimes of a very large size, especially if the stone be sprinkled with hot-water. This kingdom was divided into twelve provinces by the emperor Frederic II. viz. Lavora, Principato Citra and Ultra, Capitanata, Molise, Abruzzo Citra and Ultra, Bari, Otranto, Basilicata, and Calabria Citra and Ultra. See these articles in their order.

NAPLES, anciently called Parthenope, afterwards Neapolis, the capital of the above kingdom, lies in the province of Lavora, which is the richest and best inhabited of the whole kingdom, and comprehends a part of the ancient Campania Felix. Naples stands 110 miles S. E. of Rome. Lon. 14. 20. E. Lat. 40. 50. N.

NAPOLI DI MALVASIA, the capital of the island of Malvasia, is seated on a promontory, and has a good harbour at the foot of a rock, which is joined to the continent by a long wooden bridge. It was anciently called Epidaurus. It lies 40 miles E.S.E. of Misitra, and 75 S. of Athens. Lon. 23. 22. E. Lat. 36. 54. N.

NAPOLI DI ROMANIA, a sea-port of European Turkey, in the Morea, on a peninsula in the Gulf, 56 miles S.W. of Athens. Lon. 23. 4. E. Lat. 37. 39. N.

NAPOLI, GULF OF, a bay of the Mediterranean, on the coast of the two Napolis.

NARBARTH, or NARBETH, a town of South Wales, in Pembrokehire, 12 miles N. E. of Pembroke, and 229 W. by N. of London. Lon. 4. 46. W. Lat. 51. 50. N.

NARBO, in ancient geography, a town of the Volæ Tectosages, called also Narbo Martius, from the Legio Marcia. Now called Narbonne.

NARBONNE, an ancient city of France, in the department of Aude, and the late province of Lower Languedoc, famous for honey. Lon. 3. 6. E. Lat. 43. 11. N.

NARBOROUGH, an island in the South Pacific Ocean, near the coast of Chili, discovered by Sir John Narborough. Lon. 76. 12. W. Lat. 43. 12. S.

NARCISSUS, in fabulous history, the son of the river Cephissus Liriope, the daughter of Oceanus, was a youth of great beauty. Tiresias foretold that he should live till he saw himself. He despised the nymphs of the country: and made Echo languish till she became a mere sound, by refusing to return her passion: but one day coming weary and fatigued from the chase, he stopped on the bank of a fountain to quench his thirst; when, seeing his own form in the water, he became so in love with his shadowy image, that he languished till he died:—A good allegory of the folly of excessive self-love. On which the gods changed him into the flower which bears his name.

NARCISSUS, in botany, a genus of the monogynia order, and hexandria class of plants; natural order, Spathaceæ. Petals six, equal; nectary funnel-form, one-leaved; stamina within the nectary. There are fifteen species.

N. JONQUILLA, the **JONQUIL**, sometimes called **RUSH-LEAVED DAFFODIL**, hath an oblong, bulbous, brown root; sending up several long, semi-taper, rush-like, bright-green leaves; amidst them an upright green flower-stalk, a foot or fifteen inches high; terminated by a multiflorous spatha, protruding many yellow flowers, often expanded like a radius, each having a hemispherical, crenated nectarium, shorter than the petals; flowering in April, and mostly of a fine fragrance. The varieties are, jonquil minor with single flowers; jonquil major with single flowers; starry-flowered; yellow and white-flowered; white-flowered; semi-double-flowered; double-flowered; and large double inodorous jonquil: all multiflorous, the single in particulars; but sometimes the doubles produce only two or three flowers from a spatha, and the singles commonly six or eight. All the sorts have so fine a shape, so soft a colour, and so sweet a scent, that they are some of the most agreeable spring flowers.

N. TAZETTA, the **MULTIFLOROUS DAFFODIL**, commonly called, **POLYANTHUS NARCISSUS**; hath a very large, roundish, bulbous root; long, narrow, plain leaves; an upright flower-stalk, rising from ten or twelve inches to a foot and half high, terminated by a multiflorous spatha, protruding many large, spreading, white and yellow flowers, in a cluster, having bell-shaped nectariums shorter than the corolla; flowering in February, March, and April; and is very fragrant. The varieties of this are very numerous. They are all very pretty flowers, and make a charming appearance in the flower-borders, &c. they are also finely adapted for blowing in glasses of water, or in pots, to ornament rooms in winter.

NARCONDAM, an island in the East Indian Ocean, 20 miles in circumference; and 75 S. of the Andaman isles. Lon. 94. 12. E. Lat. 13. 25. N.

NARCOTICS, in medicine, a term comprehending opiates, anodynes, or paregorics, and all other drugs which induce sleep, or occasion stupefaction.

NARDO, a pretty populous town of Naples, in Otranto, with a bishop's see. Lon. 18. 27. E. Lat. 43. 28. N.

NARDUS, **SPIKENARD**, in botany, a genus of the monogynia order, and triandria class of plants; natural order, Gramina. Calyx none; corolla bivalved. It has four species. This plant was highly valued by the ancients, both as an article of luxury and medicine. The unguentum nardinum was used at baths and feasts as a favourite perfume. Its value is evident from that passage of scripture, where our Saviour's head was anointed with a box of it, with which Judas found fault. From a passage in Horace it appears that this ointment was so valuable among the Romans, that as much as could be contained in a small box of precious stone was considered as a sort of equivalent for a large vessel of wine, and a proper quota for a guest to contribute at an entertainment, according to an ancient custom.

NARÉA, the most southerly province of the empire of Abyssinia; a kingdom still governed by its own princes, who have the title of Beneros. Its territory was formerly more extensive than at present, the Galla having almost quite surrounded it, especially on the S. E. and N. The country on the W. is unknown; the kingdom itself stands like a fortified place in the middle of a plain, being a high and mountainous country.

NARNALLA, a town of Hindostan, in Berar; 33 miles W. N. W. of Ellichpour. Lon. 77. 34. E. Lat. 21. 25. N.

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NARNI, a very ancient town of Italy, in Sabina, 20 miles S. W. of Spoleto, and 40 N. E. of Rome.

NARRAGANSET, or **NARRAGANSETT**, a river of the United States in Connecticut.

NARRAGANSETT BAY, a large bay of Rhode Island, 18 miles long from S. to N. and from 8 to 11 broad.

NARRATION, in oratory, poetry, and history, is a recital or rehearsal of a fact as it happened, or as it is supposed to have happened. Narration is of two kinds, either simple or historical, as where the auditor or reader is supposed to hear or read of a transaction at second hand; or artificial and fabulous, as where their imaginations are raised, and the action is as it were re-acted before them. The narration, according to the writers of rhetoric, makes the second part of a just speech or harangue, viz. that immediately following to the exordium. It makes the whole history, abating for the occasional reflections, episodes, and digressions. Cicero requires four virtues in a narration, viz. perspicuity, probability, brevity, and sweetness. The narration is rendered perspicuous by observing the order of time, by using none but proper and known terms, and by reciting the action uninterruptedly. It is rendered probable by the credibility of the narrator, by the simplicity and openness of the narration, by avoiding every thing far remote from the common sense and opinion of mankind, and by a precise detail of circumstances. It is rendered brief by taking it up no higher than is necessary, nor fetching it back; and by avoiding trivial circumstances. Lastly, it is rendered sweet by using smooth, numerous, and well-sounding words; by arranging them so as to avoid any hiatus or clashing; by the greatness, novelty, and unexpectedness, of the things related; and by enriching it with tropes and figures. See **ORATORY**, **TROPE**, &c.

NARSAPOUR, the name of four towns of Hindostan: viz. 1. in the circar of Ellore, 40 miles E. S. E. of Ellore: 2. in ditto, 25 miles N. W. of Ellore: 3. in Goleonda, 10 miles S. S. E. of Damapetta: 4. in Mysore, 22 miles N. of Bangalore.

NARSINGAPATAM, a town of Hindostan, in Mysore, and territory of Bisnagur; 400 miles S. E. of Bombay. Lon. 76. 10. E. Lat. 15. 30. N.

NARVA, a strong town of Russia, in Livonia, or Revel, on the Narova, near the Gulf of Finland, built in 1224, 68 miles S. W. of Petersburg. Lon. 28. 22. E. Lat. 59. 23. N.

NASAS, a river of North America, in New Biscay, which joins the Saucedo in Lon. 67. 0. W. Lat. 25. 10. N.

NASCIO, or **NATIO**, a goddess of the Romans, supposed to preside over the birth of children. She had a temple at Ardea.

NASE, a river of North America, which runs into the Mississippi, in Lon. 85. 14. W. Lat. 37. 20. N.

NASHVILLE, a town of Tennessee, the capital of Mero district, and Davidson county, 190 miles S. by W. of Lexington, and 913 W. S. W. of Philadelphia. Lon. 84. 12. W. Lat. 37. 2. N.

NASSAU, a fertile county of Germany, in the late circle of the Upper Rhine, and district of Wetteravia, about 48 miles long, and 28 broad. In the tenth century it was possessed by Otho, Lord of Lamenberg, whose descendant, Count Henry I. about 1225, divided it between his sons Walram and Otho, the former receiving Weilburg, Wisbaden, and Istein; the latter Siegen, Dillenburg, Herborn, Hadamar, &c. which gave rise to the different branches of the present princes.

NASSAU, the capital of the above county, is seated on the Lahn, 12 miles S. E. of Coblenz, and 22 N. W. of Mentz.

NASSAU, the capital of Providence Island. Lat. 25. 3. N.

NASSAU, an island in the East Indian Ocean, W. of Sumatra, 50 miles in circuit. Lon. 100. 0. W. Lat. 2. 25. S.

NASSAU, CAPE, a cape of Surinam, N. N. W. of Essequibo Gulf. Lon. 59. 30. W. Lat. 7. 40. N.

NASTISTAK, an island of Russia, in the Lena, 80 miles long, and 20 broad. Lon. 115. 41. to 119. 35. E. Lat. 71. 44. to 72. 50. N.

NATAL, a country of Africa, S. E. of Caffraria, and W. of the Cape of Good Hope, beyond St. Christopher's river; so named by the Portuguese, because it was discovered on Christmas day.

NATAL, a river of Africa, which bounds the above country on the N. and runs into the Indian Ocean.

NATANGEN, a populous and fertile province of Prussia, bounded

bounded on N. and E. by the Pregel, S. by Ermeland, and W. by the Frische-haff. It is well cultivated. Brandenburg is the capital.

NATCHES, or **NATCHEZ**, a nation of North American Indians, formerly very powerful, who inhabited the country on the E. bank of the Mississippi. The Creeks or Muskogulges rose upon their ruins, and the French completed their destruction in 1736. The remains of them are incorporated with the Creeks.

NATCHEZ, the name still given to that district of Georgia, on the E. bank of the Mississippi, formerly possessed by the Natchez Indians. The surface is level; the soil very fertile; the water and climate excellent. All kinds of grain and fruits are produced, besides hemp, flax, hops, cotton, tobacco, indigo, mulberry, and other trees. It extends about 32 miles from Petit Goutre to Fort Rosalie, which lies 243 miles above New Orleans, in Lat. 31. 40. N.

NATCHITOCHES, or **RED RIVER**, a river of Louisiana, which runs into the Mississippi, in Lon. 91. 47. W. Lat. 31. 15. N.

NATCHITOCHES, an American Indian town and settlement, on an island in the above river; 70 leagues above its mouth, and 40 miles from Fort Adayes. Lon. 93. 28. W. Lat. 32. 11. N.

NATES, in anatomy, a term expressing those two fleshy exterior parts of the body, vulgarly called the buttocks. See **ANATOMY**.

NATES CEREBRI, are two circular protuberances of the brain, situated on the back side of the medulla oblongata, near the cerebellum. See **ANATOMY**.

NATHAN, a faithful prophet and historian of Israel, under David and Solomon; supposed to be the author of the second book of Samuel, and of the latter part of the first book: be that as it may, we are certain, that he wrote the history of David and Solomon. (See 1 Chron. xxix. 29: 2. Chron. ix. 29.) Some commentators think from these texts, that he was assisted in compiling these historical works by Gad and Ahijah; but the texts seem evidently to refer to the books of Samuel, Gad, Ahijah, and Iddo, as distinct works, and even under different titles, of books, prophecies, and visions. Nathan's affecting parable of the ewe-lamb, his bold reproof of David for his crimes, his prohibition of his building the temple, and his seasonable advice, whereby the usurpation of Adonijah was overthrown, are recorded in 2 Sam. vii. xii.; and 1 Kings i.

NATIONAL DEBT, the money owing by the government to individuals. In the rude state of society, which preceded the extension of commerce and the improvements of manufactures, when those expensive luxuries which commerce and manufactures could alone introduce, were altogether unknown; the person who possessed a large revenue, could spend or enjoy that revenue in no other way than by maintaining nearly as many people as it could maintain. Among our feudal ancestors, the long time during which estates used to continue in the same family, sufficiently demonstrates the general disposition of people to live within their income. Though hospitality was constantly exercised by the great landholders, yet they certainly lived within their incomes. They could not well indeed do any thing else but hoard whatever money they saved. To trade was disgraceful to a gentleman; and to lend money at interest, which was then considered as usury, and prohibited by law, would have been still more so. The same disposition to save and to hoard prevailed in the sovereign as well as in the subjects. Among nations to whom commerce and manufactures are little known, the sovereign is in a situation which naturally disposes him to the parsimony requisite for accumulation. In that situation, the expence even of a sovereign cannot be directed by that vanity which delights in the gaudy finery of a court. The ignorance of the times affords but few of the trinkets in which that finery consists. Standing armies are then not necessary; so that the expence even of a sovereign, like that of any other great lord, can be employed in scarcely any thing but bounty to his tenants, and hospitality to his retainers. But bounty and hospitality very seldom lead to extravagance, though vanity almost always does. All the ancient sovereigns of Europe accordingly had treasuries. Every Tartar chief in the present times is said to have one. In a commercial country abounding with every sort of expensive luxury, the sovereign, in the same manner as almost all the great proprietors in his dominions, naturally spends a great part of his

revenue in purchasing those luxuries. His own and the neighbouring countries supply him abundantly with all the costly trinkets which compose the splendid but insignificant pageantry of a court. His ordinary expence becomes equal to his ordinary revenue, and it is well if it does not exceed it. The amassing of treasure can no longer be expected; and when extraordinary exigencies require extraordinary expences, he must necessarily call upon his subjects for an extraordinary aid. The parsimony which leads to accumulation has become almost as rare in republican as in monarchical governments. The taste for some sort of pageantry, for splendid buildings at least, and other public ornaments, frequently prevails as much in the apparently sober senate-house of a little republic, as in the dissipated court of the greatest king. The want of parsimony in time of peace imposes the necessity of contracting debt in time of war. When war comes, there is no money in the treasury but what is necessary for carrying on the ordinary expence of the peace-establishment. In war an establishment of three or four times that expence becomes necessary for the defence of the state, and consequently a revenue three or four times greater than the peace-revenue. Supposing that the sovereign should have, what he scarcely ever has, the immediate means of augmenting his revenue in proportion to the augmentation of his expence; yet still the produce of the taxes, from which this increase of revenue must be drawn, will not begin to come into the treasury till perhaps a year after they are imposed. But the moment in which war begins, or rather the moment in which it appears likely to begin, the army must be augmented, the fleets must be fitted out, the garrisoned towns must be put into a posture of defence; they must be furnished with arms, ammunition, and provisions. An immediate and great expence must be incurred in that moment of immediate danger, which will not wait for the gradual and slow returns of the new taxes. In this exigency government can have no other resources but in borrowing. The same commercial state of society, which, by the operation of moral causes, brings a government in this manner into the necessity of borrowing, produces in the subjects both an ability and an inclination to lend. If it commonly brings along with it the necessity of borrowing, it likewise brings along with it the facility of doing so. A country abounding with merchants and manufacturers, necessarily abounds with a set of people through whose hands not only their own capitals, but the capitals of all those who either lend them money or trust them with goods, pass as frequently or more frequently than the revenue of a private man, who, without trade or business, lives upon his income, passes through his hands. The revenue of such a man can regularly pass through his hands only once in a year. But the whole amount of the capital and credit of a merchant, who deals in a trade of which the returns are very quick, may sometimes pass through his hands two, three, or four, times in a year. A country abounding with merchants and manufacturers, therefore, necessarily abounds with a set of people, who have it at all times in their power to advance, if they please, a very large sum of money to government. Hence the ability in the subjects of a commercial state to lend. The progress of the enormous debts, which at present oppress, and will at last probably ruin, all the great nations of Europe, has been pretty uniform. In England, after the Revolution, when new connections with Europe introduced a new system of foreign politics, the expences of the nation, not only in settling the new establishment, but in maintaining long wars, as principals, on the continent, for the security of the Dutch barrier, reducing the French monarchy, settling the Spanish succession, supporting the house of Austria, maintaining the liberties of the Germanic body, and other purposes, increased to an unusual degree: insomuch, that it was not thought advisable to raise all the expences of any one year by taxes to be levied within that year, lest the unaccustomed weight of them should create murmurs among the people. It was, therefore, the policy of the times to anticipate the revenues of their posterity, by borrowing immense sums for the current service of the state, and to lay no more taxes upon the subject than would suffice to pay the annual interest of the sums so borrowed; thus converting the principal debt into a new species of property, transferable from one man to another at any time, and in any quantity. This system indeed seems to have had its original in the state of Florence, A. D. 1344; which government then owed about 60,000*l.* sterling; and being unable to pay it, formed the principal

principal into an aggregate sum, called metaphorically a mount or bank, the shares whereof were transferable like our stocks, with interest at five per cent. the prices varying according to the exigencies of the state. This laid the foundation of what is called the national debt: for a few long annuities created in the reign of Charles II. will hardly deserve that name. Nations, like private men, have generally begun to borrow upon what may be called personal credit, without assigning or mortgaging any particular fund for the payment of the debt; and when this resource has failed them, they have gone on to borrow upon assignments or mortgages of particular funds. What is called the unfunded debt of Great Britain, has been contracted in the former of these two ways. It consists partly in a debt which bears, or is supposed to bear, no interest, and which resembles the debts that a private man contracts upon his bill or promissory note. The debts which are due either for extraordinary services, or for services either not provided for, or not paid at the time when they are performed; part of the extraordinaries of the army, navy, and ordnance, the arrears of subsidies to foreign princes, those of seamen's wages, &c. usually constitute a debt of the first kind. Navy and exchequer bills, which are issued sometimes in payment of a part of such debts, and sometimes for other purposes, constitute a debt of the second kind; exchequer-bills bearing interest from the day on which they are issued, and navy-bills six months after they are issued. The bank of England, either by voluntarily discounting those bills at their current value, or by agreeing with government for certain considerations to circulate exchequer-bills, that is, to receive them at par, paying the interest which happens to be due upon them, keeps up their value, and facilitates their circulation, and thereby frequently enables government to contract a very large debt of this kind. During the great recoinage in King William's time, when the bank of England thought proper to put a stop to its usual transactions, exchequer-bills and tallies are said to have sold from 25 to 60 per cent discount; owing partly, no doubt, to the supposed instability of the new government established by the Revolution, but partly too to the want of the support of the bank of England. When this resource is exhausted, and it becomes necessary, in order to raise money, to assign or mortgage some particular branch of the public revenue for the payment of the debt, government has upon different occasions done this in two different ways. Sometimes it has made this assignment or mortgage for a short period of time only, a year or a few years, for example; and sometimes for perpetuity. In the one case, the fund was supposed sufficient to pay within the limited time both principal and interest of the money borrowed: in the other, it was supposed sufficient to pay the interest only, or a perpetual annuity equivalent to the interest; government being at liberty to redeem at any time this annuity upon paying back the principal sum borrowed. When money was raised in the one way, it was said to be raised by anticipation; when in the other, by perpetual funding, or, more shortly, by funding. In the reign of King William III. when the debt began to be amassed, and during a great part of that of Queen Anne, before we had become so familiar as we are now with the practice of perpetual funding, the greater part of the new taxes were imposed but for a short period of time (for four, five, six, or seven, years only), and a great part of the grants of every year consisted in loans upon anticipation of the produce of those taxes. The produce being frequently insufficient for paying within the limited term the principal and interest of the money borrowed, deficiencies arose: to make good which it became necessary to prolong the term. The debt still continued to accumulate, so that in 1802 it consisted of 340 millions. To pay the interest of this enormous sum, the revenue is made perpetual, but still redeemable by the same authority that imposed them; which, if it at any time can pay off the capital, will abolish those taxes which are raised to discharge the interest. By these means, then, the quantity of property in the kingdom is greatly increased in idea compared with former times; yet, if we coolly consider it, not at all increased in reality. We may boast of large fortunes, and quantities of money in the funds. But where does this money exist? It exists only in name, in paper, in public faith, in parliamentary security; and that is undoubtedly sufficient for the creditors of the public to rely on. But then what is the pledge which the public faith has pawned for the security of these debts? The land, the trade, and the personal industry, of the subject; from which the money must arise that supplies the several taxes.

In these, therefore, and these only, the property of the public creditors does really and intrinsically exist; and of course the land, the trade, and the personal industry, of individuals, are diminished in their true value, just so much as they are pledged to answer. If A's income amounts to 100*l.* per annum; and he is so far indebted to B, that he pays him 50*l.* per annum for his interest; one-half of the value of A's property is transferred to B the creditor. The creditor's property exists in the demand which he has upon the debtor, and no where else; and the debtor is only a trustee to his creditor for one-half of the value of his income. In short, the property of a creditor of the public consists in a certain portion of the national taxes; by how much, therefore, he is the richer, by so much the nation, which pays these taxes, is the poorer. The only advantage that can result to a nation from public debts, is the increase of circulation, by multiplying the cash of the kingdom, and creating a new species of currency, assignable at any time, and in any quantity; always, therefore, ready to be employed in any beneficial undertaking, by means of this transferable quality; and yet producing some profit even when it lies idle and unemployed. A certain proportion of debt seems to be highly useful to a trading people; but what that proportion is, it is not for us to determine. This much is indisputably certain, that the present magnitude of our national incumbrances very far exceeds all calculations of commercial benefit, and is productive of the greatest inconveniences. For, first, the enormous taxes, that are raised upon the necessities of life for the payment of the interest of this debt, are a hurt both to trade and manufactures, by raising the price as well of the artificer's subsistence as of the raw material, and of course, in a much greater proportion, the price of the commodity itself. Nay, the very increase of paper-currency itself, when extended beyond what is requisite for commerce or foreign exchange, has a natural tendency to increase the price of provisions as well as of all other merchandise. For as its effect is to multiply the cash of the kingdom, and this to such an extent that much must remain unemployed, that cash (which is the universal measure of the respective values of all other commodities) must necessarily sink in its own value, and every thing grow comparatively dearer. 2dly, If part of this debt be owing to foreigners, either they draw out of the kingdom annually a considerable quantity of specie for the interest; or else it is made an argument to grant them unreasonable privileges to induce them to reside here. 3dly, If the whole be owing to subjects only, it is then charging the active and industrious subject, who pays his share of the taxes, to maintain the indolent and idle creditor who receives them. Lastly, and principally, it weakens the internal strength of a state, by anticipating those resources which should be reserved to defend it in case of necessity. The interest we now pay for our debts would undoubtedly be sufficient to maintain the most vigorous war, that any national motives could possibly require. If indeed our ancestors in King William's time had annually paid, so long as their exigencies lasted, a far less sum than we now annually raise upon their accounts, they would not in time of war have borne so great burdens, as they have bequeathed to, and settled upon, their posterity in time of peace; and might have been eased the instance the exigence was over. See FUNDS. Many schemes have been proposed at various times, and by various persons, for gradually removing this burden: but we must refer such as wish for farther information on this interesting topic to those works, which treat of it at full length; particularly Smith's *Wealth of Nations*, and Sir John Sinclair's *History of the Revenue*. The writings of Dr. Price also merit attention, especially as one of his plans for the reduction of the debt has been adopted, and established, by the legislature. His three plans may be found in a late pamphlet by William Morgan, intitled, "*A Review of Dr. Price's Writings on the Subject of the Finances of this Kingdom*." The following statement will be sufficient to shew the procedure of the national debt in its accumulation.

PROGRESS OF THE NATIONAL DEBT, FROM ITS
COMMENCEMENT TO MIDSUMMER 1802.

	Capital.	Interest.
National debt at the Revolution, 1688.....	664,263	39,855
Increase during the reign of William III.....	15,730,439	1,271,087
	Amount	

Amount at the accession of Queen Anne.....	L 16,391,702	L 1,310,942
Increase during the reign of Queen Anne.....	31,969,799	1,841,582
Amount at establishment of Sinking Fund, 1716.....	48,364,501	3,152,524
Increase during the reign of Geo. I.....	4,654,654	
Decrease of annual charge.....		941,958
Amount at the accession of Geo. II.....	53,019,155	2,210,566
Decrease during the Peace.....	6,064,532	246,541
Amount at commencement of the War, 1739.....	46,954,623	1,964,025
Increase during the War.....	31,338,089	1,096,979
Amount at the end of the War in 1748.....	78,293,312	3,061,004
Decrease during the Peace.....	3,312,426	389,364
Amount at the commencement of the War, 1755.....	74,980,886	2,671,640
Increase during the War.....	66,710,427	2,035,094
Amount at the end of the War, 1762.....	141,691,313	4,706,734
Decrease during the Peace.....	5,748,262	229,913
Amount at commencement of the American War.....	135,943,051	4,476,821
Increase during the War.....	132,157,328	5,033,411
Amount at the conclusion of the American War.....	268,100,379	9,512,232
Increase in the year 1789.....	1,189,140	56,863
Amount in 1789.....	269,289,519	9,569,095
Redeemed during the Peace.....	9,441,850	283,255
Amount at the commencement of the War, 1793.....	259,847,669	9,285,840
Increase during the War.....	350,013,508	11,988,633
	609,861,177	21,274,473
Redeemed during the War.....	69,243,336	2,089,220

Amount at conclusion of the War in 1802.....540,617,841 19,185,253
 Since the commencement of the present war in 1803, the exigencies of the state have added no less than 269 millions sterling to the national debt; for at the close of 1810, it has amounted to the awful sum of 811 millions!!!

NATIONAL INSTITUTE, or NEW ACADEMY OF ARTS AND SCIENCES, a celebrated Literary and Philosophical Society at Paris, consisting of the most learned men, and the most eminent literary characters in France; instituted in the beginning of the revolution, about the time when the Royal Academies, and every thing else that had the name of Royal, was altered or abolished. This academy, founded on a decree of the new constitution, was opened on the 7th of Dec. 1795. The academy is divided into three classes, each class into sections, each section to contain twelve members. 1st class. Mathematics and natural philosophy. This class is divided into ten sections. 1. Mathematics. 2. Mechanical Arts. 3. Astronomy. 4. Experimental Philosophy. 5. Chemistry. 6. Natural History. 7. Botany. 8. Anatomy and Animal History. 9. Medicine and Surgery. 10. Animal Economy, and the Veterinary Science. 2d class. Morality and Politics. This class consists of six sections. 1. Analysis of Sensations and Ideas. 2. Morals. 3. Legislature. 4. Political Economy. 5. History. 6. Geography. 3d class. Literature and the fine arts. This class consists of eight sections. 1. Universal Grammar. 2. Ancient Languages. 3. Poetry. 4. Antiquities. 5. Painting. 6. Sculpture. 7. Architecture. 8. Music. For each class a particular room in the Louvre is appropriated. No one can be a member of two classes at the same time, but a member of one class may be present at the meetings of any other.

Each class is to print yearly an account of its transactions. Four times a year there are to be public meetings. On these occasions, the three classes meet together.

NATIVITY, is used for Natal day, the day of a person's birth; in speaking of the saints; as, the nativity of St. John the Baptist, &c. But when we say the Nativity, it is understood of that of Jesus Christ, or the feast of Christmas.

NATIVITY, [*nativitas*, Lat.] in ancient law-books, signifies bondage or servitude.

NATIVITY, in astrology, the scheme or figure of the heavens, and particularly of the twelve houses, at the moment when a person was born; called also the horoscope. Casting the queen's nativity, or by calculation seeking to know how long the queen should live, &c. was made felony, an. 23 Eliz. c. 2.

NATIVO HABENDO, in law, a writ directed to the sheriff, for a lord who claimed inheritance in any villain, when a villain was run away from him, for the apprehending and restoring him to the lord.

NATIX, in natural history, a name given by some old writers to the Nerita.

NATOLIA, the modern name of the Lesser Asia, the most westerly part of Turkey in Asia, and consisting of a large peninsula, which extends from the Euphrates as far as the Archipelago, the sea of Marmora, the straits of Galipoli and of Constantinople, which separate it from Europe on the W. It is bounded on the N. by the Black Sea, and on the S. by the Mediterranean. It is 400 miles long from E. to W. and 35 broad, and contains the ancient Bithynia, Paphlagonia, Galatia, Phrygia, Mysia, Aolia, Ionia, Lydia, Doris, Pysidia, Lycia and Pamphylia. The soil is fertile, and commerce considerable. It is governed by a beglerbeg, and several sangiacs. There are many Greek Christians, besides Armenians and Roman Catholics in it.

NATOLICA, an island in the Mediterranean, on the coast of Greece. Lon. 21. 37. E. Lat. 38. 39. N.

NATROLITE, in mineralogy, a species of the zeolite family, first described and analysed by Klaproth, who gave it this name, because it contains a great proportion of soda. It occurs massive; its fracture presents straight or diverging fibres; its colour is light-yellow, with little lustre. It fuses very readily before the blow-pipe. It is composed of

Silica.....	48
Alumina.....	24.25
Soda.....	16.5
Oxide of Iron.....	1.75
Water.....	9
	99.5
Loss.....	5
	100

NATRON, in chemistry, a term frequently given to soda, upon the supposition that it is the natron or nitrum of the ancients. See SODA. Natural natron occurs either as an efflorescence on the surface of the soil, or on decomposing rocks of particular kinds, or on the sides and bottoms of lakes that become dry during the summer. See SODA.

NATURAL, that is produced or effected according to the common laws or proceedings of nature. It stands opposed to factitious or artificial. Bishop Wilkins observes, that there appears a world of difference between natural and artificial things, when viewed with microscopes. The first ever appear adorned with all imaginable elegance and beauty; the latter, though the most curious in their kind, infinitely rude and unheavenly; the finest needle appears a rough bar of iron; and the most accurate engraving or embossment, as if done with a mattock or a trowel.

NATURAL, in heraldry, is used where animals, fruits, flowers, &c. are blazoned with the colours they naturally have, though different from the common colours of heraldry; and this is to prevent their armories being accused of falsity, when blazoned with the names of colours unknown in heraldry.

NATURAL BEAUTY, or the beauty of natural objects, implies those qualities in the works of God, which are calculated to excite pleasing sensations in the minds of all persons of true taste who attentively

attentively observe them. "That sensibility to beauty, (says Dr. Percival) in his *Moral and Liter. Dissert.* which, when cultivated and improved, we term taste, is universally diffused through the human species; and it is most uniform with respect to those objects, which being out of our power are not liable to variation from accident, caprice, or fashion. The verdant lawn, the shady grove, the variegated landscape, the boundless ocean, and the starry firmament, are contemplated with pleasure by every attentive beholder. But the emotions of different spectators, though similar in kind, differ widely in degree; and to relish with full delight the enchanting scenes of nature, the mind must be uncorrupted by avarice, sensuality, or ambition; quick in her sensibilities; elevated in her sentiments; and devout in her affections. Perhaps such ardent enthusiasm may not be compatible with the necessary toils and active offices which Providence has assigned to the generality of men. But there are none to whom some portion of it may not prove advantageous; and if it were cherished by each individual, in that degree which is consistent with the indispensable duties of his station, the felicity of human life would be considerably augmented. From this source, the refined and vivid pleasures of the imagination are almost entirely derived: and the elegant arts owe their choicest beauties to a taste for the contem-

plation of nature. Painting and sculpture are express imitations of visible objects; and where would be the charms of poetry, if divested of the imagery and embellishments which she borrows from rural scenes? Painters, statuary, and poets, therefore, are always ambitious to acknowledge themselves the pupils of nature; and as their skill increases, they grow more and more delighted with every view of the animal and vegetable world. But the pleasure resulting from admiration is transient; and to cultivate taste, without regard to its influence on the passions and affections, is to rear a tree for its blossoms, which is capable of yielding the richest and most valuable fruit." Physical and moral beauty bear so intimate a relation to each other, that they may be considered as different gradations in the scale of excellence; and the knowledge and relish of the former should be deemed only a step to the nobler and more permanent enjoyments of the latter." It is the part, then, of the moralist, and it has been frequently his business, to point out and recommend such pleasures as are highly gratifying, and are yet perfectly innocent.

NATURAL FUNCTIONS are those actions whereby the elements are changed and assimilated so as to become a part of the body.

NATURAL HISTORY.

NATURAL HISTORY, in its most extensive signification, denotes a knowledge and description of the whole universe. Matters of fact respecting the heavens, meteors, atmosphere, the earth, respecting all the phenomena, indeed, which occur in the world, and even of the external parts and actions of man himself, as far as reason can discover them, belong to the province of natural history; but when we leave the simple recital of effects, and endeavour to investigate the causes of such phenomena, we then leave natural history, and enter on philosophy. The object of this article, therefore, in the sense here given it, is as extensive as nature itself. But, in its more appropriated sense, it only extends to the surface of the earth, the works on it, and the inhabitants of it. In this restricted sense natural history may be divided into two heads: the first teaches us the characteristics, or distinctive marks, of each individual object, whether animal, vegetable, or mineral; the second renders us acquainted with all its peculiarities, in respect to its habits, its qualities, and its uses. In order to attain this knowledge with facility some system of classification is necessary; that of Linnaeus is preferred. See BOTANY, MINERALOGY, and ZOOLOGY. See also the several genera into which the classes are divided.

OF THE TERRAQUEOUS GLOBE IN GENERAL, AND ITS CHANGES.

The terraqueous globe, or the world, which we inhabit, is every where surrounded with elements, and contains in its superficies the three kingdoms of Nature, as they are called; the fossil or mineral, which constitutes the crust of the earth; the vegetable, which adorns the face of it, and draws great part of its nourishment from the fossil kingdom; and the animal, which is sustained by the vegetable kingdom. Thus, then, these three grand divisions or kingdoms; cover, adorn, and vary, the surface of the earth; and the boundaries of all these kingdoms are formed in the ZOOPHYTES, which see. Minerals occupy the interior parts of the earth, in rude and shapeless masses. They are concrete bodies, destitute of life and sensation. See MINERALOGY, and the several genera of minerals. Vegetables clothe its surface with verdure, imbibe nourishment through their bibulous roots, respire by means of leaves, and continue their kind by the dispersion of seed within prescribed limits. They are organized bodies, possessing life, but not sensation. See BOTANY. Animals inhabit the exterior parts of the earth, respire, and generate eggs; are impelled to action by hunger, affections, and pain, and by preying on other animals and vegetables, restrain within proper limits and proportions the numbers of both. They possess organized bodies, enjoy life and sensation, and have the power of loco-motion. See ZOOLOGY, and

the several genera of animals. To perpetuate the established course of nature in a continued series, the Divine Wisdom has thought fit that all living creatures should constantly be employed in producing individuals that all natural things should contribute towards preserving every species; and lastly, that the death and destruction of one thing should always be subservient to the production of another. Hence the objects of our present inquiry fall to be considered in a threefold view, that of propagation, preservation, and death or destruction.

OF THE FOSSIL KINGDOM.

I. PROPAGATION. It is generally agreed, that stones are not organical bodies, like plants and animals; and therefore it is clear, that they are not produced from an egg, like the tribes of the other kingdoms. Hence the variety of fossils is proportionate to the different combinations of coalescent particles; and hence the species in the fossil kingdom are not so distinct as in the other two. Hence also the laws of generation in relation to fossils have been in all ages extremely difficult to explain; and hence have arisen so many different opinions about them, that it would be endless to enumerate them.

II. PRESERVATION. As fossils are destitute of life and organization; are hard, and not obnoxious to putrefaction; so they last longer than any other kind of bodies. Air is supposed to contribute to this duration; as it hardens many stones upon the surface of the earth, and makes them more solid, compact, and durable. The chalky marl, which they use in Flanders and about Bath for building houses, as long as it continues in the quarry is friable; but when dug up and exposed to the air it grows gradually harder. Though we know not the cause why large rocks are split, and vast fragments frequently torn off; yet we observe, that fissures are closed up by water, which gets between them, and is detained there; forming crystal and spar. Hence we scarcely ever find any crystal, but in those stones which have retained for some time in their chinks, water loaded with stony particles. In the same manner water fills the cavities in mines, and concretes into quartz or crystal. It is manifest that stones are not only generated, augmented, and changed, perpetually, from incrustations brought upon moss, but are also increased by crystal and spar. The adjacent earth too, especially if it be impregnated with iron-particles, is commonly changed into a solid stone. It is said, that the marble-quarries in Italy, whence fragments are cut, grow up again. Ores grow by degrees, whenever the mineral-particles, conveyed by water through the clefts of mountains, are retained there: so that, adhering to the homogeneous matter a long

while, at last they take its nature, and are changed into a similar substance.

III. DESTRUCTION. Fossils, although the hardest of bodies, yet are subject to destruction, as well as all other created substances. They are dissolved in various ways by water, air, and the solar rays; by the rapidity of rivers, violence of cataracts, and eddies, which continually beat upon, and at last reduce to powder, the hardest rocks. The agitations of the sea, and lakes, and the vehemence of the waves, excited by turbulent winds, pulverise stones, as evidently appears by their roundness along the shore. Also the chemical actions of various substances destroy the texture, and disunite the parts, of minerals according to their different affinities.

OF THE VEGETABLE KINGDOM.

I. PROPAGATION. Anatomy proves, that all plants are organic and living bodies; and that all organic bodies are propagated from an egg has been demonstrated. The seeds of vegetables, as well as of animals, are called eggs; these are different in every different plant. Many plants, however, push forth from their roots fresh offsets for two or more years. Many may even be propagated by branches, buds, suckers, and leaves, fixed in the ground, and even not a few trees. Hence their stems being divided into branches, may be looked on as roots above ground; for in the same way the roots creep under ground; and divide into branches. As a proof of this, a tree will grow in an inverted situation, the roots being placed upwards, and the head downwards, and buried in the ground; for then the branches will become roots, and the roots will produce leaves and flowers. The lime-tree may afford an example, on which gardeners have chiefly made experiments. Yet this by no means overturns the doctrine, that all vegetables are propagated by seeds; for in each of these instances nothing vegetates but what was the part of a plant, formerly produced from seed; so that, in fact, without seed no new plant is produced. Plants produce seeds; but they are entirely unfit for propagation: unless fecundation precedes, which is performed by an intercourse between different sexes. Plants therefore are provided with organs of generation, analogous to animals. See BOTANY. These are contained in the flowers. In most flowers the stamina surround the pistils, and are of about the same height: but there are many plants in which the pistil is longer than the stamina; and in these the flowers recline, that the dust may the more easily fall into the stigma, e. g. in the campanula, cowslip, &c. But when the fecundation is completed, the flowers rise again, that the ripe seeds may not fall out before they are dispersed by the winds. In other flowers, where the pistil is shorter, the flowers preserve an erect situation; when the flowering comes on, they become erect, though before they were drooping, or immersed under water. When the male flowers are placed below the female ones, the leaves are exceedingly small and narrow, that they may not hinder the dust from flying upwards like smoke; as we see in the pine, fir, yew, sea-grape, juniper, cypress, &c. But when in one and the same species one plant is male and the other female, and consequently may be far from one another, the male dust is carried in abundance by the wind from the male to the female; as in the whole class of Diœcia. A more difficult impregnation is compensated by the longevity of the individuals, and the continuation of life by buds, suckers, and roots. Most flowers expand themselves when the sun shines forth; whereas when clouds, rain, or evening, come on, they close up, lest the genital dust should be coagulated or rendered useless. But when the fecundation is over, the flowers, never close themselves up. As to the dissemination of seeds after they come to maturity, the Author of nature has wisely provided for this in numberless ways. The stalks and stems raise the fruit above the ground, that the winds, shaking them, may disperse far off the ripe seeds. Most of the pericarpia are shut at top, that the seeds may not fall before they are shaken out by stormy winds. Wings are given to many seeds, by the help of which they fly far from the mother-plant, and often overspread a whole country. These wings consist either of a down, as in most of the composite flowered plants; or of a membrane, as in the birch, alder, ash, &c. Hence woods, which happen to be consumed by fire or any other accident, are soon restored by new plants disseminated by these means. Many kinds of fruit are endued with a remarkable elasticity, by the force of which the ripe pericarpia throw the seeds to a

great distance; as the wood-sorrel, the spurge, the phyllanthus, the dittany, &c. Other seeds or pericarpia are rough, or provided with hooks; so that they are apt to stick to animals that pass by them, and are thus carried to their holes, where they are both sown and manured, and therefore the plants of these seeds grow where others will not; as hounds-tongue, agrimony, &c. Berries and other pericarpia are allotted for aliment to animals; but while they eat the pulp they sow the seeds; for they either disperse them at the same time; or, if they swallow them, they always come out unhurt. By means of the sea, lakes, and rivers too, seeds are often conveyed unhurt to distant countries. Various other ways in which nature provides for the dissemination of plants, are pointed out by Linnæus in an Oration concerning the augmentation of the habitable earth.

II. PRESERVATION. The great Creator of all things decreed, that the whole earth should be covered with plants, and that no place should be void, none barren. But since all countries have not the same changes of seasons, and every soil is not equally fit for every plant; he therefore, that no place should be without some, gave to every one of them such a nature, as might be chiefly adapted to the climate: so that some of them can bear an intense cold, others an equal degree of heat; some delight in dry ground, others in moist, &c. The Alpine plants live only in high and cold situations; and therefore often on the Alps of Armenia, Switzerland, the Pyreneans, &c. whose tops are equally covered with eternal snows as those of the Lapland Alps, plants of the same kind are found, and it would be in vain to seek for them any where else. The Alpine plants blow, and ripen their seeds, very early, lest the winter should steal upon them on a sudden, and destroy them. Our northern plants, although they are extremely rare every where else, yet are found in Siberia, and about Hudson's Bay; as the arbutus, bramble, winter-green, &c. Plants impatient of cold live within the torrid zones; hence both the Indies, notwithstanding their distance, have plants in common. The Cape of Good Hope produces plants peculiar to itself; as all the mesembryanthema, and almost all the species of aloes. Grasses, the most common of all plants, can bear almost any temperature, for they above all plants are necessary for the nourishment of cattle; and the same thing is observed of our most common grains. Thus neither the scorching sun, nor the pinching cold, hinders any country from having its vegetables. Nor is there any soil which does not bring forth many kinds of plants. The pond-weeds, the water-lily, and lobelia, inhabit the waters. The fluviatiles, fuci, confervæ, cover the bottoms of rivers, and seas. The sphagna fill the marshes. The brya clothe the plains. The driest woods, and places scarcely ever illuminated by the rays of the sun, are adorned with the hypha. Nay, stones and the trunks of trees are not excepted, for these are covered with various kinds of liverwort. The desert and most sandy places have their peculiar trees and plants; and as rivers or brooks are seldom found there, we cannot without wonder observe that many of them distil water, and by that means afford the greatest comfort both to man and beast that travel there. Thus the tillandsia, which is a parasitical plant, and grows on the tops of trees in the deserts of America, has its leaves turned at the base into the shape of a pitcher, with the extremity expanded; in these the rain is collected, and preserved for thirsty men, birds, and beasts. Plants often by their very structure contribute remarkably both to their own preservation and that of others. But the wisdom of the Creator appears no where more than in the manner of the growth of trees. For as their roots descend deeper than those of other plants, provision is made, that they shall not rob them too much of nourishment; and a stem not above a span in diameter often shoots up its branches very high; these bear many thousand buds, each of which is a plant, with its leaves, flowers, and stipule. Now if all these grew upon the plain, they would take up a thousand times as much space as the tree does; and in this case there would scarcely be room in all the earth for so many plants as at present the trees alone afford. Besides, plants that shoot up in this way are more easily preserved from cattle; and their leaves falling in autumn cover the plants growing against the rigour of the winter; and in summer they afford a pleasing shade, not only to animals, but to plants, against the intense heat of the sun. Trees imbibed water from the earth; which water does not circulate again to the root, but being dispersed, like small rain, by the transpiration of the leaves, moistens the

the plants that grow around. Many trees bear fleshy fruits of the berry or apple kind, which, being secure from the attack of cattle, grow ripe for the use of man and other animals, while their seeds are dispersed after digestion. Lastly, the particular structure of trees contributes much to the propagation of insects; for these chiefly lay their eggs upon the leaves, where they are secure from the reach of cattle. The preservation of grasses is abundantly evident from hence, that the more the leaves of the perennial grasses are eat, the more they creep by the roots, and send forth off-sets. For the Author of nature intended that vegetables of this kind, which have very slender and erect leaves, should be copious, and very thick set, covering the ground like a carpet; and thus afford food sufficient for so vast a quantity of grazing animals. But although the grasses are the principal food of such animals, yet they do not touch the flower and seed-bearing stems, that the seeds may ripen and be sown. The caterpillar or grub of the moth, although it feeds upon grasses, to the great destruction of them in meadows, yet it seems to be formed in order to keep a due portion between these and other plants; for grasses, when left to grow freely, increase to that degree, that they exclude all other plants; which would consequently be extirpated, unless this insect sometimes prepared a place for them. Hence always more species of plants appear in those places where this caterpillar has laid waste the pastures the preceding year than at any other time.

III. DESTRUCTION. All plants, as well as animals, must submit to death. They spring up, grow, flourish, ripen their fruit, wither, and at last die, and return to the dust. Thus all black mould, which every where covers the earth, is mostly owing to dead vegetables. For all roots descend into the sand by their branches, and after a plant has lost its stem the root remains; but this too rots at last, and changes into mould. Thus this kind of earth is mixed with sand, nearly in the same way as dung thrown upon fields is wrought into the earth by the industry of the husbandman. The earth thus prepared returns again to plants what it has received from them. For when seeds are committed to the earth, they draw to themselves the more subtile parts of this mould, by the co-operation of the sun, air, and rains; so that the tallest tree is nothing but mould compounded with air and water, and modified by a virtue communicated to a small seed by the Creator. From these plants, when they die, the same kind of mould is formed as gave birth to them originally; whence fertility remains uninterrupted. The crustaceous liverworts are the foundation of vegetation; therefore are plants of the utmost consequence in the economy of nature, though despised by us. When rocks first emerge out of the sea, they are so polished by the force of the waves, that scarcely any herb can find a fixed habitation upon them; as we may observe every where near the sea. But the very minute crustaceous liverworts begin soon to cover these dry rocks, although they have no other nourishment but that small quantity of mould and imperceptible particles which the rain and air bring thither. These liverworts dying turn into a very fine earth; on this earth the imbricated liverworts find a bed to strike their roots in. These also die after a time, and turn to mould; and then the various kinds of mosses, e.g. the hypna, the brya, and polytricha, find a proper place and nourishment. Lastly, these dying in their turn, and rotting, afford such plenty of new-formed mould, that herbs and shrubs easily root and live upon it.

OF THE ANIMAL KINGDOM.

I. PROPAGATION. The generation of animals holds the first place among the works of the Creator; and chiefly that appointment by which he has regulated the conception of the fœtus, and its exclusion, that it should be adapted to the way of living of each animal. No species of animals are exempt from the passion of love, that the Creator's mandate may be fulfilled, increase and multiply; and that thus the egg, in which is contained the rudiment of the fœtus, may be fecundated. Foxes and wolves, under this impulse, every where howl in the woods; crowds of dogs follow the female. Stags have annually new horns which they lose after rutting time. Birds look more beautiful than ordinary, and warble all day long through fondness. Peacocks spread forth their gay and glorious trains. Fishes exult in the water; and grasshoppers chirp among the herbs. The fecundated egg requires a certain proportionate degree of heat for the expansion of the embryo; and therefore we find in different classes of animals a dif-

ferent way of excluding the fœtus. The females of quadrupeds have an uterus, for easy gestation, cherishing warmth, and proper nourishment of the fœtus. Birds, to get subsistence, are under the necessity of shifting place, by their wings. Gestation therefore would be burthensome to them. For this reason they lay eggs covered with a hard shell. These they sit upon and cherish till the young come forth. The ostrich and cassowary are almost the only birds that do not observe this law; these commit their eggs to the sand, where the intense heat of the sun cherishes and excludes the fœtus. Fishes inhabit cold waters, and most of them have cold blood: whence they have not heat sufficient to produce the fœtus. The allwise Creator therefore has ordained, that most of them should lay their eggs near the shore; where by the solar rays, the water is warmer, and because water-insects abound there, which afford the young fry nourishment. Salmon, when about to lay their eggs, go up the stream, where the water is fresh and more pure. The fish of the ocean, which cannot reach the shores by reason of the distance, are exempt from this law. The Author of nature has given to this kind eggs that swim; so that they are hatched amidst the swimming fœtus, called sargazo. (Flor. Zeyl. 389.) The cetaceous fish have warm blood; and therefore they bring forth their young alive, and suckle them with their teats. The butterfly fish also brings forth its fœtus alive. Many amphibious animals bring forth live fetuses, as the viper and the toad, &c. But all the species that lay eggs lay them in places where the heat of the sun supplies the warmth of the parent. Thus the rest of the frog and lizard kind, lay their eggs in warm waters; the common snake, in dunghills, and such like warm places. The crocodile and sea-tortoises lay their eggs under the sand, where the heat of the sun hatches them. Most insects neither bear young nor hatch eggs; yet their tribes are the most numerous of all living creatures. If the bulk of their bodies were proportionate to their numbers, they would scarcely leave room for any other kinds of animals. The females meet and copulate with the males; and afterwards lay their eggs, in such places as may supply their offspring with nourishment, for the mother dies soon after she has laid her eggs. Butterflies, moths, some beetles, weevils, bugs, cuckoo-spit-insects, gall-insects, tree-bugs, &c. lay their eggs on the leaves of plants, and every different tribe chooses its own species. There is scarcely any plant which does not afford nourishment to some insect; and there is scarcely any part of a plant which is not preferred by some of them. Thus one insect feeds upon the flower; another upon the trunk, root, or leaves. The leaves of some trees and plants, after eggs have been let into them, grow into galls; and form dwellings for the young ones. Thus when the gall-insect has fixed her eggs in the leaves of an oak, the wound of the leaf swells, and a knob like an apple arises, which includes and nourishes the embryo. The multiplication of animals is not tied down to the same rules in all; for some have a remarkable power of propagating, others are confined within narrow limits. Yet in general we find, that the least animals, and those which are useful and serve for nourishment to the greatest number of other animals, are endued with a greater power of propagating than others. Mites, and many other insects, will multiply to a thousand within the compass of a very few days; while the elephant scarcely produces one young in two years. The hawk kind generally lay not above two eggs, at most four; while the poultry produce from 50 to 100. The diver, or loon, which is eaten by few animals, lays also two eggs; but ducks, moor-fowls, partridges, &c. and small birds, lay a very large number. If two pigeons hatch nine times a-year, they may produce in four years 14,760 young. They are endued with this remarkable fertility, that they may serve for food, not only for man, but for birds of prey.

II. PRESERVATION appears chiefly in the tender age, while the young are unable to provide for their own support. For then their parents, though otherwise ever so fierce in their disposition, are moved with a wonderful affection towards their progeny, and spare no pains to provide for, guard, and preserve them. Quadrupeds give suck to their tender young, and support them by a liquor perfectly easy of digestion, till they be able to digest what is more solid. Their love toward them is so great, that they endeavour to repel with the utmost force every thing which threatens danger to them. The ewe, which brings forth two lambs at a time, will not admit one to her teats unless the other be present and suck also. Birds

build

their nests in the most artificial manner, and line them as soft as possible, lest the eggs should get any damage. And they build only where they may quietly lie concealed, and be safe from the attacks of their enemies. The hanging bird makes its nest of the fibres of withered plants, and the down of the poplar seeds, and fixes it upon the bough of some tree hanging over the water, that it may be out of reach. The diver places its swimming nest upon the water itself, amongst the rushes. Birds sit on their eggs with so much patience, that many of them will perish with hunger, rather than expose the eggs to danger by going to seek for food. The male rooks and crows, at the time of incubation, bring food to the females. Pigeons, and all other birds which pair, sit by turns; but where polygamy prevails, the males scarcely take any care of the young. Amphibious animals, fishes, and insects, which cannot come under the care of their parents, yet owe this to them, that they are put in places where they easily find nourishment. As soon as animals come to maturity, and no longer need the care of their parents, they attend with the utmost industry, according to their respective economy, to the preservation of their lives. Some live on particular species of plants, which certain regions and soils only produce: some on animalculæ: others on carcases; and some even on mud and dung. Some swim in water, others fly: some inhabit the torrid, frigid, or temperate zones; others frequent deserts, mountains, woods, pools, or meadows, according as food is found proper to their nature. Thus there is no terrestrial tract, sea, river, or country, but contains and nourishes various kinds of animals: and thus the world at all times affords nourishment to so many inhabitants, while nothing it produces is useless or superfluous. Every animal too is furnished with such cloathing as is proper to the country where they live, and the structure of their bodies is adapted to their particular way of life. And their instinct leads them to chuse such food as is suited to their respective natures. So various are the appetites of animals, that there is scarcely any plant which is not chosen by some, and left untouched by others. The horse leaves the water-hemlock to the goat. The cow yields the long-leaved water-hemlock to the sheep. The goat gives up the monkshood to the horse, &c. for that which certain animals fatten upon, others dislike. Hence no plant is absolutely poisonous, but only respectively. Thus the spurge, that is noxious to man, is a wholesome nourishment to the caterpillar. That brutes may not poison themselves, each is guarded by such delicacy of smell, that they easily distinguish pernicious plants from wholesome; and when different animals feed upon the same field, one kind always leaves something for the other, as the mouths of all are not equally adapted to lay hold of the grass; whereby there is sufficient food for all. An economical experiment has been made by the Dutch, that where eight cows have been in a pasture, and can no longer get nourishment, two horses feed well there for some days; and when nothing is left for the horses, four sheep will live upon it. Swine turn up the earth, for succulent roots; the leaves and fruits of trees are intended as food for some animals, as the sloth, and the squirrel; and these have feet fit for climbing. Besides myriads of fishes, the castor, the sea-calf, and other amphibious quadrupeds, inhabit the water, and their hinder feet are formed for swimming, and perfectly adapted to their manner of life. The whole order of the goose-kind, as ducks, mergansers, &c. live in water, feeding upon water-insects, fishes, and their eggs. Their beaks, their necks, their feet, and their feathers, exactly suit their manner of life. Much providential care seems to be taken for the preservation of those animals, which, at a certain time of the year, are by the rigour of the season excluded from the necessities of life. Thus the bear in autumn creeps into the moss which he has gathered, and lies there all winter; subsisting upon his fat, collected during summer in the cellular membrane, and which supplies the place of food. The hedge-hog, badger, and mole, in the same manner fill their winter-quarters with vegetables, and sleep during the frosts. The bat seems quite dead all winter. Most of the amphibious animals get into dens, or to the bottom of lakes and pools, &c. Insects in winter generally lie hid within their cases, and are nourished by the surrounding liquor like the fetus of other animals; whence, at the approach of spring, they awake, and fly forth. However, all animals which lie hid in winter do not observe these laws of fasting. Some provide store-houses in summer and autumn, from which they take what is necessary: as mice, jays, squirrels, bees, beavers, &c.

III. DESTRUCTION. All animals do not live upon vegetables. There are some which feed upon animalculæ; and there are many others which daily destroy numbers of the peaceable kind. The weaker generally are infested by the stronger in a continued series. Thus the tree-louse lives upon plants. The musca aphidivora lives upon the tree-louse; the hornet and wasp-fly, upon the musca aphidivora; the dragon-fly, upon the hornet and wasp-fly; the spider, on the dragon-fly; the small birds on the spider; and the hawks on the small birds. The monoculus delights in putrid waters, the gnat eats the monoculus, the frog devours the gnat, the pike swallows the frog, the sea-calf eats the pike. The bat and goat-sucker make their excursions only at night, that they may catch the moths, which then fly about in vast numbers. The woodpecker pulls out the insects which he hid in the trunks of trees. The swallow pursues those which fly about in the open air. The mole pursues worms. The large fishes devour the small. We scarcely know an animal which has not some enemy to contend with. Among quadrupeds wild beasts are most remarkably destructive to others; and the falcon-kind among birds. But that they may not, by too general a butchery, destroy a whole species, these are circumscribed within certain bounds. The most fierce are few in proportion to other animals. They are not to be found in many countries. Thus France and Britain breed no wolves, and the northern countries no tigers or lions. These fierce animals sometimes destroy one another. Thus the wolf devours the fox. The dog pursues both the wolf and fox; and wolves sometimes venture to attack a bear. The male tiger often devours its own whelps. Dogs are sometimes seized with madness, and destroy their fellows. Wild beasts seldom arrive at so great an age as animals which live on vegetables; for they are subject, from their alkaline diet, to various diseases, which bring them sooner to an end. But although all animals are infested by their peculiar enemies, yet the weakest are often able to escape their violence. Thus the hare often eludes the dog by her windings. When the bear attacks sheep and cattle, these draw up together for mutual defence. Horses join heads together, and fight with their heels. Oxen join tails, and fight with their horns. Swine get together in herds, and boldly oppose themselves to any attack, so that they are not easily overcome; and all of them place their young in the middle, that they may remain safe during the battle. Birds, by their different ways of flying, often escape the hawk. If the pigeon had the same way of flying as the hawk, she would hardly ever escape his claws. Some animals consult their safety by night. When horses sleep in woods, one by turn remains awake, and keeps watch. When monkeys in Brasil sleep upon trees, one of them keeps awake, to give the sign when the tiger creeps towards them; and in case he sleep, the rest tear him to pieces. Hence rapacious animals are not always successful in their hunting. For this reason they can bear fasting a long time. Thus the lion lurks in his den many days without famishing; and the wolf, when he has once well satisfied his hunger, can fast many weeks without inconvenience. There are some viviparous dyes which bring forth 2000 young. These in a little time would fill the air, and like clouds intercept the rays of the sun, unless they were devoured by birds, spiders, and many other animals. Storks and cranes free Egypt from frogs, which, after the inundation of the Nile, cover the whole country. Falcons clear Palestine of mice. Bellonius says, "The storks come to Egypt in such abundance, that the fields and meadows are white with them. Yet frogs are generated in such numbers there, that did not the storks devour them, they would over run every thing. They also catch and eat serpents. Between Belba and Gaza, the fields of Palestine are often desert on account of the abundance of mice and rats; and were they not destroyed by the falcons, the inhabitants could have no harvest." The white fox is of equal advantage in the Lapland Alps; as he destroys the Norway rats, which are generated there in great abundance, and thus hinders them from increasing too much, which would be the destruction of vegetables. Human reason cannot account for this circuit of animation and destruction. It is sufficient for us, that nothing is created in vain; and that whatever is made, is made with supreme wisdom. It does not become us, nor indeed do our present faculties enable us, to pry too boldly into the designs of God. In many parts of the economy of nature, however, we see evident marks of divine wisdom: and throughout the whole of it astonishing proofs of infinite power. This united with infinite goodness must finally produce a

happy consummation. The whole world would be suffocated with carcases and stinking effluvia, if some animals did not delight to feed upon them. Therefore, when an animal dies, bears, wolves, foxes, ravens, &c. quickly devour the body and carry it all away. When the carcases of fishes are driven near the shore, the voracious kinds, such as the thornback, the hound-fish, the conger-eel, &c. gather about and eat them. And as the flux and reflux soon change the state of the sea, they themselves are often detained in pits, and become a prey to the wild beasts that frequent the shores. Thus the earth is not only kept clean from the putrefaction of carcases, but the necessities of life are provided for many animals. In like manner many insects at once promote their own good, and that of other animals. Thus gnats lay their eggs in stagnant, putrid, and stinking waters, and the grubs that arise from these eggs clear away all the putrefaction. This appears from a simple experiment; fill two vessels with putrid water; leave the grubs in one, and take them all out of the other; the water that is full of grubs will soon become pure and without any stench, while that which has no grubs will continue stinking. Lice increase in a wonderful manner in the heads of children that are scabby; yet they are not without their use, for they consume the redundant humours. Beetles in summer extract all moist and glutinous matter out of the dung of cattle, so that it becomes like dust, and is spread by the wind over the ground. Were it not for this, the vegetables that lie under the dung would be so far from thriving, that all that spot would be rendered barren. As the excrements of dogs is of so septic a nature that no insect will touch them, and therefore they cannot be dispersed by them, these animals exonerate upon stones, and trunks of trees, that vegetables may not be hurt by them. Cats, being domestic animals, naturally bury their dung. All these treasures of nature, so artfully contrived, so wonderfully propagated, so providentially supported, seem intended by the Creator for the use of man. Every thing may be made subservient to his use, mediately, or immediately. By reason and various inventions, man tames the fiercest animals; pursues and catches the swiftest; and is able to reach even those which traverse the waters of the sea. By cultivation, he increases the number of vegetables immensely; and by art and ingenuity, obtains whatever is convenient or necessary for food, drink, clothing, medicine, navigation, and many other purposes. He can go down into the abyss of the earth, and almost search its very bowels. He can procure fragments from the most rocky mountains, make the hardest stones fluid like water, separate the useful metals from the dross, and turn the finest sand to use. In short, when we take a review of created things, we may reasonably infer, that all things are made for man; and for this end more especially, that he, by admiring the works of the Creator, should extol his glory, and enjoy those things of which he stands in need, in order to pass his life conveniently and pleasantly. Such are a few of the outlines of the present constitution of nature, wherein, though there appears a great mixture of good and evil, happiness and misery, pleasure and pain, yet good upon the whole predominates, in so far, that all partial evil tends to produce universal good, and destruction itself contributes to renovation. That such, however, was not the original constitution of nature, we are certain, as the divine author of nature hath assured us, that all things were at first created very good: and that they will all ultimately become so, at the final restitution of all things, we have the same great authority to believe, when the period shall arrive, that "the leopard shall lie down with the lamb, the young lion and the fating together; and there shall be nothing to hurt or to defile in all God's holy mountain." Our limits forbid us to extend this subject; we shall, however, point out a methodical arrangement for a collection of natural substances, whether mineral, vegetable, or animal. In erecting a Museum of Natural History, the windows ought to be placed in the two longest sides of the building, that it may be equally lighted during the whole day. On one wing must be placed ten presses, with shelves supported on wooden brackets, for containing the following classes of the mineral kingdom, which forms the original basis of every thing pertaining to this globe: viz. 1. Waters. 2. Earths. 3. Sands. 4. Stones. 5. Salts. 6. Pyrites. 7. Metals. 8. Bitumens and sulphurs. 9. Volcanic productions. 10. Petrifications, fossils, and lusus naturæ. These presses should be of an uniform height; but their breadth proportioned to the size or number of the mate-

rials composing the class which each contains; and they are supported on a chest of drawers breast high. These drawers must correspond to the presses above them, and contain substances of the same class. A methodical arrangement is a great help to the memory; as it occasionally supplies the place of a numbered catalogue, and in a great multitude of objects it affords the best means of finding at once what we want. In the mineral-kingdom, these drawers are very useful for containing earths, belemnites, entroches, astroites, and other polymorphous fossils, univalve, bivalve, and multivalve shells, polished petrifications of bones and pieces of wood, collections of marbles and polished flints, collections of silix, sands, and amber, together with pieces procured from the melting of ores, such as regulus, dross, &c. Some parts of the mineral-kingdom, such as the earths and certain stones, make not a brilliant figure in a museum; they are however the most scientific parts of it, and the most interesting to those who prefer the tracing nature in her most important productions, and fundamental operations, to gaudy colours and agreeable figures. Minerals in general require to be kept with great care, and so as not to be intermixed. Some of them, such as the salts, easily dissolve; and others, as the pyrites, are subject to efflorescence. Vegetable and animal bodies are likewise more or less liable to corruption; and to prevent this inconvenience, great pains must be taken in preserving certain pieces which are subject to speedy decay. On the second wing of the cabinet are to be placed ten presses, distributed like those of the mineral-kingdom, and intended for containing the ten following divisions of the vegetable kingdom. Vegetables are organised bodies; but they possess not, like animals, spontaneous motion or feeling. 1. Roots. 2. Barks. 3. Woods and stalks. 4. Leaves. 5. Flowers. 6. Fruits and seeds. 7. Parasite plants, agaries, and mushrooms. 8. The juices of vegetables; as balsams and solid resins, resinous gums, and gums properly so called. 9. Extracted juices, sugars, and dregs. 10. Marine plants, and plants growing on the shores of the sea. In this kingdom, the same order of presses, the same symmetry and arrangement, are to be observed as in the mineral-kingdom. The semicircular shelves in the bottom of the presses are here very useful for containing in small square phials China varnish, essential oils, and other aromatics of Arabia or India; with the roots of eumou, mandragora, certain fruits, either monstrous or natural, which grow in the East Indies, and which the natives ripen in large bottles with narrow necks, preserved in spirits, such as the cashew-nut, &c. Here likewise are placed a number of fruits, remarkable for their rarity or great size; as cocoa-nuts, gourds, the fruit of the bastard locust-tree, the fruit of the sand-box-tree, banana-figs, pine-apples, coloquintida-apple, dogsbane, vegetable tumors or wens, and a branch of bois de dentelle, in which the three parts of the bark, especially the liber, are distinctly separated. Sea-weeds, and small marine plants of an elegant shape, which from their colour and variety form agreeable pictures, may be framed and suspended by hooks to the pilasters of the presses. In the animal-kingdom, preservations, particularly of insects, are attended with irreparable devastations. Butterflies, still more than the most beautiful birds, are not only subject to destruction in this way, but are also exposed to great danger from the rays of the sun, either direct or reflected, which alter their colour, make them lose all their splendour, and, in some species, render it impossible to distinguish them. In general, we cannot prevent the destruction of vegetables and animals, but by drying them as much as possible, or by putting them in prepared liquors, which must not be allowed to evaporate. But dried animals and vegetables require still greater care: a great multitude of insects bred in April feed upon them, and destroy them internally before they are perceived: they ought to be carefully watched during this period, which is about five months. The moisture of winter and the heat of summer make it necessary that the presses of museums should be kept carefully shut, except perhaps those which front to the north. The vapour of sulphur in combustion will kill these destructive insects either before or after they become perfect: the fumigations must be carefully performed during dry weather, and in a box made on purpose, into which only the specimens attacked are introduced. On the third wing of the cabinet are placed presses for containing the ten following divisions of the animal-kingdom: 1. Lithophytes. 2. Zoophytes. 3. Testaceous animals. 4. Crustaceous animals. 5. Insects. 6. Fishes. 7. Amphibious animals, 8 P

mals, reptiles, and oviparous quadrupeds. 8. Birds, with their nests and eggs. 9. Viviparous quadrupeds. 10. Man. In these presses the same external decoration and distribution may be observed as in the preceding ones. And such variations may be made in all as the nature of the case may require. The science of natural history is so exceedingly extensive, that the longest life is far from being sufficient to acquire a perfect knowledge of it: it is important beyond dispute, because it is the study of the works of God. In all the articles connected with this subject, and forming particular parts of it, (to which we refer,) we have made great use of the works of the celebrated Linnaeus, who arranged the three kingdoms into regular systems, of which botany is the most complete. Buffon, and some other eminent naturalists, have writ-

ten on this subject without regard to systematic arrangement. Dr. Berkenhout's works on this science are very useful; particularly, because he translates Latin names, &c. Bomare's *Natural History*, in 15 vols. 8vo. is also a work of considerable importance, published in 1791. The most complete system, however, of natural history which has been yet given to the public, is that of Linnaeus, in his *Systema Naturæ*, of which a new and improved edition is published by Dr. Gmelin, and translated by Mr. Kerr. Of this valuable work, a view will be found under the article **ZOOLOGY**. See also **BOTANY**, **ENTOMOLOGY**, **ICHTHYOLOGY**, **MINERALOGY**, **ORNITHOLOGY**, and the other branches of *Natural History*; with the various classes, orders, and genera, of animals, plants, &c. in their order.

NATURALIZATION, in law, the act of naturalizing an alien, or placing him in the condition of a natural born subject. In England, this is done by act of parliament; but none can be naturalized unless they have received the sacrament within one month before the bringing in of the bill, and taking the oaths of allegiance and supremacy in the presence of the parliament. A person who is naturalized may have lands by descent, as heir at law, as well as obtain them by purchase; but he is disabled from being a member of the privy council or parliament, or from holding offices, 7 Jac. I. cap. 2. 12 Will. III. cap. 2. All children born out of the king's dominions, whose fathers were or are subjects of this kingdom at the time of their birth, are adjudged to be natural born subjects of this realm, except children of parents attainted of treason, or that are in the actual service of a foreign prince at enmity with us, 4 Geo. II. cap. 21. Every foreign seaman, who in time of war serves two years on board an English ship, is ipso facto naturalized, 13 Geo. II. cap. 3. And all foreign Protestants and Jews, upon their residing seven years in any of the British colonies, without being absent above two months at a time, or serving two years in a military capacity there, are upon taking the oaths naturalized to all intents and purposes, as if they had been born in this kingdom; and therefore are admissible to all such privileges, and no other, as Protestants or Jews born in this kingdom are entitled to. See **ALIEN**, and **DENIZEN**. In France, before the Revolution, naturalization was the king's prerogative; in England it is only done by act of parliament. In the former of those places, before their government was overturned, Swiss, Savoyards, and Scots, did not require naturalization, being reputed *regnicoles*, or natives.

NATURAL NOTE, in music, is used in opposition to flat and sharp notes, which are called artificial notes. See **MUSIC**, **NOTE**, **SCALE**, &c.

NATURAL PHILOSOPHY is commonly defined to be that art or science, which considers the powers and properties of natural bodies, and their mutual actions on one another. The province of moral philosophy is the mind of man; its inquiries and researches are into the intellectual world. Natural philosophy, on the other hand, is only concerned with the material part of the creation. The ancient and modern definitions of the word philosophy, together with its origin, as well as the manner of philosophizing in former times as well as at present, with the gradual improvement of science, particularly natural, we shall introduce, we think, more properly under the words **PHILOSOPHY** and **PHYSICS**, which see.

NATURAL RELIGION. See **THEOLOGY**.

NATURALS, among physicians, whatever naturally belongs to an animal, in opposition to non-naturals. See **NON-NATURALS**.

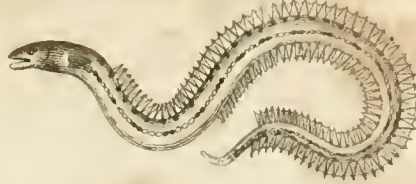
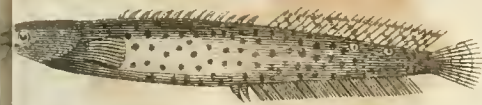
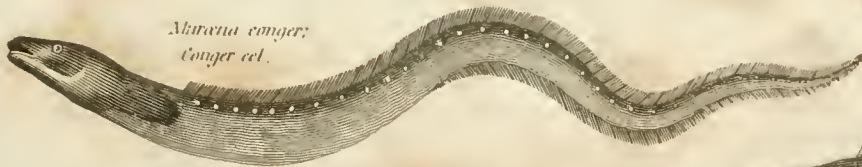
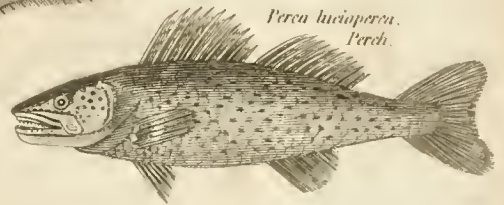
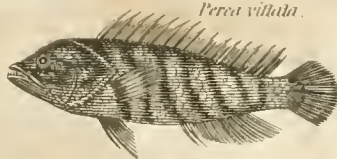
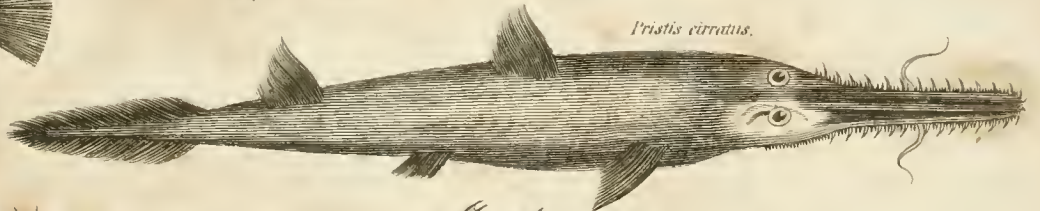
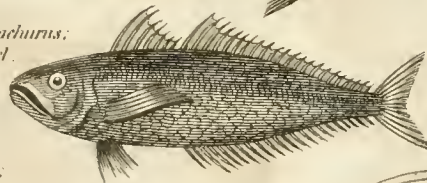
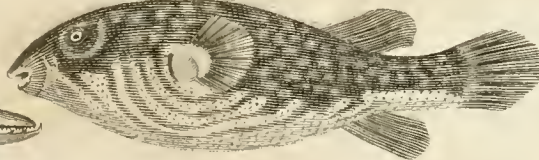
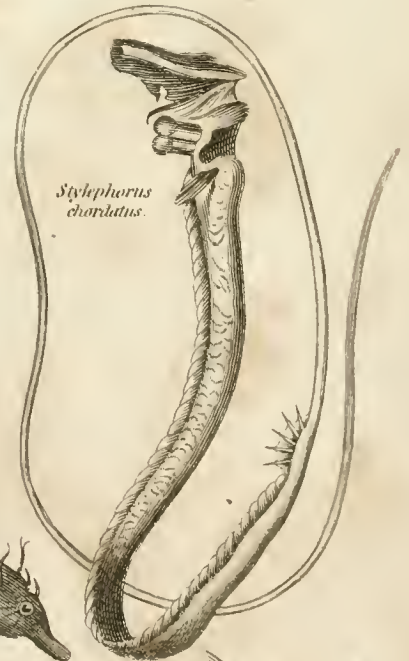
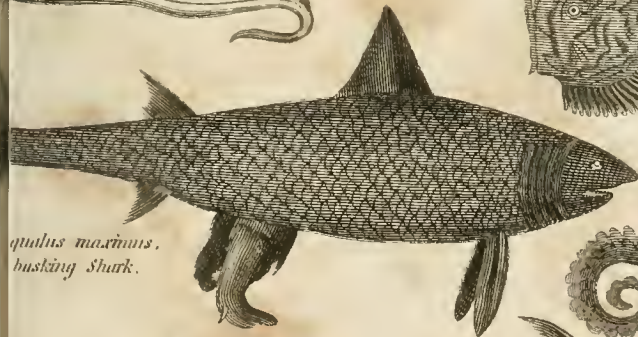
NATURE, [*natura*, Lat.] according to Mr. Boyle, has eight different significations; it being used, 1. For the author of nature, whom the schoolmen call *natura naturans*, being the same with God. 2. By the nature of a thing, we sometimes mean its essence; that is, the attributes which makes it what it is, whether the thing be corporeal or not; as when we attempt to define the nature of a fluid, of a triangle, &c. 3. Sometimes we confound that which a

man has by nature, with what accrues to him by birth; as when we say, that such a man is noble by nature. 4. Sometimes we take nature for an internal principle of motion; as when we say, that a stone by nature falls to the earth. 5. Sometimes we understand, by nature, the established course of things. 6. Sometimes we take nature for an aggregate of powers belonging to a body, especially a living one; in which sense physicians say, that nature is strong, weak, or spent; or that, in such and such diseases, nature left to herself will perform the cure. 7. Sometimes we use the term nature for the universe, or whole system of the corporeal works of God; as when it is said of a phoenix, or chimera, that there is no such thing in nature. 8. Sometimes too, and that most commonly, we express by the word nature a kind of semi-deity, or other strange kind of being. If, says the same philosopher, I were to propose a notion of nature, less ambiguous than those already mentioned, and with regard to which many axioms, relating to that word, may be conveniently understood, I should first distinguish between the universal and the particular nature of things. Universal nature I would define to be the aggregate of the bodies that make up the world, in its present state, considered as a principle; by virtue whereof they act and suffer, according to the laws of motion, prescribed by the Author of all things. See the articles **PHYSICS**, **BODY**, **INERTIA**, **MOTION**, &c. And this makes way for the other subordinate notion; since the particular nature of an individual consists in the general nature, applied to a distinct portion of the universe; or, which is the same thing, it is a particular assemblage of the mechanical properties of matter, as figure, motion, &c.

NATURE, ABUSE OF THE WORD. The Rev. Mr. Thomas Roberts, in his *Letters to M. Volney*, (who in his *Ruins of Empires*, has the atheistical assurance to affirm, "that the idea of God is merely that of the powers of nature,") has the following among many other judicious observations:—"Of the abuse of words (says Mr. Roberts,) there is an instance in writers on morals, which ought to be noticed. It is customary, in speaking of nature, to wrest the signification, and to make it stand for some indistinct being. The same may be said of the expression a secret cause. Either puts the idea of God, as a really existing being, out of sight, the consequence of which is evidently atheism, and too little care has been taken in avoiding this consequence."

NAVAL ARCHITECTURE. See **SHIP-BUILDING**.

NAVAL CAMP, in antiquity, a fortification, consisting of a ditch and parapet on the land-side, or a wall built in the form of a semicircle, and extended from one point of the sea to another. This was sometimes defended with towers, and beautified with gates, through which they issued forth to attack their enemies. Homer hath left us a remarkable description of the Grecian fortifications of this sort, in the Trojan war, beginning at v. 436. *Iliad*. Towards the sea, or within it, they fixed great pales of wood, like those in their artificial harbours; before these the vessels of burden were placed in such order, as that they might be instead of a wall, and give protection to those within; in which manner Nicias is reported by Thucydides to have encamped himself: but this seems only to have been practised when the enemy was thought superior in strength, and raised great apprehensions of danger in them.

Muraena ophis Spotted sea serpent.*Ophidium aculeatum; Prickly ophidium.**Muraena catenata;
chain striped Muraena**Muraena conger;
Conger eel.**Perca luciopeperca.
Perch.**Perca villata.**Pristis cirratus.**Ostracion quadricornis.**Trachinus draco;
The Dragon weever.**Scorpaenopsis trachurus;
Horse mackerel.**Tetradon testudinens;
tortoise shell tetradon.**Trichiurus argenteus;
Silver Trichiure.**Stylophorus chordatus.**Scorpaena horrida.**Syngnathus hippocampus;
or Sea horse pipe fish.**Gulius maximus,
bushy Shark.**Xiphias gladius; common sword fish.**Squalus zygaena;
or the hammer headed shark.*



Mergus cucullatus



Mergus Merganser
Goosander



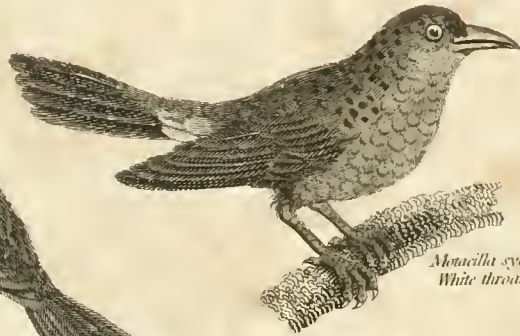
Merops Erythropterus
the red winged
bee eater



Muscicapa Crinita



Oriolus picus
Climbing Oriole



Monticola cybina
White throat



Monticola Sutoria



Muscicapa flabellifera
Fan-tailed Fly catcher



Paradisaea
Bird of Paradise



Namadia
Guinea hen



Ovis Tarda



Palamedea cornuta the
horned Screamer



Penelope marail



Pavo cristatus Peacock



Monticola Lucina
The Nightingale



Parus caeruleus
The blue Titmouse

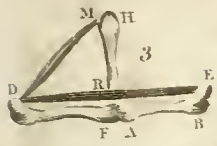


Corvixant

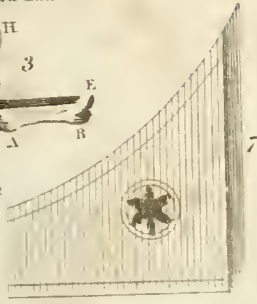


MISCELLANIES.

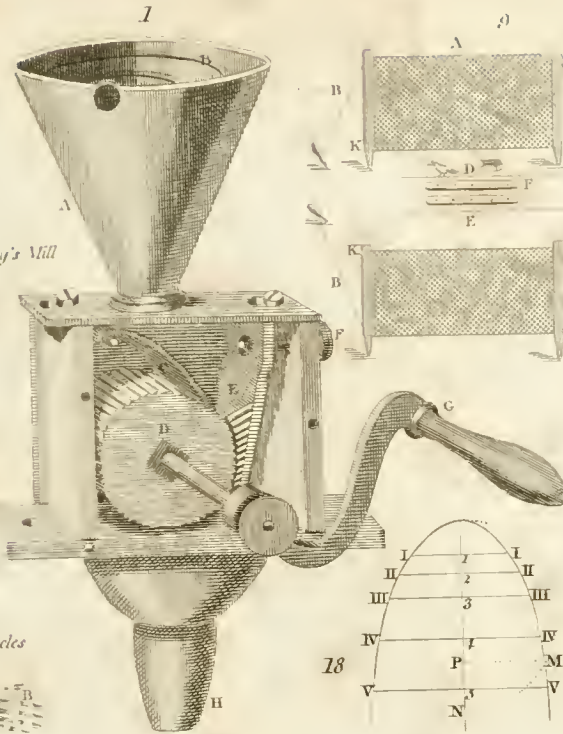
Insertion of the Muscles



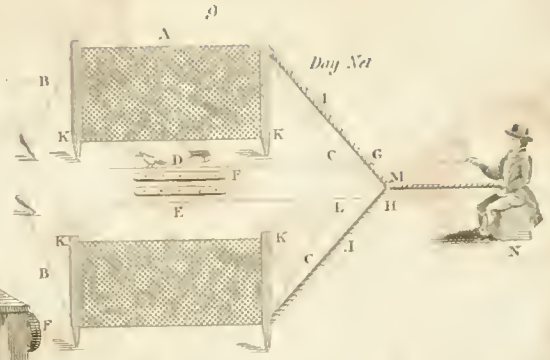
Nablon or Nibel



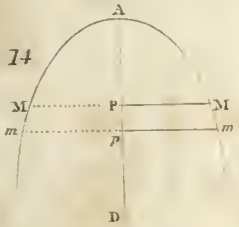
Terry's Mill



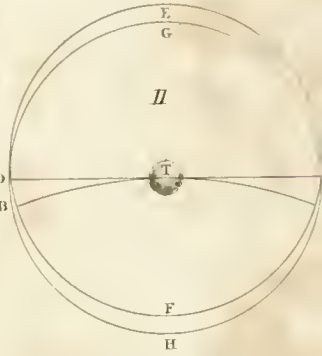
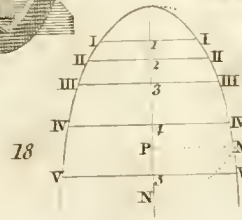
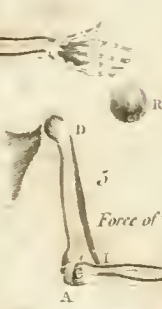
Day Net



Ordinate



Force of the Muscles



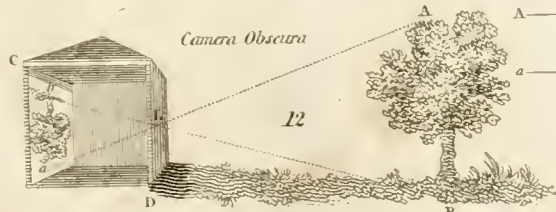
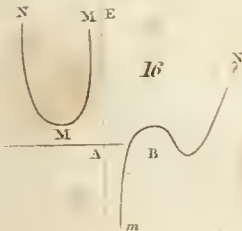
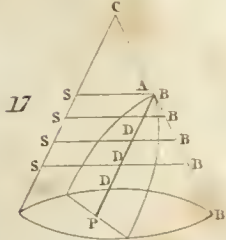
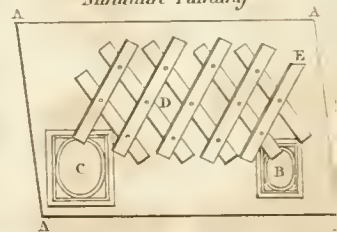
No. 1.

Napier's Rods.

No. 2.

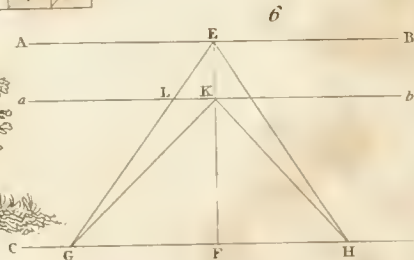
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3	3	6	9	12	15	18	21	24	27	0	3	12	21	18	24
4	4	8	12	16	20	24	28	32	36	0	4	16	28	24	32
5	5	10	15	20	25	30	35	40	45	0	5	20	35	30	40
6	6	12	18	24	30	36	42	48	54	0	6	24	42	36	48
7	7	14	21	28	35	42	49	56	63	0	7	28	49	42	56
8	8	16	24	32	40	48	56	64	72	0	8	32	56	48	64
9	9	18	27	36	45	54	63	72	81	0	9	36	63	54	72

Miniature Painting

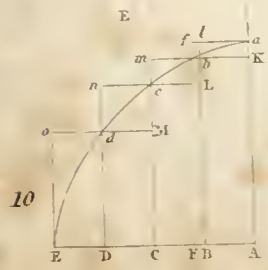


Camera Obscura

12



6

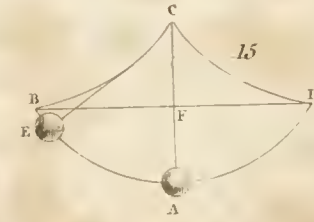


10



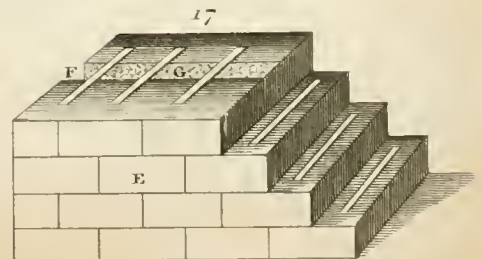
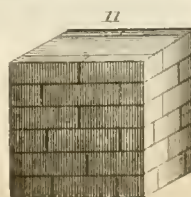
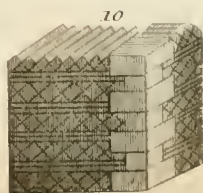
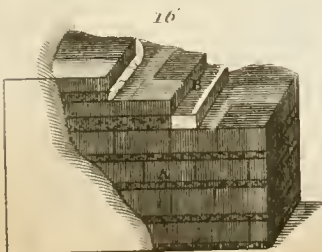
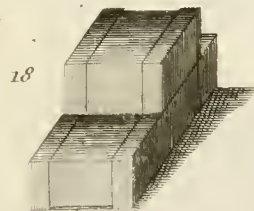
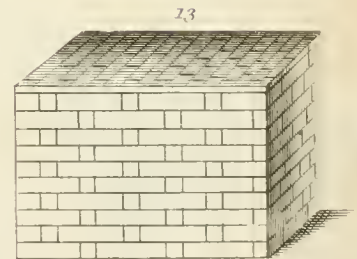
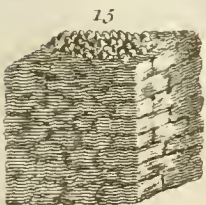
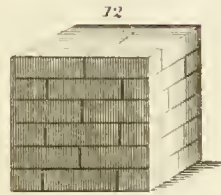
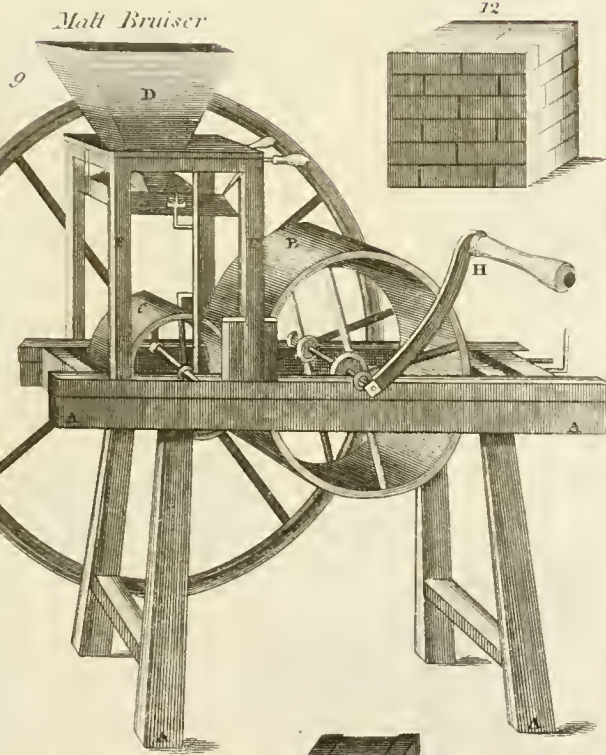
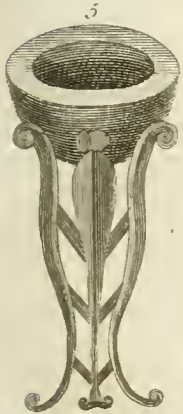
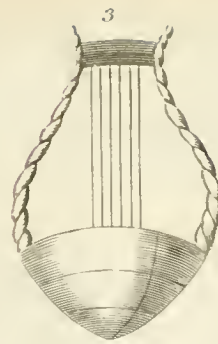
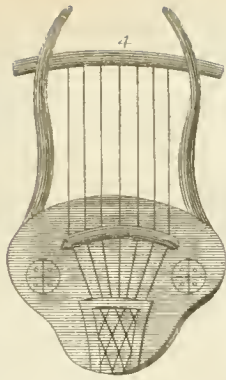
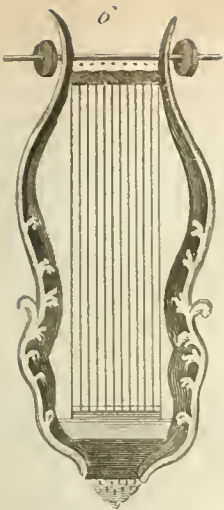
Magic Lantern

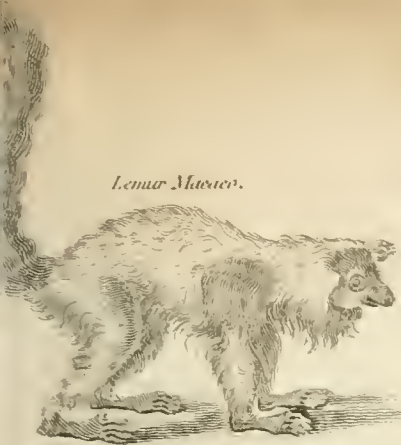
13



15







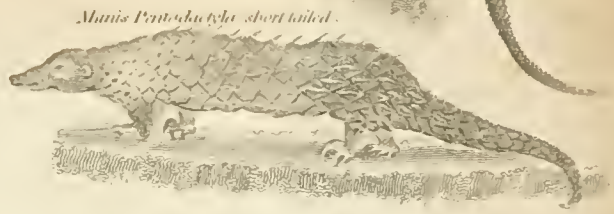
Lemur Macaco.



Lemur volans.



Manis Tetradactyla, long tailed.



Manis Pentadactyla, short tailed.



Lepus alpinus.



*Mus crinitus
Hawster Rat.*



Capibara



*Mus striatus
Striped Mouse.*



*Mus leucurus
The Leucurist.*



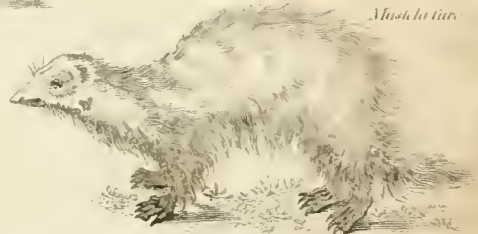
*Muschus moschiferus
Himalay Musk.*



*Muschus moschiferus
The brown rat.*



*Muschus moschiferus
the Otter.*



Muschus moschiferus



*Myrmecophaga jubata
Jabal ant eater.*



*Myrmecophaga
The Wood Dermouse.*



*The Siberian
Antelope or Wild sheep.*



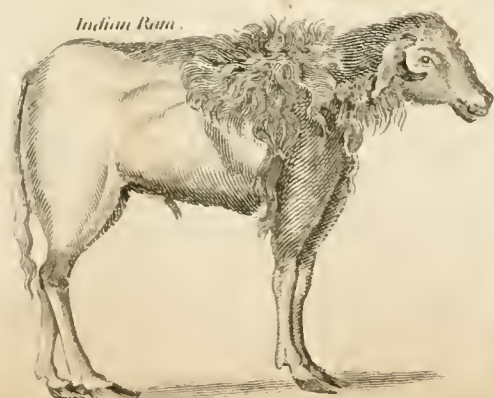
Cape Sheep.



Myrmecophaga jubata



Wahichian Ram.



Indian Ram.

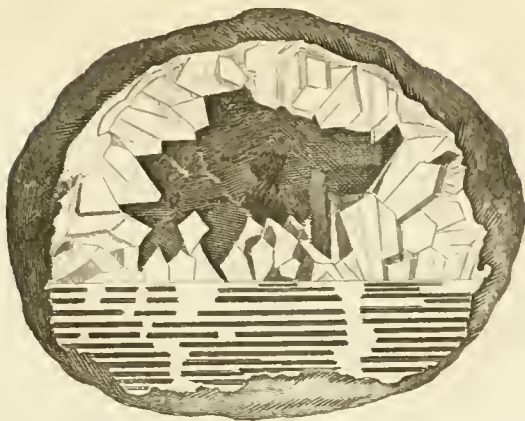


African Ram.

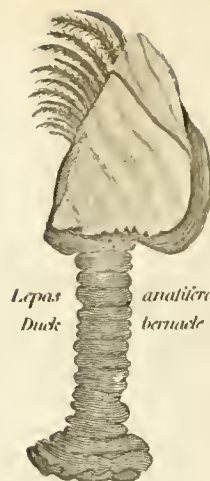
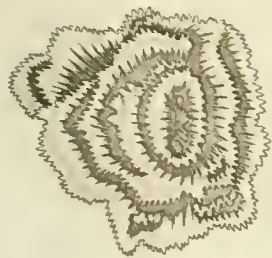
*or Ram of
Tunis.*



Lapis calcareus



Milipora laticornis



Lepas anatifera
Duck barnacle

Milipora capitata



Medusa Palopica

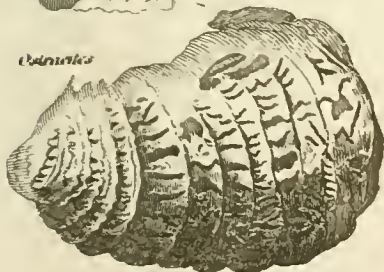


Pennantula Phosphorea



Milipora polycornuta

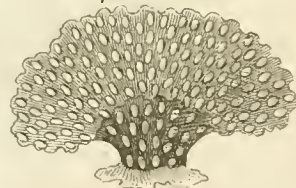
Calymene



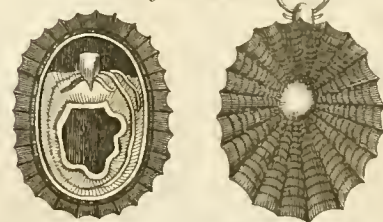
Perinid animal bodies



Milipora cellulosa



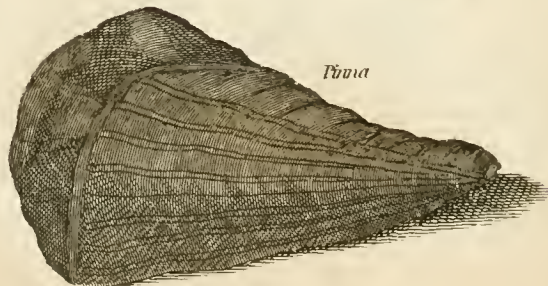
Patella vulgata Common Limpet



Medusa capillata



Tortoise shell Buckler.



Perna

Cinnamomum camphora
Camphor Tree.



Lobelia siphilitica



Myrica verticillata
Caulle berry myrtle.



Moranta galanga
Galangal.



Lantana aculeata.



Mimosa catechu.



Mimosa scandens.



Myrtus pimenta
Jamaica pepper.



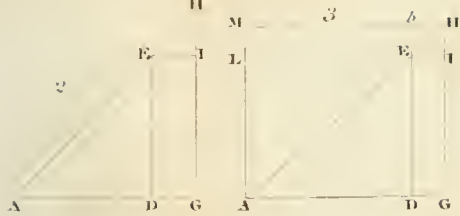
Myristica, the
Nutmeg Tree.



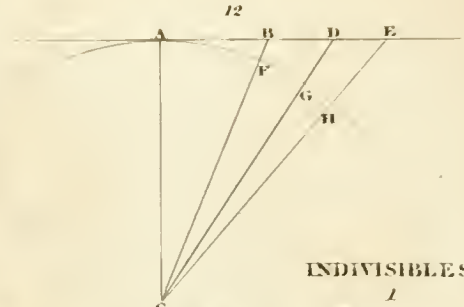
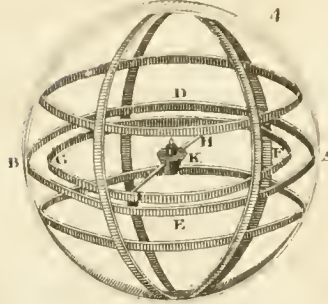
Musa Paradisiaca.



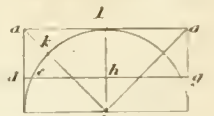
INFINITESIMALS



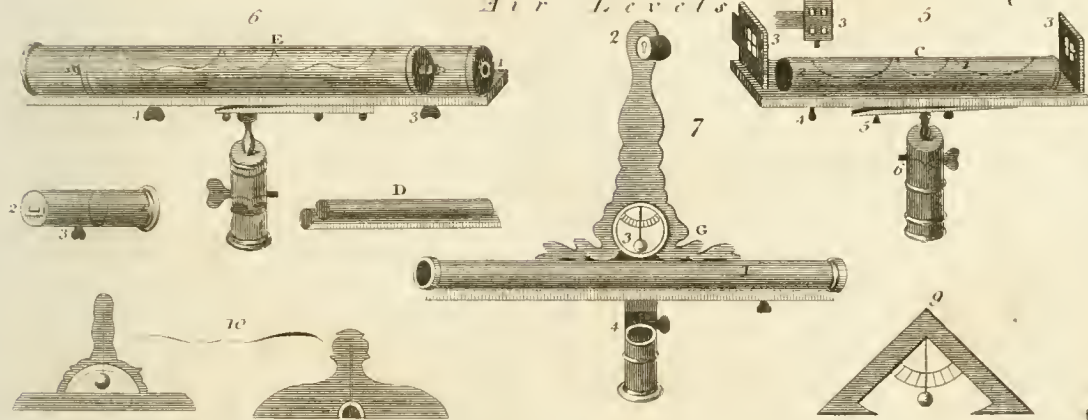
Rolling Lamp



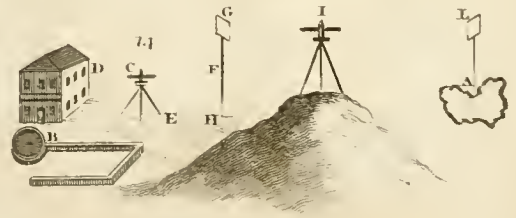
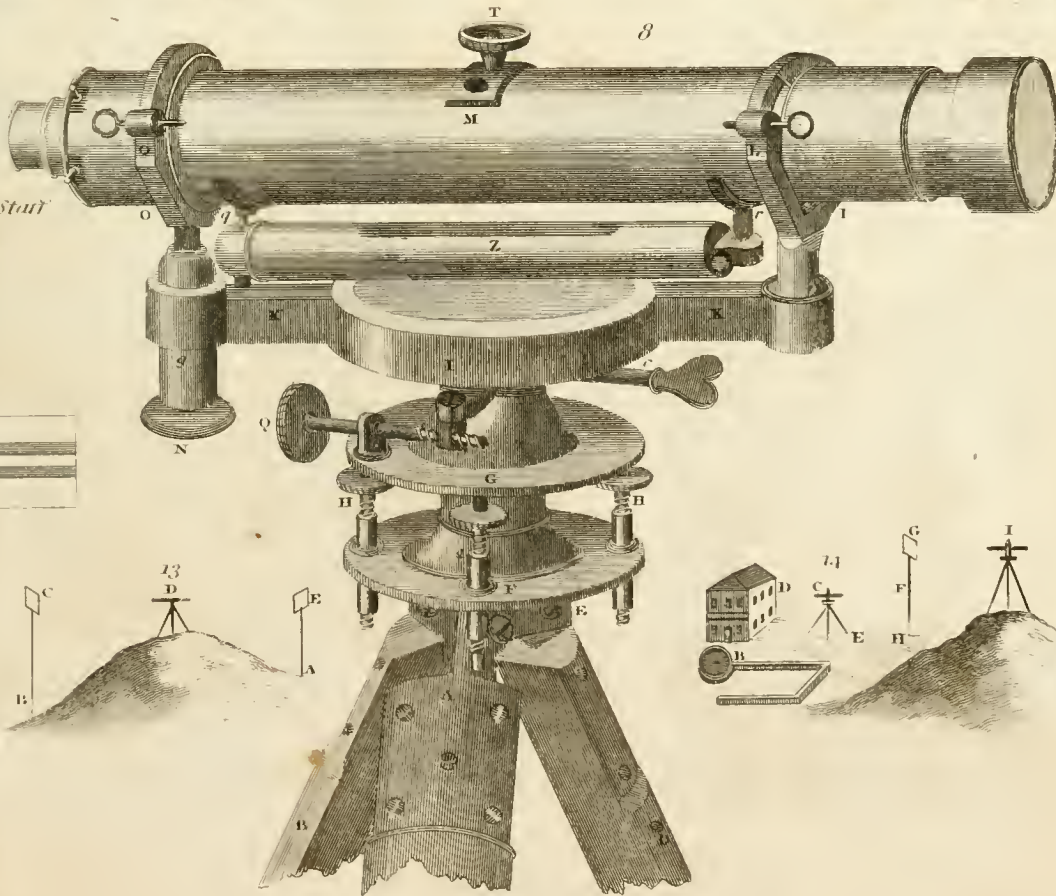
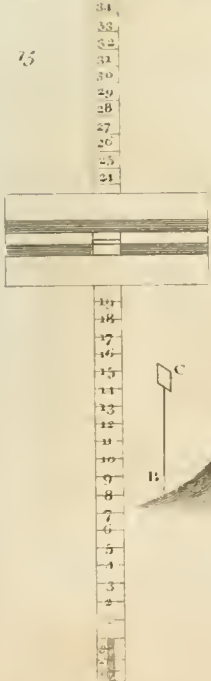
INDIVISIBLES.



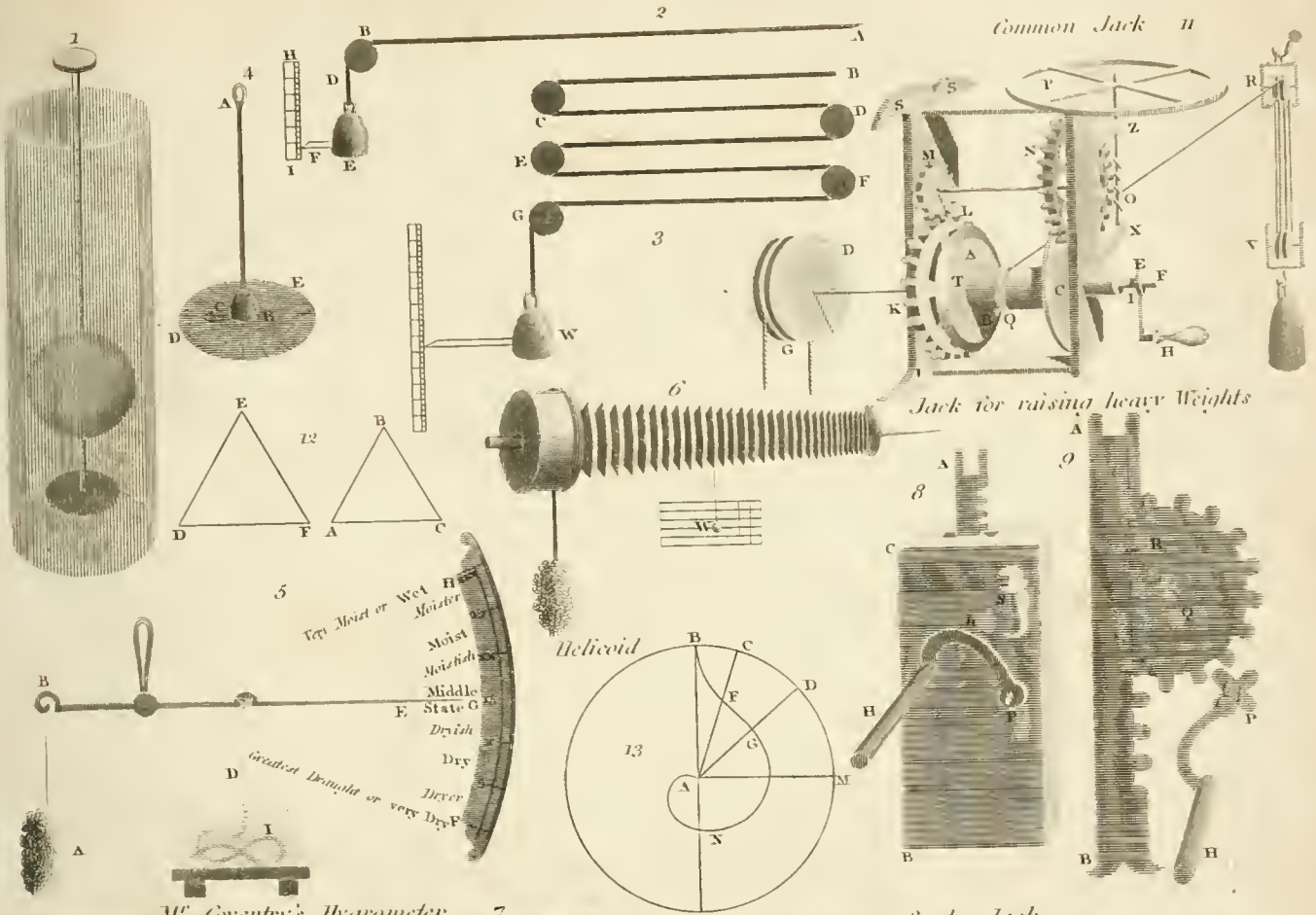
Air Levels



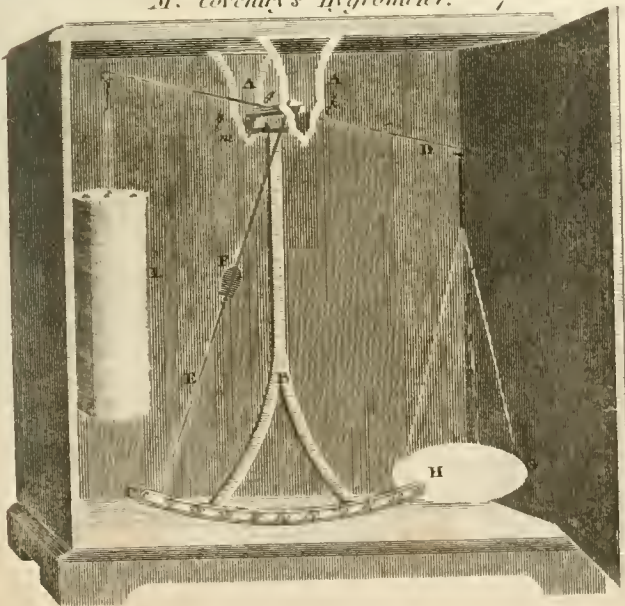
Leveling



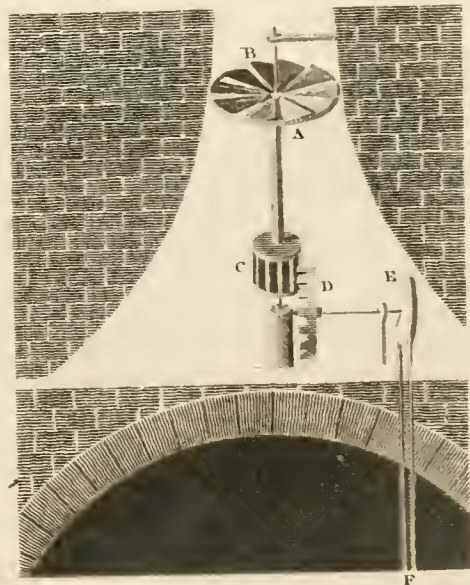




M. Coventry's Hygrometer. 7



10 Smoke Jack



them. When their fortifications were thought strong enough to defend them from the assaults of enemies, it was frequent to drag their ships to shore, which the Greeks called *σπωλκνν*, the Romans *subducere*. Around the ships the soldiers disposed their tents, as appears every where in Homer : but this seems only to have been practised in winter, when their enemy's fleet was laid up and could not assault them ; or in long sieges, and when they lay in no danger from their enemies by sea ; as in the Trojan war, where the defenders of Troy never once attempted to encounter the Grecians in a sea-fight. The adjacent places were usually filled with inns and stews, well stocked with females, that prostituted themselves to the mariners, merchants, and artificers of all sorts, who

flocked thither in great numbers ; this, however, appears to have happened only in times of peace.

NAVAL CROWN, among the ancient Romans, a crown adorned with figures of prows of ships, conferred on persons who in sea-engagements first boarded the enemy's vessel. See CROWN.

NAVAL ENGAGEMENT. See NAVAL TACTICS.

NAVAL STORES, comprehend all those particulars made use of, not only in the royal navy, but in every other kind of navigation ; as timber and iron for shipping, pitch, tar, hemp, cordage, sail-cloth, gunpowder, ordnance, and fire-arms of every sort, ship-chandlery wares, &c.

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